



UNIVERSITY OF WASHINGTON BULLETIN

GENERAL CATALOG 1988-1990

UNDERGRADUATE STUDY

GRADUATE STUDY AND RESEARCH

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PRESIDENT'S MESSAGE



A university is a community of scholars and artists, a place where faculty and students pursue truth and enrich human understanding. Universities have been regarded as essential attributes of civilized societies for hundreds of years, providing training for the professions and more general educational opportunities in scientific and humanistic studies.

The University of Washington has become one of the finest universities in the country, richly combining its research, instructional, and public service missions. It is an exciting place to be, and its contributions to the state and the nation will continue to grow as we all face the formidable challenges of the late twentieth century.

A handwritten signature in dark ink, reading "W. P. Gerberding". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

William P. Gerberding, President

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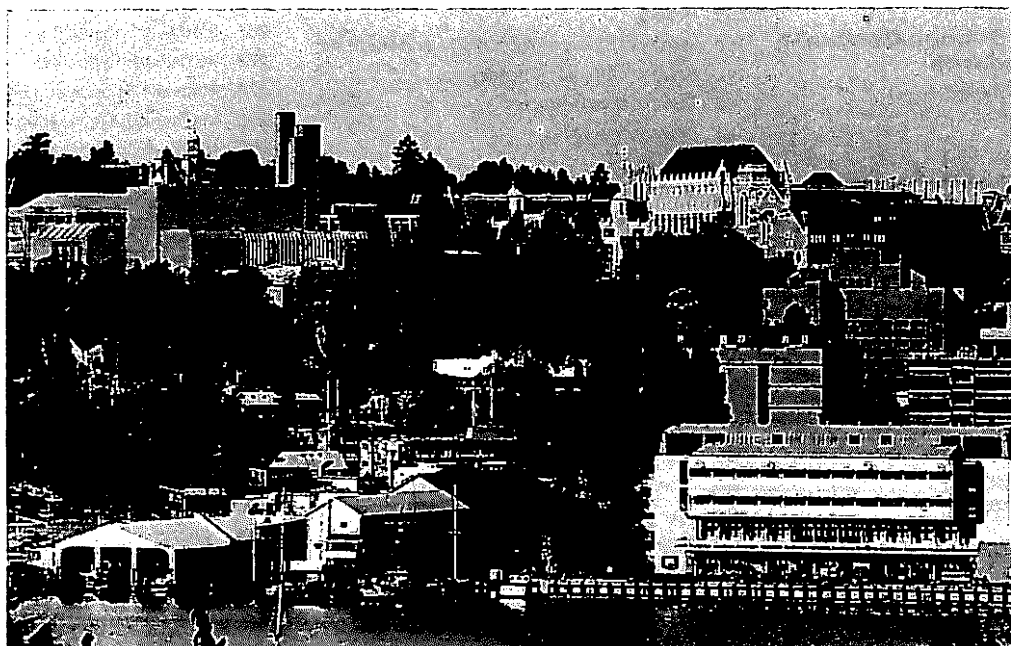
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1988-89**Summer Quarter 1988**

Application closing date for all new and former students	May 15
Regular quarter and Term a classes begin	June 20
Independence Day holiday	July 4
Term a classes end	July 20
Term b classes begin	July 21
Regular quarter and Term b classes end	August 19

Autumn Quarter 1988

Application priority date for new freshmen entering from high school	March 1
Application closing date for all new and former students	July 1*
Classes begin	September 26
Veterans Day holiday	November 11
Thanksgiving recess	November 24, 25
Last day of instruction	December 7
Final examinations	December 8-15

Winter Quarter 1989

Application closing date for all new and former students	November 1*
Classes begin	January 3
Martin Luther King, Jr.'s Birthday holiday	January 16
Presidents' Day holiday	February 20
Last day of instruction	March 10
Final examinations	March 13-17

Spring Quarter 1989

Application closing date for all new and former students	February 1*
Classes begin	March 27
Memorial Day holiday	May 29
Last day of instruction	June 2
Final examinations	June 5-9
Commencement	June 10

* If enrollment quotas are filled before the application closing date, it may not be possible to offer enrollment, although an applicant may be scholastically eligible for admission.

1989-90**Summer Quarter 1989**

Application closing date for all new and former students	May 15
Regular quarter and Term a classes begin	June 19
Independence Day holiday	July 4
Term a classes end	July 19
Term b classes begin	July 20
Regular quarter and Term b classes end	August 18

Autumn Quarter 1989

Application priority date for new freshmen entering from high school	March 1
Application closing date for all new and former students	July 1*
Classes begin	September 25
Veterans Day holiday	November 10
Thanksgiving recess	November 23, 24
Last day of instruction	December 6
Final examinations	December 7-14

Winter Quarter 1990

Application closing date for all new and former students	November 1*
Classes begin	January 2
Martin Luther King, Jr.'s Birthday holiday	January 15
Presidents' Day holiday	February 19
Last day of instruction	March 9
Final examinations	March 13-16

Spring Quarter 1990

Application closing date for all new and former students	February 1*
Classes begin	March 26
Memorial Day holiday	May 28
Last day of instruction	June 1
Final examinations	June 4-8
Commencement	June 9

Dates in this calendar are subject to change without notice. A detailed calendar with the latest information on registration is printed in each issue of the quarterly *Time Schedule*.

For directory assistance, telephone the University switchboard, (206) 543-2100.

Address correspondence to:

University of Washington
(Name of office and location)
Seattle, Washington 98195

The University of Washington, as a standing policy, does not discriminate on the basis of race, color, creed, religion, national origin, sex, sexual orientation, age, marital status, disability, or status as a disabled veteran or Vietnam era veteran. Any discriminatory action can be a cause for disciplinary action. This policy applies to all University programs and facilities, including, but not limited to, admissions, educational programs, employment, and patient and hospital services. Such discrimination is prohibited by Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, Age Discrimination in Employment Act Amendments of 1978, Vietnam Era Veterans' Readjustment Assistance Act of 1974, other federal and state statutes and regulations, and University policy. Coordination of the compliance efforts of the University of Washington with respect to all of these laws and regulations is under the direction of the Equal Employment Officer, Dr. Helen Remick, 126 Brooklyn Building, 4045 Brooklyn Ave. N.E., JA-08, University of Washington, Seattle, Washington 98105, telephone (206) 543-1830.

Additional information concerning the equality of opportunity and affirmative action policies and procedures including grievance procedures are in the *Operations Manual*, D45.4, D45.5, D46.2 and the *UW Handbook*, Vol. IV, p. 44.

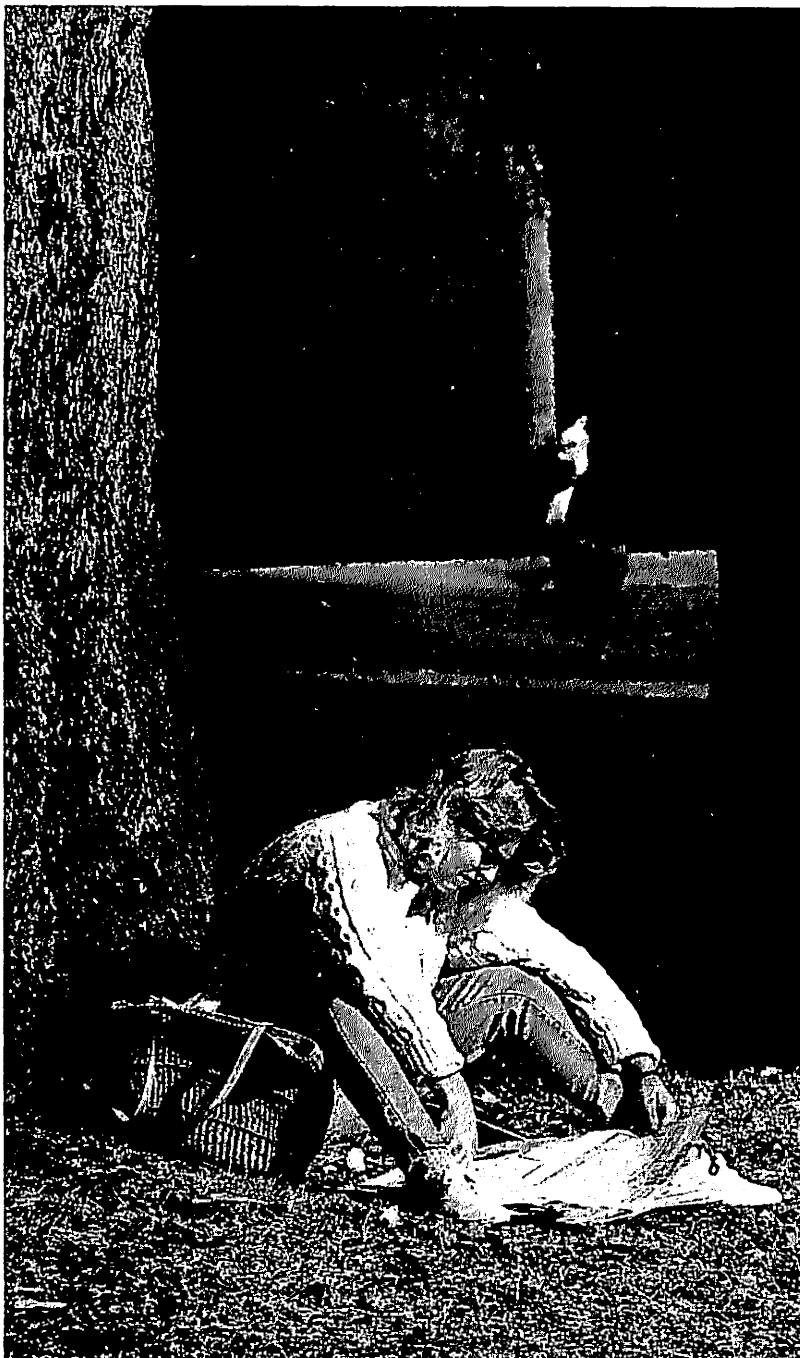
Distributed free to enrolled undergraduate students, prospective and enrolled graduate students, and to high schools, colleges, universities, libraries, and educational agencies in the state of Washington.

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The material in this catalog has been compiled and organized to provide the reader with a comprehensive overall view of the University's programs and courses. It includes academic requirements and procedures necessary for admission and graduation. Information on programs, faculty, and courses is usually arranged in alphabetical order following departmental structure within each school or college.

Because curriculum revisions and program changes usually occur during the two-year period the *General Catalog* is in circulation, students should assume the responsibility of consulting the appropriate academic unit or adviser for more current or specific information. The quarterly *Time Schedule* gives information on courses offered, class hours, and classroom locations, and has the latest calendar dates, fees, and details on registration.

All announcements in the *General Catalog* are subject to change without notice and do not constitute an agreement between the University of Washington and the student.

Founded in 1861, the University of Washington is the oldest state-assisted institution of higher education on the Pacific coast. From its original site on a ten-acre tract of wooded wilderness that is now located in downtown Seattle, the campus has grown to comprise 680 acres of trees, landscape, and buildings. Located between the shores of Lake Washington and Lake Union, it is in a residential section of the city that long has been considered one of the most attractive in the nation.

Enrollment at the University in Autumn Quarter 1987 was 33,302, of which 24,691 were undergraduates and the balance were in professional and graduate programs. Approximately eighty-six percent of the undergraduates enter as freshmen from Washington high schools or as transfer students from Washington community colleges or other colleges and universities in the state. The majority of students who enter the University as freshmen are from the top one-third to one-fifth of their high school graduating class. The grade-point average for the regularly admitted freshman class entering in Autumn Quarter 1987 was 3.51. In 1987, the full-time teaching faculty of the University numbered 2,555 members.

The University recognizes as one of its highest educational priorities the need to increase the number of qualified minorities and women in certain academic fields and professions to which they have been historically denied access or traditionally underrepresented in higher education. Through its admission policies, the University attempts to enroll more minorities and women at all levels of its educational programs. In addition, special educational support services are provided through the Office of Minority Affairs and the Graduate School's Minority Education Division to facilitate the entry of persons from underrepresented minorities and to enhance their likelihood of success while attending the University.

Accreditation

The University is accredited by the Northwest Association of Schools and Colleges and is a member of the Association of American Universities. Individual schools and colleges are members of the various accrediting associations in their respective fields.

Academic Sessions

University instruction is offered during Autumn, Winter, and Spring quarters, each lasting approximately eleven weeks. The nine-week Summer Quarter is divided into two 4½-week terms.

Evening Classes

Opportunities for evening study at the University are varied to serve individual students' interests and academic goals. Matriculated students may enroll in day or evening courses listed in the quarterly *Time Schedule*. For nonmatriculated (not formally admitted students, University Extension offers an evening credit program and noncredit evening programs, which are described in the University Extension section of this catalog. Matriculated students enrolling in courses listed only in the University Extension catalog will pay separate extension course fees.

Certificate Programs

Through certificate programs, University Extension offers carefully planned programs of study in several areas. The Studies in the Humanities program is a twelve-course noncredit study of the classics. Other candidate programs are industry- or function-oriented and provide focus on specific careers. The programs offer specialized training that supplements other education and work experience. In some certificate programs, students earn academic credit; in others, they earn certificates of completion. To accommodate working professionals, University Extension schedules



classes to meet evenings or weekends. Course fees and admission requirements vary, and enrollment in all certificate programs is limited. More information may be obtained by consulting the quarterly University Extension catalog, available by telephone, 543-2300, Ext. 363.

Summer Quarter

During Summer Quarter, a wide selection of courses in most major fields is available to graduate and undergraduate students pursuing degree programs on a year-round basis as well as to summer-only students seeking to broaden, intensify, or refresh their subject-matter competence. Summer-only students can apply for admission as nonmatriculated students. In that status, they can earn credits toward a degree at another college or enroll in UW classes even if they are not pursuing a UW degree. This status also accommodates teachers and school administrators who take special interest courses to earn additional university credits and postbaccalaureate students who do not desire formal admission to a graduate, or second undergraduate, program. Freshman students entering from high school are encouraged to begin their college work in the summer. Through the Office of Admissions, enrollment in summer courses may be arranged for specifically qualified students who have not yet completed high school.

Credits earned during Summer Quarter are evaluated as residence credits; and, with the exception of separate fee schedules for medical and dental students, Summer Quarter fees closely parallel those of the other quarters. Nonresidents and residents pay the same fees during the summer.

A complete listing of Summer Quarter courses is published in the Summer Quarter bulletin, available on request from the University of Washington, Office of Summer Quarter, GH-24, Seattle, Washington 98195, telephone (206) 543-2320.

University Libraries

The University Libraries, with almost 4½-million volumes, consists of the Suzzallo Library, Odegaard Undergraduate Library, Health Sciences Library, East Asia Library, and seventeen branch libraries. In addition to books and periodicals, the libraries' holdings in-

clude archival materials and manuscripts, maps, newspapers, microforms, research reports, media materials, and government publications. The on-line catalog is a fully integrated, computerized system, that provides information and circulation status for the cataloged holdings of the University Libraries. Computer-based reference services offer access to over three hundred data bases in business, in the sciences, and in the humanities and social sciences. Special facilities and equipment for persons who are disabled are provided in the Suzzallo and Odegaard Undergraduate libraries.

The Suzzallo (main) Library houses the system's major humanities and social sciences collections. It also serves as the central acquisitions, administrative, and processing unit for the library system. In addition to the system's major humanities and social sciences collections, Suzzallo Library contains many specialized collection areas, including Government Publications, Manuscripts and University Archives, the Microforms-Newspapers Section, and the Pacific Northwest Collection. Reference assistance is available most hours the library is open. The natural sciences library also is located in Suzzallo Library.

The Odegaard Undergraduate Library (OUGL) collection supports the undergraduate curriculum and is interdisciplinary, with an emphasis on materials in the social sciences and the humanities. The primary reserve unit for non-health sciences subjects is in OUGL. Media services and materials for both course-related and recreational usage are provided in the OUGL Media Center. Almost all study materials needed by undergraduates may be found in this library.

The Health Sciences Library collection includes materials on dentistry, medicine, nursing, pharmacy, public health, and related behavioral, biological, and quantitative sciences. This library serves as the collection and operations base for the Pacific Northwest Regional Health Sciences Library Services and houses the King County Medical Society Library Services and the Drug Information Services.

The East Asia Library is the major resource center of its kind north of Berkeley and west of Chicago. The collections are especially strong in anthropology, art, business, communications, languages, literature, law, music, and political science with respect to the cultures of China, Japan, Korea, Inner Asia, and Southeast Asia.



Henry Art Gallery

The Henry Art Gallery, the art museum of the University, brings to the campus and the community special exhibitions of contemporary and historical work in all media. The offerings include exhibitions, lectures, symposia, and an active publishing program. The University's permanent collection includes a large research collection of ethnic textiles and Western dress as well as a small but distinguished collection of European and American paintings, prints, drawings, photographs, and contemporary American ceramics and Japanese folk pottery. The collections are available for viewing by appointment to students, classes, and researchers. The Henry Gallery Association offers membership to students, faculty members, and the community for the purpose of supporting this multifaceted program. Open six days each week, the gallery is closed on Mondays and some holidays. UW students and faculty and staff members are admitted free.

Museum

The Thomas Burke Memorial Washington State Museum is an educational and cultural center whose function is to collect, preserve, research, exhibit, and interpret the natural and cultural objects of the human environment, particularly the Pacific Ocean, its islands, and mainland shores. Museum divisions are anthropology, education, exhibition, geology, and zoology.

Graduate training in the museum includes a program that leads to a Master of Arts degree in anthropology with a specialization in museology. The museum is accredited by the American Association of Museums.

The museum celebrated its centennial in 1985-86.

University Theatres

The School of Drama operates three theatres: the Glenn Hughes Playhouse, with a thrust stage; the

Penthouse Theatre, the first theatre-in-the-round built in America; and Meany Studio Theatre, which seats approximately three hundred and contains a proscenium stage. Faculty- and student-directed plays drawn from the full range of world dramatic literature are presented throughout the year.

The school also mounts annual productions in the two theatres of Meany Hall, and it gives technical and design support to opera and dance productions of the School of Music.

Language Learning Center

The Language Learning Center is a pooled resource within the College of Arts and Sciences that provides support in areas related to the teaching and learning of languages. Services directly available to students include listening facilities, individual recording and replay, provision of cassette copies of laboratory exercises, and a tutoring service for occasional use in study of the major foreign languages taught on campus.

English As A Second Language Center

The English As A Second Language Center offers a variety of courses to nonnative speakers of English from many different countries. Additional information appears in the University Extension section of this catalog.

Women's Information Center

The Women's Information Center, located in Imogen Cunningham Hall, provides information on women for both the campus and off-campus communities. Services include a resource and referral file, a re-entry program, a library, and the publication of a monthly calendar of events and a quarterly newsletter. The center offers numerous classes, programs, and events throughout the year.

Academic Computing Services

Academic Computing Services (ACS) has primary administrative responsibility on campus in the area of computing for instruction and research. Computing facilities provided include a campuswide communications network linking terminals, computers, and local area networks to a central ACS site equipped with 6 DEC VAX computers, a CDC Cyber 855 computer, and

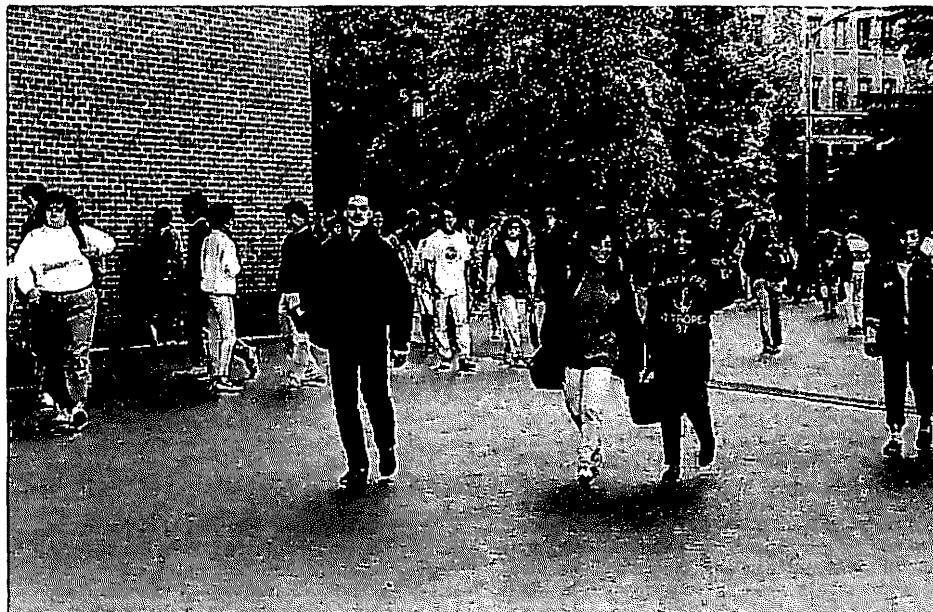
an IBM 4381 computer. Under a uniform access policy, basic services on these computers are provided at no charge to all students and faculty and staff members. These computers are equipped with a wide variety of peripheral equipment, including graphics terminals, laser printers, tape drives, and plotters. The ACS network and central computers also make possible the use of campus, national, and international electronic mail networks, including BITNET and ARPANET.

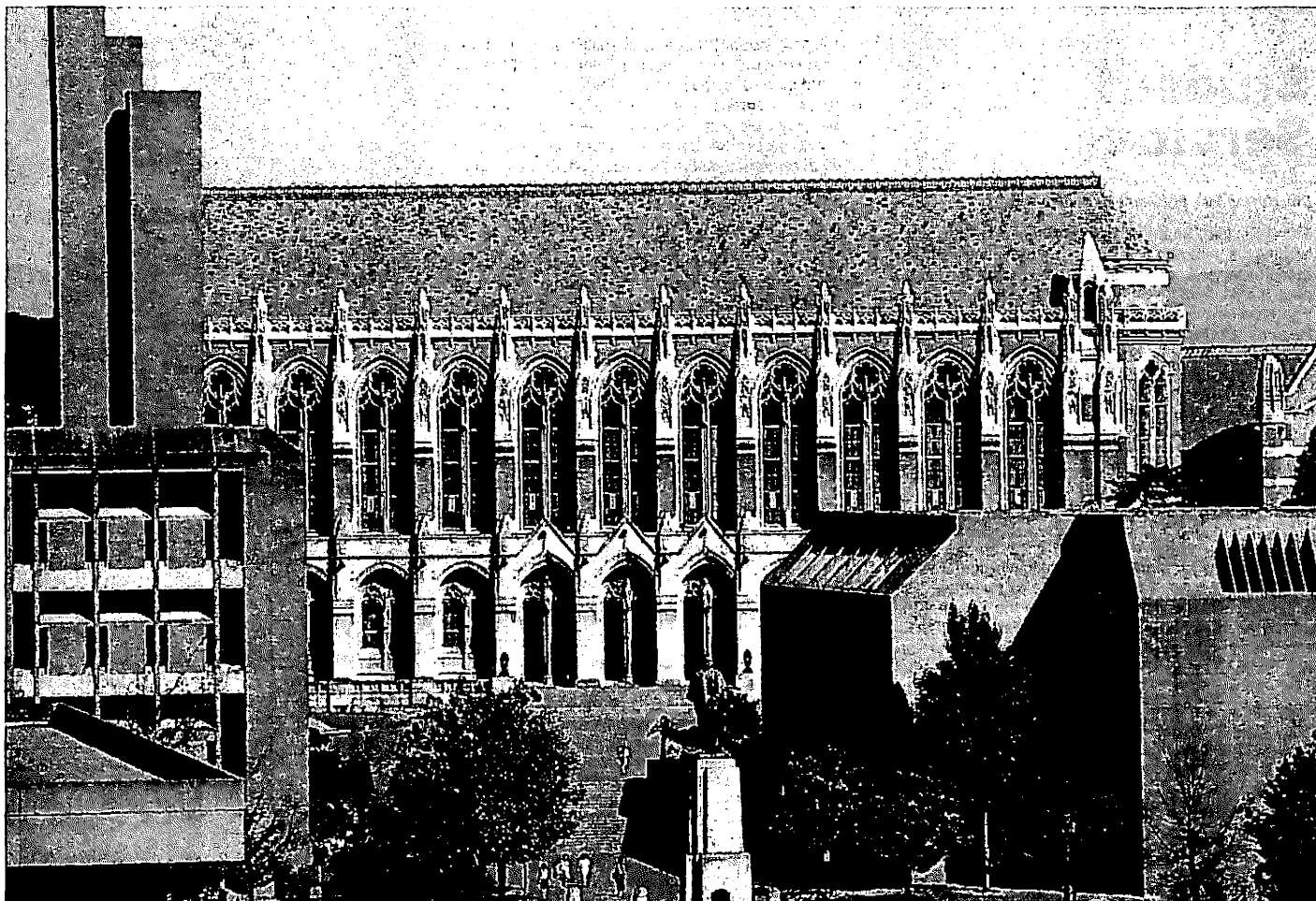
In cooperation with other departments, ACS maintains public terminal facilities in seventeen locations throughout the campus. Software on the ACS central computers includes the major programming languages and more than a hundred application packages, such as statistical analysis, data-base management, graphics, and document preparation.

In addition to providing hardware and software, ACS offers a full range of services for people who have departmental or personal computers. Some of the services provided by ACS include consultation, contract programming, product discounts on purchases by individuals and departments, facilities management, network services, access to supercomputers, assistance in selecting equipment, public domain software, and noncredit classes on topics related to computing.

ACS provides two microcomputer laboratories—an MS-DOS laboratory at the Academic Computer Center and a primarily Apple Macintosh laboratory at the Husky Union Building. Each laboratory offers an extensive variety of software and is equipped with draft- and publication-quality printers. To help students and faculty and staff members select microcomputer products, ACS operates a micro showroom, where various types of hardware and software are on display for comparison and testing. The ACS Computer Maintenance Group provides on-site hardware maintenance, including warranty service for the most popular types of systems. ACS also operates the Computing Information Center, which contains thousands of publications that deal with computing, videotapes, and public-domain software.

ACS services are described in detail in the *ACS Handbook*. Answers to questions or copies of the handbook may be obtained by telephoning 543-5970 or visiting the central facility at 3737 Brooklyn Avenue Northeast.





University Research Facilities

In addition to the campus facilities previously described, the University has numerous educational and cultural resource centers. Academic or research activities and facilities that are of general significance in all or many fields of knowledge throughout the University are listed in the Graduate School section of this catalog; others are described in individual school or college sections.

University-Owned Housing

Residence Halls

The University of Washington provides housing for about 4,400 students in seven residence halls. All are located within easy walking distance of classrooms and other campus facilities. Food service is available to residence hall students at locations throughout the campus through the use of *À La Carte*™ Plus, a debit card system. Students live in an environment of responsible freedom, and a residential life staff enhances the University experience through a variety of educational, cultural, and social programs.

Interest houses in the residence halls are available for students seeking a particular learning experience. These special living environments include Freshman House, Outdoor House, International House, and Chicanos House. For students with an interest in a related foreign language, French House, German House, or Russian House should be considered. Russian House,

offered in cooperation with the Department of Slavic Languages and Literature, is an integral part of the Russian language program.

Single-Student Apartments

The University also has a limited number of apartment spaces available for single students. Stevens Court houses three hundred students in four- and six-bedroom apartments, which have private bedrooms and share a common kitchen, living room, and bathroom. Studio apartments are available in other locations.

An application form or additional information on residence halls and single-student apartments may be obtained by writing to the Housing Assignments Office, 301 Schmitz, PC-50, 1400 Northeast Campus Parkway, Seattle, Washington 98195.

Family Housing

Convenient and economical apartment housing is available for about six hundred student families. Community programs for adults, as well as special children's activities, are presented by the Family Housing Resident Services Office, where one may write to obtain information about housing facilities, eligibility requirements, and application procedures, at 301 Schmitz, PC-50, 1400 Northeast Campus Parkway, Seattle, Washington 98195.

Food Service

University Food Services operates dining facilities

throughout the campus. The diverse schedules and dietary preferences of the campus community are accommodated by providing full meal service and *à la carte* menu items and by keeping ample hours of operation.

Food may be purchased through the *À La Carte*™ program at all University Food Services facilities. This program, required for residence hall students and available to the entire campus community, offers prepaid meal service through use of a debit card. The *À La Carte*™ program provides the flexibility for purchase of food at any of nine locations on campus.

Parking

Parking for students on the campus is limited. The University endorses and promotes alternative modes of transportation, such as transit (subsidized passes), carpooling (ride-match services provided), and bicycling.

A few parking permits are available to commuter students on a first-come-first-served basis the first day of school each quarter. University Housing will provide students with information on resident hall and family housing parking accommodations.

Additional information may be obtained by writing to the Parking Division, ND-05, 3901 University Way Northeast, Seattle, Washington 98195.

Student Services

Office of the Vice President for Student Affairs

The Division of Student Affairs assists the University in fulfilling its academic mission by providing a broad range of services and programs designed to further the educational and personal development of students. The division consists of eight units: Admissions and Records, Counseling Center, Housing and Food Services, Placement Center, Recreational Sports Programs, Student Financial Aid, Student Publications, and Student Activities and Union Facilities.

Students are encouraged to contact the Office of the Vice President for Student Affairs, 543-4792, 476 Schmitz, for information concerning various aspects of extra-class life at the University.

Childcare Program

The Childcare Program provides eligible student-parents with direct financial assistance to purchase services at licensed childcare facilities in the Seattle-King County area. To apply, students must submit the Financial Aid Form (FAF) to the College Scholarship Service and a Childcare Request Application to the Childcare Office, 466 Schmitz. Childcare locator files designed to help students find licensed facilities are located in the lobby on the fourth floor of Schmitz Hall, at the information desk in the Husky Union Building, and in the Health Sciences Library. Brochures describing the program are available at 466 Schmitz, 543-1041.



Counseling Center

All full-time students at the University may make use of the services of the Counseling Center and its staff of psychologists and vocational counselors to discuss educational progress, personal adjustment, or career goals. Psychological tests, when necessary, are provided as part of the center's counseling service. A library of reference materials on occupations and career opportunities is available for student use. Also available is a computer-assisted career guidance system with which students can work independently.

Other services of the center include the provision of various group programs directed toward concerns and skills of interest to students in their efforts to adapt to the University.

Students are not charged for the first appointment, which is provided to determine if the Counseling Center's services are needed. Individual appointments after the first visit cost \$9 each. Fees for entrance to group programs range from \$15 to \$40. For students financially unable to pay the fee, efforts are made to find other alternatives. The center is located on the fourth floor of Schmitz Hall.

Disabled Student Services

The University provides program access to students with either permanent or temporary disabilities through a variety of services, equipment, and publications. Disabled Student Services (DSS) coordinates many of these special services. To the maximum extent possible, disabled students are integrated into the general student population and their problems are solved through the usual channels.

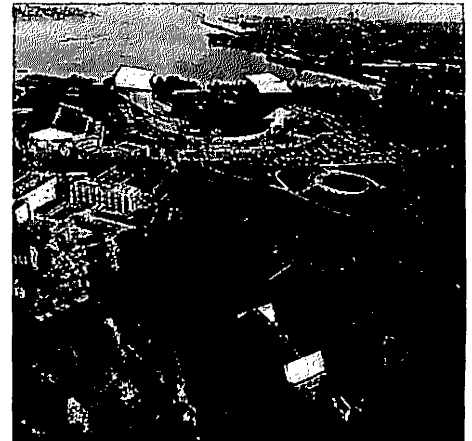
In those instances that a person requires a special accommodation as a result of a disability, DSS works with individuals to define and coordinate specific adaptation. Services available include preadmission interviews, counseling and referrals, priority registration, classroom relocation, classroom testing accommodations, tape-recording and reader referral service for print-handicapped students, mediation when necessary, and other services for mobility-limited or sensory-impaired students, which are arranged on an individual basis. Specialized equipment of many types is available for on-campus use or checkout; equipment lists may be obtained from DSS. Publications include *Access: UW* (a guidebook showing classroom access, ramps, curb cuts, parking, accessible restrooms, etc.), a wheelchair map and a braille map of campus, *Faculty Guide for Working With Disabled Students*, and a newsletter entitled *ACCESSory*.

Various other departments offer additional services: Transportation Department provides free on-campus transportation on Dial-a-Ride, a van with a wheelchair lift (telephone 545-1511), and Parking Division offers disability parking permits and a battery recharge station for electric wheelchairs (545-1543). Other departments that offer services include Housing and Food Services (543-4059) and Hall Health Center (545-1011), as does an ASUW-affiliated student group, the Disabled Students Commission, 302A HUB (543-7503 or TTY 543-8725).

Additional information is available from Disabled Student Services, 482 Schmitz, PB-07, 543-8924 (Voice/TTY).

Early Entrance Program

A unique UW program provides early University entry to exceptionally bright, highly motivated adolescents who are ready for college-level work by age fourteen, the usual age of entering high school. A transition school provides an intensive, one-year bridge to regular, full-time University enrollment; counseling support and a "home base" are also provided to full-time stu-



dents. Information is available from the Center for the Study of Capable Youth, Guthrie Annex II, 543-4160.

Educational Assessment Center

Testing and educational evaluative services for University departments and individual students are available at the Educational Assessment Center. Of particular interest to prospective and entering students are the center's programs for admissions testing, including the Washington Pre-College Testing Program, and for placement testing in mathematics and foreign languages. For the University student approaching graduation, the center administers tests required for admission to graduate, law, medical, and other professional schools, as well as those tests often requested by prospective governmental or private employers. The center has its offices on the fourth floor of Schmitz Hall.

Foreign Study Office

The Foreign Study Office cooperates in and administers more than thirty international study programs for eligible University students. It provides information and counseling services to those who wish to study abroad on University programs as well as through other U.S. and foreign institutions. The office is located at 572 Schmitz, 543-9272.

Hall Health Center

The University provides outpatient health and medical care for students through the Hall Health Center. Located on campus, the center is staffed by physicians and nurse practitioners.

The following specialties are represented: chest disease, endocrinology, dermatology, family planning, general practice, general and hand surgery, gynecology, internal medicine, orthopaedics, physical therapy, and psychiatry. Common conditions in other specialties also may be treated.

All graduate and undergraduate students, registered for full- or part-time courses and paying student fees, are eligible for health service upon presentation of a current University student identification card.

There is no charge for professional consultation by physicians or nurses. Moderate fees are charged for x-rays, physical examinations, mental-health visits, vision care, allergy injections, and a few other services. Students must pay for outside laboratory and medical services and for prescriptions filled at the pharmacy.

Student health insurance, available through the University of Washington, should not be confused with services through Hall Health Center. A student may use Hall Health Center services without having student insurance. For major surgery and the occasional illness

of exceptional severity that require treatment elsewhere, the student should protect himself or herself against the expense by obtaining student health insurance. A low-cost medical-surgical-hospital policy, designed to meet those specific needs, may be purchased at the time of registration.

The Hall Health Center is open from 8:00 a.m. to 5:00 p.m., Monday through Friday, during Autumn, Winter and Spring quarters. Summer Quarter service hours are 8:30 a.m. to 5:00 p.m. Emergency service is available at the Urgent Problem Clinic on Saturdays, Sundays, and holidays during the regular school year.

Additional information may be obtained from University of Washington, Hall Health Center, GS-10, Seattle, Washington 98195.

Student Health Insurance Program

A health insurance plan is available to regularly enrolled University students and their dependents on a voluntary basis. A student may enroll in the plan at the time of registration each quarter. The appropriate premium must be paid by the quarterly tuition due date. The plan provides coverage for accidents and illnesses that require treatment or hospitalization. Brochures describing the insurance eligibility, coverage, and costs are available at the Office of the Vice President for Student Affairs, 466 Schmitz, Hall Health Center, HUB, and information window in Schmitz Hall.

The University also sponsors a field-trip sickness and accident insurance plan. Application forms may be requested from the Risk Management Office, 270 Administration, AG-76, telephone (206) 543-0183.

Insurance for Foreign Students

All students from foreign countries are required to have a health-and-accident insurance policy in force while registered at the University. This may be achieved by purchasing either the student health and accident insurance offered through the University or other cover-

age, of which proof must be furnished to the International Services Office and for which an insurance waiver must be obtained. If registration is not to be canceled, the Cashier's Office must have either full payment of tuition and fees and an insurance waiver on file or full payment of tuition and fees and insurance by the tuition due date.

International Services Office

The International Services Office provides assistance to international students, including such matters as general orientation of new students to the campus and community; advice and counsel for educational, financial, and personal problems; dissemination of important information through newsletters; and assistance in meeting United States Immigration and Naturalization Service regulations on such matters as extensions of stay, change of status, transfer of schools, and work permits. The office is located in 459 Schmitz, 543-0840.

Office of Minority Affairs

The Educational Opportunity Program, administered by the Office of Minority Affairs, provides a variety of services to students from minority and economically disadvantaged backgrounds. These services include recruitment, admissions, academic advising, tutoring, personal and career counseling, housing and financial aid advising, and other assistance.

The Office of Minority Affairs operates the Instructional Center, which provides assistance in reading, composition, mathematics, sciences, and basic study skills as well as tutorial support for courses offered at the University.

The Early Identification Program provides enrichment activities to prepare minority undergraduate students interested in earning postbaccalaureate degrees. The activities include early exposure to research processes, faculty mentors, seminars, and advising, as

well as assistance with the graduate school application process.

The Ethnic Cultural Center is a complex that houses a library of ethnic literature, multipurpose rooms, and offices for use by minority students. Minority student, faculty, and community groups use the facilities for a variety of purposes, including meetings, study, social, and cultural events.

The Ethnic Cultural Center Theatre is the home of Seattle's only ethnic acting company, The Group. A recipient of outstanding reviews for its performances of contemporary plays, The Group serves as a cultural link with the broader and off-campus community.

The Office of Minority Affairs is located on the third floor of Schmitz Hall.

Placement Center

The University's Placement Center, which includes a Minority Placement Program, offers career information and services to assist undergraduates, graduate students, and degree- or certificate-holding alumni (1) to make a viable connection between their academic backgrounds and their career or long-range employment objectives, (2) to develop effective job-seeking strategies, and (3) to find suitable employment upon leaving the University or to change employment thereafter.

Office of Special Services

The Office of Special Services, 460 Schmitz, assists students eligible for veterans' educational benefits, including tuition or fee reductions; advises students who must meet English As A Second Language requirements; administers the Student Visitation Program for prospective students; and oversees tuition reciprocity agreements between Washington State and other localities.

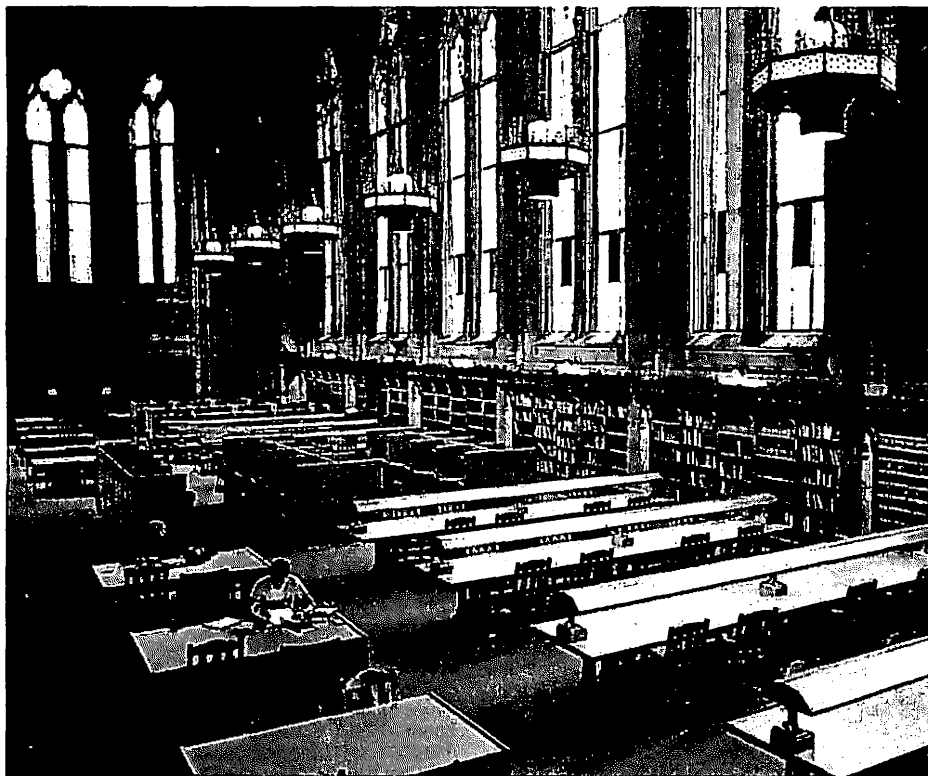
Office of Student Financial Aid

The Office of Student Financial Aid, 105 Schmitz, administers several federal, state, and private financial aid programs created to help students pay for their educations. Assistance is offered in the form of grant aid, scholarships, long-term loans that must be repaid after leaving school, and work opportunities. An information packet describing the different programs, eligibility criteria, and application procedures may be obtained by telephoning, (206) 543-6101.

Both undergraduate and graduate students may apply for aid through the Office of Student Financial Aid; graduate student assistance is generally limited to long-term loans and work opportunities. Information on graduate fellowships, scholarships, and teaching and research assistantships may be obtained from the graduate program coordinator in the individual department or program (see Graduate School section of this catalog).

To be eligible for financial aid, an individual must be a citizen or permanent resident of the United States and be admitted to the University as a matriculated, degree-seeking student. First consideration is given to full-time students who are pursuing their first degree at any level (first baccalaureate, first master's, etc.). Priority consideration is also given to students who apply before the University's financial aid application deadline, which is generally March 1 of the preceding year (e.g., March 1, 1989, for the year beginning in September 1989).

The Office of Student Financial Aid also administers the Student Employment Service, 172 Schmitz, telephone (206) 543-1840, an employment referral service that lists a wide variety of part-time jobs on and off campus throughout the year. The office, 180 Schmitz,



also administers short-term emergency loan programs for full-time students who find themselves in temporary, severe financial difficulty. University students may take advantage of the Student Employment Service and of the short-term emergency loan programs without applying for financial aid.

Student Legal Services

Student Legal Services provides legal advice, counseling, negotiating, and court representation in many non-criminal legal matters. All currently enrolled undergraduate and graduate students are eligible for a free initial consultation. If additional services are needed, there is an hourly charge of \$10, plus a minimal supply fee and court costs, if any. The office is staffed by third-year law students supervised by licensed attorneys, including a staff attorney. Students may telephone 543-6486 or visit the office, 31 Brooklyn Building, JA-16, 4045 Brooklyn Avenue Northeast, to make an appointment or to learn more about the office's services.

Student Union Facilities

The Student Union facilities, the Husky Union Building and the South Campus Center, are the principal centers of student activities and programs on the campus.

STUDENT UNION BUILDING

The Husky Union Building (HUB) houses a variety of facilities and services for students, faculty and staff members. These include a 478-seat auditorium, a multipurpose ballroom, a barber and hair styling shop, a branch of the University Book Store, several retail food operations, a recreation and amusement games area, a lost-and-found office, a ticket sales office, a newsstand, a self-service post office, and a limited-service bank, two cash machines, and a microcomputer laboratory. Meeting rooms accommodating from 10 to 175 persons are available for registered student organizations.

SOUTH CAMPUS CENTER

The South Campus Center offers services and activities similar to those in the HUB primarily to students in the health and marine sciences. In addition to student offices, conference rooms, a student art gallery, and recreation facilities, the center offers indoor and outdoor dining. A ticket office, a newsstand, a University Book Store branch, and a twenty-four-hour cash machine are also available.

Student Activities and Organizations

Student Activities Office

The services provided by the Student Activities Office (SAO) staff include assisting students in understanding University policies and procedures, providing technical help in the planning and conduct of student events, and furnishing information and assistance to student groups or organizations in order that they may represent themselves and their interests in an effective manner. Advisers are available to assist students involved in group activities with budget and program planning, advertising, orientation to campus resources, and leadership and organizational skill development. Underlying the SAO service functions is a desire to provide an environment in which students can learn from their experiences in extracurricular activities as a supplement to their classroom experiences. Additional information about the services is available from the Student Activities Office, 207 HUB, telephone 543-2380.

Student Organizations

Students at the University are encouraged to become active in at least one of the campus's approximately 350 voluntary student organizations, which include honorary, professional, and social organizations; service and coordinating clubs; activity groups; and religious and fraternal organizations. Voluntary student or-

ganizations that register with the University receive various benefits and services to assist their respective activities. Additional information is available from the Student Activities Office, 207 HUB, telephone 543-2380.

Associated Students, University of Washington

The Associated Students, University of Washington (ASUW), is a voluntary, nonprofit association of students designated by the University Board of Regents to carry out a variety of student activities and to represent student interests. In order to vote in ASUW elections, hold ASUW office, or be employed by the ASUW, a student must be a member of the ASUW by providing an affirmative answer on the University registration form each quarter.

The ASUW has an annual budget of approximately \$1 million, supported by the services and activities fee paid as part of tuition and supported from program revenue. The government of the ASUW is headed by a president, three other officers, a seven-member board of control elected by the student body each year, and one representative from the Graduate and Professional Student Senate. The ASUW maintains agencies and service groups to provide students with a varied program of activities during the school year and nominates students for service on a number of University committees. ASUW services include lecture notes, a poster printing service, Experimental College, and a bicycle repair shop. Questions regarding the ASUW and its services should be directed to either the Student Activities Office, 207 HUB, telephone 543-2380, or the ASUW office, 204L HUB, telephone 543-1780.

Graduate and Professional Student Senate

The Graduate and Professional Student Senate (GPSS) serves primarily as an advocate for the academic welfare of graduate and professional students. It is composed of representatives elected from each graduate and professional degree-granting unit. Funded from student services and activities fees, GPSS dedicates a portion of its budget each year to direct allocations for departmental student groups and for special programs benefiting students from many departments. GPSS publishes informational bulletins, monitors legislative issues of impact to graduate students, maintains graduate student representation on University administrative committees, assists with personal or academic grievances and, in general, seeks to represent graduate student issues and concerns within the University community. Questions regarding the GPSS should be directed to either the Student Activities Office, 207 HUB, 543-2380, or the GPSS office, 300 HUB, 543-8576.

Student Publications

Student publications at the University include the *Daily*, the *Tyee* (yearbook), and the *Student Directory*. The *Daily* is published Monday-Friday mornings throughout the academic year and is distributed on campus without charge. During Summer Quarter, the *Daily* is published once a week. Any student with an interest in journalism may serve on the *Daily* or *Tyee* staffs.

Intercollegiate Athletics

The Department of Intercollegiate Athletics operates an integrated program for men and women. Intercollegiate competition is limited to full-time students.

There are nine women's teams: cross-country, volleyball, gymnastics, basketball, swimming, track and field, tennis, golf, and crew. Women's competition is in the ten-team Pacific-10 Conference (PAC-10) and is affiliated with the National Collegiate Athletic Association (NCAA).

Ten sports are offered for men's competition: baseball,



basketball, crew, cross-country, football, golf, soccer, swimming, tennis, and track and field. Men's teams compete on a full Pacific-10 Conference schedule, as well as with other institutions locally, regionally, and nationally. The University is a member of the National Collegiate Athletic Association.

Facilities available to intercollegiate athletic teams are Hec Edmundson Pavilion, Pavilion Addition, Husky Stadium, Graves Baseball Field, Chaville Track and Field Complex, Conibear Shellhouse and other crew facilities on Lake Washington at the eastern boundary of the campus, the Quillian Memorial Tennis Courts, and a variety of golf courses throughout the greater Seattle area.

Recreational Sports

The Department of Recreational Sports Programs provides a comprehensive program of sports activities designed to meet the diverse needs and interests of students. To provide this service, the department manages recreation facilities that include the Intramural Activities (IMA) Building, Golf Driving Range, Waterfront Activities Center, outdoor facilities (Denny Field and Tennis courts) swimming pool and locker rooms at Hutchinson Hall, and the Practice Climbing Rock. A varied program of intramural sports, co-recreational activities, sports skill classes, sports clubs, special events, and general recreation is open to every student (modifications available for disabled participants as needed) with a valid student identification card.

Instruction is offered in aerobics, archery, badminton, basketball, conditioning, dance (ballet, jazz), fencing, golf, judo, kayaking, karate, mountaineering, pickleball, racquetball, roller skating, ski conditioning, skin diving and SCUBA, soccer, springboard diving, squash, swimming, tae kwon do, tennis, volleyball, and weight training.

Sports clubs exist for aikido, archery, badminton, bicycling, canoeing, climbing, fencing, gymnastics, ice hockey, judo, karate, kendo, kung fu, lacrosse, racquetball, rowing, rugby, sailing, synchronized swimming, skiing, skin diving and SCUBA, skydiving, soccer for men and women, squash, tae kwon do, underwater hockey, volleyball, water polo, and weight lifting.

Intramural sports are offered for men, women, and men and women combined (Co-Rec) in a variety of activities, including basketball, bowling, flag football, handball, innertube basketball, racquetball, soccer, softball, squash, swimming, tennis, track and field, ultimate frisbee, and volleyball, as well as a variety of special events. More information regarding these programs may be obtained by telephoning Intramural Sports, 543-8558; Sports Clubs, 543-8499; Instruction, 543-2571; IMA Building, 543-4590, Waterfront Activities Center, 543-9433; or the Golf Range, 543-8759.

The University and its colleges and schools reserve the right to change the fees, the rules, and the calendar regulating admission and registration; the instruction in, and the graduation from, the University and its various divisions; and any other regulations affecting the student. The University also reserves the right to withdraw courses and programs at any time.

It is the University's expectation that all students will follow the University regulations and procedures as they are stated in the *General Catalog*. Appeals may be filed with the student's Dean or with the Vice President for Student Affairs in nonacademic matters.

Registration and Withdrawal

The University provides registration services through a touchtone telephone registration system referred to as STAR (Student Telephone-Assisted Registration). This system allows students to register at the University from any touchtone telephone. Registering, adding sections, dropping sections, and completely withdrawing from the University may be accomplished through STAR.

Detailed information and procedures pertaining to registration and withdrawal are outlined in the quarterly *Time Schedule*. Specific information on Summer Quarter policies appears in the bulletin for Summer Quarter.

Registration Period I

Designed to accommodate currently registered matriculated students, Registration Period I occurs during the latter half of the quarter preceding the quarter for which the student is registering. However, currently enrolled students registering for Autumn Quarter do so in Spring Quarter.

Registration Period II

Registration occurs after Registration Period I closes and is intended primarily to accommodate new and returning students. Continuing students who fail to register during Registration Period I may register during this phase.

Registration Period III

Students who have been admitted may register late, but are charged a \$25 fee through the tenth day of the quarter. The fee is \$75 after the tenth day of the quarter and permission is required.

Faculty/Staff Tuition Exemption

Eligible faculty and staff may enroll for up to 6 credits each quarter under the tuition exemption program. Because such students are registered on a space-available basis, they must register after other students. The quarterly *Time Schedule* lists registration dates and hours during which the faculty and staff members may register. Eligibility information may be obtained from either the Staff Personnel Office or the Registrar's Office.

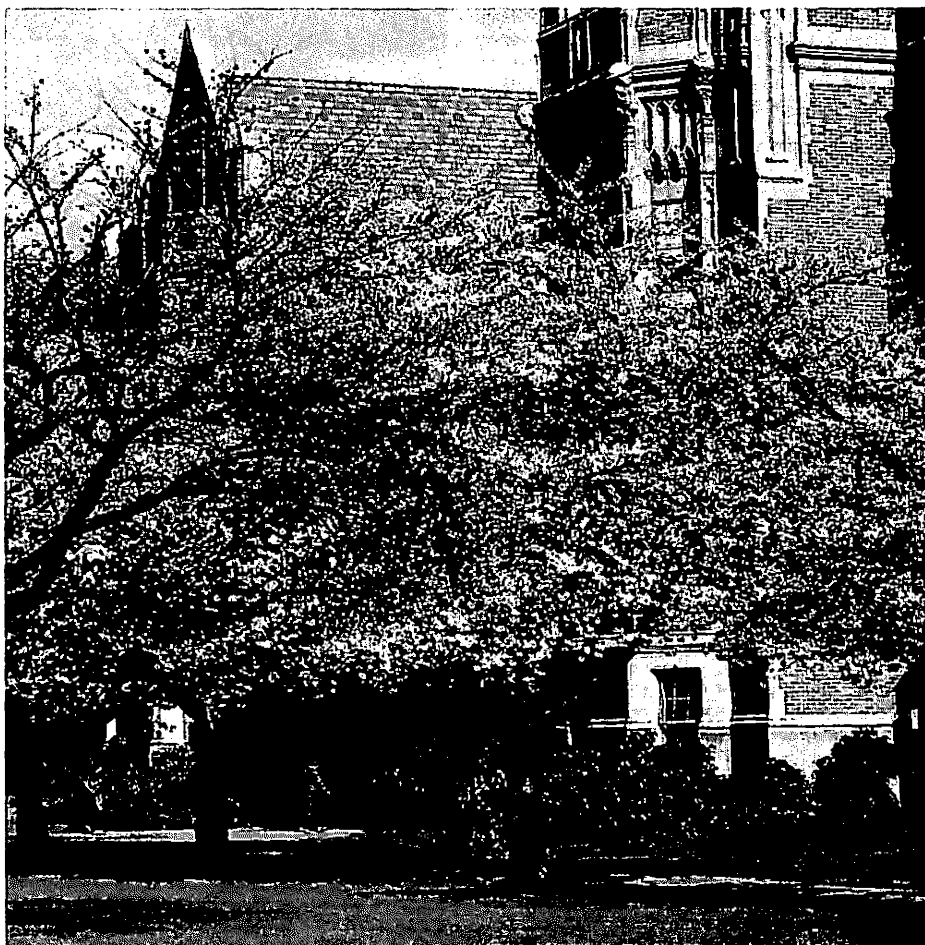
"Access" Program for Older Adults

The University of Washington allows Washington residents sixty years of age or older to audit certain courses on a space-available basis. Students who attend the University under the Access program are limited to two courses per quarter. There is a nominal registration fee. As auditors, students do not receive credit and do not complete laboratory work or take examinations.

Change of Program to Drop or Add Classes

1. Registered students may add and drop classes before the quarter begins. Information on dates and procedures appears on posters placed throughout the campus and in the quarterly *Time Schedule*.

2. All students may add and drop courses during the



first week of school by following instructions in the quarterly *Time Schedule*.

Adding Courses/Permission Guidelines

For reasons of public safety and instructional quality, course enrollment in each section is limited to no more than the approved classroom capacity. The Registrar's Office monitors course enrollments throughout the quarter, following these guidelines:

1. Through the fifth class day, students may add a section without the instructor's signature unless the class is full or requires permission. The Registrar's Office will accept course overload authorization up to 115 percent of room capacity when the student presents authorization signature by either the instructor or an authorized person in the department.

2. From the second through fifth weeks, overload authorization signatures will be accepted for up to 105 percent of room capacity.

3. Beginning the sixth week, course registration will not be accepted if it lacks signatures by both the instructor and the department Chairperson. Registration will not be permitted if enrollment has reached 100 percent of room capacity.

4. Audited courses may not be changed to credit registration after the first two weeks of the quarter.

DROPPING A COURSE

Undergraduates dropping a course during the first two weeks of a quarter shall have no entry on their permanent academic record except notice of withdrawal from

the University if all courses are dropped. During the third and fourth weeks, a dropped course is recorded as *W*. During Summer Quarter, no entry is recorded on the student's record for drops made during the first week of an *a* term course, or the first week of a *b* term course. During the second week of either term, the grade *W* is recorded. Drops require that a student process a Change of Program card through the Registrar's Office.

Undergraduates cannot drop courses after the fourth week of the quarter through the last day of instruction, with the following exceptions:

(a) A student may drop all courses by withdrawing from the University through the last day of instruction.

(b) A student is allowed a limited number of uncontested (peremptory) course drops in accordance with the following schedule:

Number of credits earned at UW at time of course drop	Number of uncontested course drops permitted
0-44	3
45-89	1
90-134	1
135-179	1
180-224	1
etc.	1

An entry of **W* is made for each uncontested (peremptory) drop.

The three uncontested (peremptory) course drops that are allowed students who have earned 0-44 University of Washington credits may not be accumulated for use after 44 credits are earned. Subsequent uncontested course drop privileges, however, may be accumulated.

(c) A student may petition the Registrar in writing to drop a course. Such a petition is granted if, in the Registrar's judgment, (1) the student is unable to complete the course in question due to a severe mental or physical disability, or (2) unusual and extenuating circumstances beyond the student's control prevented him or her from dropping the course by the end of the fourth week. A petition must be filed in 209 Schmitz immediately after the student discovers it necessary to drop the course. This does not affect tuition charges.

The Registrar enters the grade of *HW* (Hardship Withdrawal) for all courses approved for drop by petition.

No drops or withdrawals may be made after the last day of instruction (i.e., no drops are permitted during or after the final examination period). During Summer Quarter, an undergraduate student may not drop a course (a term, b term, or full term) or withdraw from the University during the last five days of instruction.

A student who drops a class unofficially (i.e., without the proper approvals and without processing an add/drop card through Sections) is given a grade of 0.0.

Students receiving or applying for financial aid should check with the Office of Student Financial Aid, 105 Schmitz, telephone 543-6101, before dropping a class, because it may affect their eligibility.

Withdrawal From the University

Once registered, a student must officially withdraw if he or she later chooses not to attend the University for the registered quarter. Official withdrawal must be made by the fifth day of the quarter for the student to avoid further financial obligation (see Tuition, Fees, and Special Charges for refund information on withdrawals).

1. To be official, a withdrawal from the University must be turned in at the Withdrawal Office, 264 Schmitz. Withdrawal forms are available at advising offices and the Withdrawal Office. An official withdrawal is effective the day it is received in the Withdrawal Office.

2. Submission of a graduate On-Leave application does not constitute official withdrawal from the University.

3. Refer to grading section in the Undergraduate Study or the Graduate School: Graduate Study and Research sections.

4. A recipient of veterans' benefits should immediately notify the Office of Special Services of withdrawal.

5. A student with a scholarship or loan awarded through the University should notify the Student Accounts and Scholarships Office or the Student Loan Office.

Change of Address

The student is responsible for keeping his or her address up-to-date in the Registrar's Office by filling out a change of address form at the Registration Office, 225 Schmitz. The mailing of notices to the last address on record constitutes official notification.

Restrictions on Attending Classes

No person, other than a faculty member attending informally with the approval of the instructor, may attend a University course in which that person has not been registered.

An instructor may allow a student to attend his or her



class only if the student's name is on the official class list from the Registrar's Office.

Student Identification

Each student is issued a quarterly identification card after registering at the University. This card is the student's means of establishing entitlement to the rights and privileges that normally accrue to students.

Students whose identification cards have been lost or stolen can have them replaced by paying a nonrefundable fee at the University Student Accounts and Scholarships Office. Replacement of cards made invalid by changes in students' names or of cards rendered unusable by normal wear and tear is provided without charge upon return of the original card to the Registrar's Office. Two pieces of identification (one with a photo) are required to obtain a replacement card.

Cards that have been tampered with or misused may be confiscated by the University agency or department involved. The incident may be referred to the Office of Student Affairs for appropriate University action.

Transcripts

Official copies of student academic records at the University of Washington must bear the official embossed seal of the University, the signature of the Registrar, and the date of issue.

Transcript Fee

A charge of \$3, payable to the Transcript Office in advance, is required for each transcript. Partial transcripts are not issued. Each transcript will include all course work taken at the University of Washington.

Transcripts From Other Schools

A transcript covering a student's previous secondary and college education that has been submitted to the University as a requirement for admission becomes part of the official file and is not returned to the student. Any student who desires transcripts of his or her course work undertaken elsewhere must order official transcripts from the institution. The University does not issue or certify copies of transcripts from other institutions.

Estimated Expenses

The cost of a student's education at the University varies, the amount depending on his or her classification, status as resident or nonresident, and field of study. In computing college costs, a student should consider such additional expenses as insurance coverage, books, and laboratory supplies. Personal expenses (e.g., clothing, laundry, recreation, and transportation), which vary with each individual, as well as between-quarter expenses, should not be overlooked.

Prepared by the Office of Student Financial Aid, the following figures reflect modest, but adequate, probable costs for students attending the University during the nine-month academic year. They should be used only as a guide in determining the year's expenses.

	Lives with parents		Traditional	Non-traditional	
	Under-graduate	Graduate		Under-graduate	Graduate
Books	\$ 468	\$ 498	\$ 468	\$ 468	\$ 498
Room and board	1,500	1,500	3,486	4,428	4,428
Transportation	576	624	576	624	624
Miscellaneous personal expenses	996	1,083	1,272	1,359	1,359
Total	\$3,540	\$3,705	\$5,802	\$6,879	\$6,909

Traditional budget: For all undergraduate students, without a spouse or children, who are living away from the parental home.

Nontraditional budget: For all graduate and professional students and for undergraduate students who are married or have dependents.

	Resident tuition and fees	Nonresident tuition and fees
Undergraduates	\$1,797	\$4,998
Graduate students	2,595	6,468
Medical and dental students	4,209	10,674

Tuition and fees are subject to change.

Tuition, Fees, and Special Charges

Enrollment Service Fee

A new or returning former student or continuing student in a new classification (e.g., undergraduate, postbaccalaureate [fifth-year], graduate) is required to confirm his or her intention to enroll by paying a nonrefundable \$50 enrollment service fee (not required of nonmatriculated students). The \$50 is applied toward tuition and fees assessed for the quarter for which the student is determined to be admissible and subsequently enrolls. A student who pays the fee for a given quarter but does not register in that quarter is not entitled to refund except in the situations listed below:

1. A new or returning matriculated student who is unable to obtain courses that are applicable to the requirements for the degree or certificate program to which the student has been admitted, and who does not enroll in or attend other courses, is refunded the \$50 enrollment service fee upon written request to the Registrar. Petitions should include a statement from an appropriate academic adviser certifying that no such courses are available. Petitions must be submitted by Friday of the second week of the quarter.
2. A new or returning matriculated student who, after meeting with an appropriate academic adviser or receiving a University General Catalog, determines that the program for which admission was granted differs substantially from what the student was led to expect based upon earlier available information, will be refunded the \$50 enrollment service fee upon written request to the Registrar. Such a request for refund must be submitted before the student registers for courses and in no case later than the first day of the quarter for which admission has been granted.
3. A new or returning student who applies by the prescribed deadline for financial aid administered by the University's Office of Student Financial Aid, and who cannot be awarded financial aid adequate to his or her needs as determined by that office, and who is therefore unable to attend the University, is refunded the \$50 enrollment service fee upon application to the Registrar no later than two weeks after receipt of notice of the financial aid award.
4. A new or returning student who is unable to attend the University because of pregnancy, disability, or death, or because of being called involuntarily into the military service of the United States or into civil duty, will be refunded the amount, if any, by which the enrollment service fee exceeds the amount of tuition and fees assessed at the time of withdrawal. Requests for refund must be submitted in writing to the Student Accounts and Scholarships Office by the last day of the quarter for which the student was determined admissible and for which the enrollment service fee has been paid. Appropriate documentation is required.

Fee Payment

An obligation to pay tuition and fees in United States dollars is incurred when a student registers. A fee statement is mailed to the student's address on file in the Registrar's Office.

Payment of this obligation is due by Friday of the third week of the quarter. Nonpayment of tuition and fees by the due date results in: (1) charge of \$30 for late payment, if payment is received within the one-week late payment period; (2) cancellation of registration, if payment is not made by the end of the fourth week. One-half of tuition is assessed when registration is canceled for nonpayment of tuition and fees. The Summer Quarter bulletin should be consulted for fees and fee payment schedule applicable to Summer Quarter only.

When the payment is not in conformance with the tuition and fee billing, specific instructions on how the

payment is to be applied must accompany the payment. In the absence of instructions, the University makes a reasoned interpretation of the student's intent and accounts for the funds accordingly. The student number must be specified on all payments.

Quarterly Tuition and Fee Rates Effective Autumn Quarter 1988

Undergraduate (including nonmatriculated and fifth-year)		Resident	Nonresident
Additional fee per credit for more than 18 credits.		\$ 53	\$ 160
Full time (more than 9 through 18 credits)		599	1,666
Part-time: 9 credits		539	1,500
8 credits		479	1,334
7 credits		419	1,168
6 credits		359	1,002
5 credits		299	836
4 credits		239	670
3 credits		179	504
2 credits		119	338
Graduate and Law			
Additional fee per credit for more than 18 credits.*		115	299
Full time (more than 6 through 18 credits)		867	2,158
Part-time: 6 credits		743	1,850
5 credits		619	1,542
4 credits		495	1,234
3 credits		371	926
2 credits		247	618
Medical and Dental			
Full time (more than 12 credits)		1,405	3,560
Part-time: 12 credits		1,297	3,286
11 credits		1,189	3,012
10 credits		1,081	2,738
9 credits		973	2,464
8 credits		865	2,190
7 credits		757	1,916
6 credits		649	1,642
5 credits		541	1,368
4 credits		433	1,094
3 credits		325	820
2 credits		217	546

* Does not apply to candidates for the J.D. (law) degree.

Fees are subject to change without notice.

Tuition schedules for resident and nonresident students apply to the academic year (Autumn, Winter, and Spring quarters). Summer Quarter tuition is listed in the Summer Quarter bulletin. Resident fee tuition is charged nonresident students during Summer Quarter, except for students in the Schools of Dentistry or Medicine.

Veterans: A special exemption program is available for "resident" veterans who served in Southeast Asia (see section on residence requirements). Under certain conditions, a veteran of World War II who is not eligible for Veterans Administration benefits is fully or partly exempt from the building fee portion of the tuition. Information concerning these exemptions may be obtained from the Office of Special Services, 480 Schmitz.

Special Course and Laboratory Fees

The amounts listed above normally cover University charges for course registration. Some courses, however, have extraordinary expenses associated with them, and in such cases the University may charge additional fees in amounts that approximate the added instructional or laboratory costs.

Other Fees

Auditors: There is no reduction in fees for auditors.

Admission Application Fees: Undergraduate, \$25; Graduate, \$35; Law, Medicine, Dentistry, \$35. Former students returning in the same classification, \$25.

On-Leave Registration Fee: This fee of \$35, charged graduate students only, provides for a maximum On-Leave registration period of four successive academic quarters or any part thereof and is not refundable.

Late Registration Fees: A late-registration service charge of \$25 is assessed a student granted permission to register after the last scheduled day of registration and through the tenth day. Students registering after the tenth day pay a \$75 late registration fee. A student who must reregister as a result of a cancellation for nonpayment of tuition must also pay a \$75 fee. Waiver or refund of the registration service charge may be petitioned in the Registrar's Office. Waiver or refund of the \$75 registration fee may be petitioned in the Student Accounts and Scholarships Office.

Change of Registration Fee: A charge of \$20 is made for each change of registration or change of section, or number of changes that are simultaneous after the official change of registration period.

Transcript Fees: A charge of \$3, payable to the University's Transcript Office in advance, is required for each transcript.

Thesis and Dissertation Fees: Publication binding fee, \$35; abstract-only fee, \$25; copyright service fee, \$25.

Replacement Fees: Duplicate diploma, with paper folder, \$10; teaching certificate (typed copy), \$1; student identification card, \$5.

Credit by Examination Fee: In order to obtain credit for independent study, a student may take an examination prepared by the department concerned. The fee is \$25 per examination. Appropriate forms must be obtained from the Grade Recording Information Office, Schmitz Hall.

All fees are subject to change without notice.

Cancellation of Tuition and Fees

Registered students must pay full tuition and fees. Tuition may be canceled or reduced if a student makes an official withdrawal or drops a course during the period specified by state statute. Refunds are given when a cancellation or reduction results in an overpayment.

CONTINUING STUDENTS

1. A student who withdraws on or before the fifth class day does not pay tuition.
2. A student who withdraws after the fifth class day through the thirtieth calendar day of the quarter must pay one-half tuition.
3. A student who withdraws after the thirtieth calendar day must pay full tuition.

NEW AND RETURNING STUDENTS

1. A student who withdraws on or before the fifth class day forfeits the \$50 enrollment service fee but does not pay the regular tuition.
2. A student who withdraws after the fifth class day through the thirtieth calendar day of the quarter must pay one-half tuition.
3. A student who withdraws after the thirtieth calendar day of the quarter must pay full tuition. The \$50 enrollment service fee is applied toward payment of tuition.



FEE FORFEITURE

A student who does not completely withdraw but is dropping one or more courses may be eligible for lower tuition, depending on the total number of credits remaining after the course drop and on the time period when the drop was made. Tuition for students making a course drop on or before the fifth class day is determined by the total credits remaining. Tuition for students making a course drop after the fifth class day through the thirtieth calendar day of the quarter is computed on the total credits remaining plus one-half the difference between the old tuition and the new tuition. There is no cancellation or reduction in tuition for courses dropped after the thirtieth calendar day of the quarter. The tuition for a new or returning student cannot be reduced below the \$50 minimum paid as an enrollment service fee.

FEE REFUND

When a fee payment is made by check, a three-week waiting period is required before a refund can be authorized. An application for refund may be refused, unless it is made during the quarter in which the fees apply. A student who withdraws for disciplinary reasons forfeits all rights to refund or cancellation of any portion of his or her fees.

Residence Classification Requirements

Residence classification information is available from the Residence Classification Officer, 209 Schmitz.

Veterans and Children of Totally Disabled Veterans and Personnel in the Armed Forces

Information on educational benefits and special exemption programs for veterans and their dependents is available at the Office of Special Services, 460 Schmitz.

Veterans and members of the armed forces who apply for admission to the University are subject to the same minimum requirements as regular students and are expected to enroll in accordance with University requirements.

The University complies with the standards of progress as required by the Veterans Administration and the State Approving Agency. A copy of those standards, as

approved, is available for review at the Registrar's Office.

Financial Obligations

The Comptroller is authorized to place a hold (administrative) on the records of any student who fails to pay promptly amounts due the University.

Until this hold is cleared, the University (1) does not release the student's record or any information based upon the record, (2) does not prepare transcripts or certified statements, and (3) denies registration as well as graduation from the University. Debts paid by cash, cashier's check, or money order are released immediately. Those paid by personal check are released three weeks after receipt of the check, if the check proves valid.

In cases of serious financial delinquency, the Comptroller, with the consent of the Registrar, may order that a student's registration be canceled and that privileges of attendance be withdrawn.

Tuition and fees not paid by the end of the academic quarter are subject to an interest charge of 1 percent per month, or a fraction thereof (12 percent APR), beginning the month following the end of the quarter.

An administrative hold or cancellation also may occur when a student has not complied with other University rules, procedures, or obligations. The hold may be placed on the student's record by the authorized University office responsible for enforcement of the rule, procedure, or obligation involved. The student is not permitted to register for any subsequent quarter or to obtain a transcript of his or her record or a certified statement except on the written release of the office that placed the hold.

Tuition Exemptions

The following categories of students may be exempted from all or part of tuition. Students in these categories may contact the offices shown either for information on the exemption or to obtain the appropriate form to apply for the exemption. Most of the exemptions must be renewed each quarter and should be renewed before the beginning of the quarter. The various categories of exemptions are established by legislative mandate and may be revoked by the legislature at any time.

Category	Contact office
World War II veterans who have fully utilized federal benefits	Office of Special Services, 460 Schmitz
Children of persons who were POWs or MIA	Office of Special Services, 460 Schmitz
Veterans who served in Southeast Asia during the period of August 5, 1964-May 7, 1975	Office of Special Services, 460 Schmitz
Students participating in the WICHE Program	Student Accounts and Scholarships Office, 129 Schmitz
Residents of British Columbia, Idaho, or Oregon	Office of Special Services, 460 Schmitz
Medical and dental students in the WAMI Program	Student Accounts and Scholarships Office, 129 Schmitz
Faculty members and their children and spouses	Academic Personnel Office, 85 Administration

Staff members and their children and spouses

TA/RA's with half-time appointments

Active duty military assigned to Washington and their children and spouses

Immigrants holding a refugee classification who have been in the United States less than one year

Residence Classification Office, 209 Schmitz

Graduate School, 201 Administration

Residence Classification Office, 209 Schmitz

Residence Classification Office, 209 Schmitz

To learn the requirements for resident classification and to apply for classification as residents as soon as they might meet the requirements, students are invited to contact the Residence Classification Office, 209 Schmitz.

Student Rights and Responsibilities

Student Conduct Code

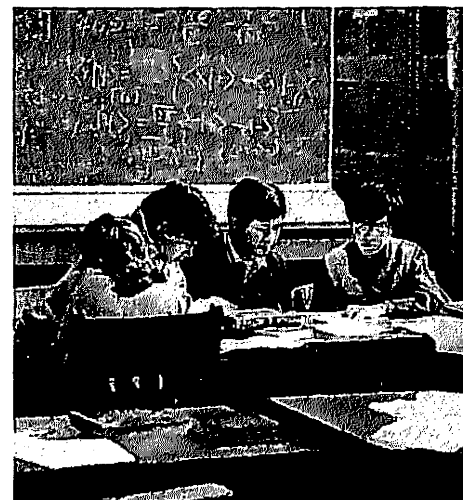
The University Board of Regents has adopted a *Student Conduct Code*, which applies to both academic and nonacademic conduct for students while in attendance at the University. The code specifies standards of conduct, jurisdiction for hearing disciplinary matters, and due process. Interested students may obtain copies through either their advisers or the Office of Student Affairs, 459 Schmitz.

University Policy on Student Education Records

A copy of the University's policy on a student's right to inspect his or her education records and the University's responsibility to maintain the confidentiality of such records is located at each departmental reference station. The policy is filed under the Washington Administrative Code 478-140-010. Copies of the policy are available at the Registrar's Office, Schmitz Hall.

Sexual Harassment Grievance Procedure

Students and members of the faculty and staff who wish to file a complaint regarding sexual harassment may contact either of two offices: Ombudsman for Sexual Harassment, 543-0283, or Human Rights Office, 4045 Brooklyn Avenue Northeast, 543-7217. Personnel in these offices are available to discuss and provide assistance in resolving such complaints.



The University welcomes inquiries regarding its many undergraduate programs and invites prospective students to visit the campus. The Office of Admissions sponsors a campus tour for prospective students and their parents. The free tour, available without a prior reservation, begins every weekday except holidays at 2:30 p.m.

The Student Visitation Program offers prospective freshmen and transfer students the opportunity to make a personal visit to the campus; visitors may attend a class, meet with an admissions counselor or an academic adviser, take a guided tour of the campus, and spend a night in a residence hall. Additional information is available from the Office of Special Services, 460 Schmitz, PB-15. Visits require a minimum of three weeks' notice.

Following are the principal fields of study offered by the University's schools and colleges. Not all areas listed below lead to degrees. The appropriate department may be consulted for specific information on program and degree requirements.



Areas of Study

At the undergraduate level, the freshman or transfer student generally enrolls in the college that offers his or her chosen major. If admission to the selected major is restricted, or if the student has not yet selected a major, the student enters the College of Arts and Sciences as a premajor. The premajor category is also provided in certain other colleges for those students who have not made a definite choice of major in the college. Undergraduates preparing for professional study in such fields as architecture, business administration, dentistry, education, engineering, medical technology, medicine, occupational therapy, pharmacy, physical therapy, prosthetics and orthotics, and social welfare complete preliminary work in the preprofessional programs offered within the College of Arts and Sciences.

College of Architecture and Urban Planning

Architectural History
Architecture
Building Construction
Facilities Management
Interior Design
Landscape Architecture
Urban Design and Planning

College of Arts and Sciences

Afro-American Studies
American Ethnic Studies
American Indian Studies*
Anthropology
Applied Mathematics†
Art
Art History
Asian American Studies*
Asian Languages and Literature
Astronomy
Atmospheric Sciences
Biology
Botany
Canadian Studies
Chemistry
Chicano Studies*
Chinese Regional Studies
Classics (Latin, Greek, Classical Studies)
Communications (advertising, editorial journalism, broadcast journalism, communication theory)
Comparative History of Ideas
Comparative Literature
Comparative Religion

Computer Science
Dance
Drama (general drama program, professional actor training program)
Economics
English
Environmental Studies*
Ethnomusicology*
General Studies
Genetics†
Geography
Geological Sciences
Geophysics†
Germanics
History
History and Science
International Studies
Japanese Regional Studies
Jewish Studies*
Korean Regional Studies
Linguistics
Mathematics
Microbiology
Music
Music Technology*
Near Eastern Languages and Civilization
Peace and Strategic Studies*
Philosophy
Physics
Political Science
Psychology
Romance Languages and Literature
Russian and East European Regional Studies
Scandinavian Languages and Literature
Scientific and Technical Communication*
Slavic Languages and Literature
Society and Justice
Sociology
South Asian Studies
Speech and Hearing Sciences
Speech Communication
Statistics
Women Studies*
Zoology

School and Graduate School of Business Administration

Accounting
Business Economics
Finance
Human Resources Management
Information Systems
International Business
Marketing
Operations Management
Organization and Environment
Quantitative Methods

School of Dentistry

Dental Hygiene

College of Education

Elementary Education
Secondary Education
Special Education

College of Engineering

Aeronautics and Astronautics
Bioengineering†
Chemical Engineering
Civil Engineering
Computer Engineering
Electrical Engineering
Industrial Engineering
Materials Science Engineering
Mechanical Engineering
Nuclear Engineering†
Ocean Engineering
Scientific and Technical Communication

College of Forest Resources

Forest Resources Management
Logging Engineering
Pulp and Paper Science
Wood Science and Technology

Interschool or Intercollege Programs

Bioengineering†
Quantitative Science

Graduate School of Library and Information Science

School of Medicine

Animal Medicine
Medical Technology
Microbiology
Occupational Therapy
Physical Therapy
Prosthetics and Orthotics

School of Nursing

Community Health Care Systems
Parent and Child Nursing
Physiological Nursing
Psychosocial Nursing

College of Ocean and Fishery Sciences

Fisheries Science
Food Science
Oceanography

School of Pharmacy

Medicinal Chemistry
Pharmaceutics
Pharmacy Practice

Graduate School of Public Affairs†

School of Public Health and Community Medicine

Environmental Health

School of Social Work

Social Welfare

* Program that may be taken for a degree under General Studies.

† Graduate program. Certain courses open to undergraduates.

Foreign Study Programs

The Foreign Study Office administers and cooperates in more than thirty international study programs in Latin America, Europe, the Middle East, Africa, and Asia. Qualified undergraduate and graduate students are enrolled concurrently at the University and in the foreign study program, earning UW credit and maintaining residency and financial aid eligibility. Quarter, semester, and academic year programs are offered. Opportunities for study include language and liberal arts courses (in English) in Avignon, Cologne, Guadalajara, Jerusalem, London, and Sienna; advanced language programs requiring two to three years college-level language preparation in Beijing, Cairo, Leningrad, Nantes, Rennes, and Seville; and specialized professional programs in Denmark, England, Finland, and Japan. The University also has reciprocal exchange agreements with major research institutions abroad, including the Universites of Duisburg, Guadalajara, Strasbourg, Tashkent, and Tübingen and the Institut d'Etudes Politiques in Paris. These arrangements allow qualified UW students to enroll in regular courses at the foreign university and maintain full UW standing.

Program information and counseling are available in the Foreign Study Office, 572 Schmitz, PA-10; telephone (206) 543-9272.

Undergraduate Degrees

The University of Washington grants the following degrees upon satisfactory completion of appropriate programs of study in the departments, schools, and colleges:

Bachelor of Arts	B.A.
Bachelor of Arts in Business	
in Administration	B.A.B.A.
Bachelor of Fine Arts	B.F.A.
Bachelor of Landscape Architecture	B.L.Arch.
Bachelor of Music	B.Mus.
Bachelor of Science	B.S.
Bachelor of Science in Aeronautical and Astronautical Engineering	B.S.A.&A.
Bachelor of Science	
in Building Construction	B.S.B.C.
Bachelor of Science	
in Ceramic Engineering	B.S.Cer.E.
Bachelor of Science	
in Chemical Engineering	B.S.Ch.E.
Bachelor of Science in Civil Engineering	B.S.C.E.
Bachelor of Science	
in Computer Engineering	B.S.Comp.E.
Bachelor of Science	
in Electrical Engineering	B.S.E.E.
Bachelor of Science in Engineering	B.S.E.
Bachelor of Science in Fisheries	B.S.Fish.
Bachelor of Science in Forest Resources	B.S.F.
Bachelor of Science	
in Industrial Engineering	B.S.I.E.
Bachelor of Science	
in Mechanical Engineering	B.S.M.E.
Bachelor of Science in	
Medical Technology	B.S.Med.Tech.
Bachelor of Science	
in Metallurgical Engineering	B.S.Met.E.
Bachelor of Science in Nursing	B.S.Nurs.
Bachelor of Science	
in Occupational Therapy	B.S.Occ.Therapy
Bachelor of Science in Pharmacy	B.S.Pharm.
Bachelor of Science	
in Physical Therapy	B.S.Phys.Therapy

Admission

General Admission Policy

Eligibility for admission is determined through criteria established by the University faculty. In general, admission is based on the applicant's scholastic standing, admission test scores, and adequacy of preparation for University study while in high school or another collegiate institution, with preference given, as necessary, to those with the greater probability of success in completing a degree program. In the event that there are more qualified applicants than can be accommodated, priority is given to those students offering the highest admission qualifications. Special consideration is given to the availability of space at the proposed level of entrance.

Admission of Nonresident Students

Because the University is a state institution, its primary obligation is toward the education of residents of the state. Students who are nonresidents are expected to present academic credentials meeting higher standards than those required of Washington residents. Nonresident students also pay higher tuition and fees than those paid by residents.

Nonresident sons and daughters of University alumni are considered for admission according to resident admission requirements, but are required to pay nonresident tuition and fees.

Admission Requirements

To be considered for admission as a freshman or transfer student, an applicant must submit the materials listed below. Early application is advised (see section entitled Admission Process and Closing Dates).

1. A completed application, accompanied by a \$25 application fee.

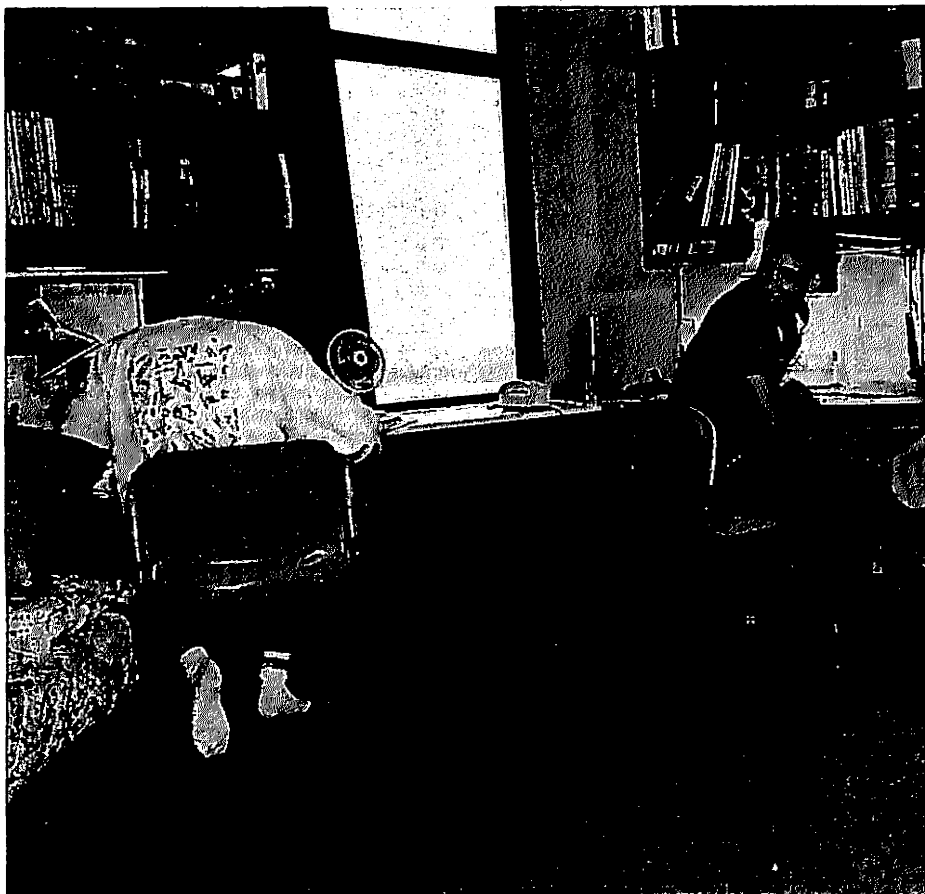
2. Transcripts showing completion of the equivalent of an acceptable college preparatory program and records of all college study. Prior studies must include fourteen specified high school course units (or college equivalents) as follows:

- Three years of English (four years recommended).
- Two years of one foreign language (three or four years recommended).
- Three years of college preparatory mathematics (normally one year of geometry and two years of algebra, including an introductory component on trigonometry).
- Two years of social sciences (three years recommended).
- One year of a laboratory science (two years recommended; preferably biology, chemistry, or physics).
- Three years of electives chosen from the above areas of study.
- Additional study in music and art also recommended.

In equivalent college courses, 5 quarter credits are treated as equal to one high school unit (one year, or two semesters, of study).

Transfer students who have not satisfied the mathematics requirement in high school may do so in other colleges either by completing appropriate high school equivalents or by completing a 5-quarter-credit course in intermediate algebra with a grade of at least C (2.0). Students who have not completed two years of foreign





language in high school may satisfy this requirement by completing either two quarters (10 credits) of a single foreign language or the second-quarter course in a foreign language.

3. Verbal and quantitative composite scores from the Washington Pre-College Test, the Scholastic Aptitude Test, or the American College Test. Scores need not be submitted by a transfer if the student:

(a) qualifies under the Direct Transfer Agreement now in force with the Washington community colleges (see below), or

(b) has completed at least 75 transferable credits with a cumulative grade-point average high enough to predict that his or her upper-division grade-point average at the University will be at least equal to the median upper-division grade-point average of the University's junior-senior classes.

Qualified applicants are ranked by means of formulas combining their previous grade-point averages with their test scores. Since the University often has many more applicants than it has space to accommodate, it cannot guarantee admission to all qualified students. Each quarter, in accordance with the number of spaces available in the student body, all applicants at or above a certain ranking are offered admission, but those below that ranking must be denied admission. It is impossible to state absolute or fixed minimums for admission, but in recent years residents of the state of Washington entering from high school with a cumulative grade average of B-plus (about 3.30 GPA) usually have been admissible if their total score on the Scholastic Aptitude Test was 1000 or higher (24 or higher on the American College Test composite score, or a total

composite of 111 or higher on the Washington Pre-College Test). Nonresidents are expected to present higher grades and scores. The mean high school grade-point average for freshmen entering from high school in Autumn Quarter 1987 was 3.51; the average college grade-point average for transfer students was 3.24. Of the 3,507 freshmen who entered Autumn Quarter 1986, 96 percent were enrolled in Spring Quarter of 1987.

Transfer Policy and Agreements

The University of Washington subscribes to the state-wide Policy on Inter-College Transfer and Articulation Among Washington Public Colleges and Universities endorsed by the public colleges and universities of Washington and the State Board for Community College Education and adopted by the Higher Education Coordinating Board. The policy deals with the rights and responsibilities of students and the review and appeal process in transfer credit disputes. More detailed information is available from the Office of Admissions.

Transfer Admission Agreement

The University of Washington has a direct transfer agreement with each of the twenty-seven community colleges in the state of Washington. The provisions of this agreement are as follows:

1. **Admission:** Transfer students from Washington community colleges will be assured of admission to the University if they satisfy the following conditions:

- Washington residency
- Completion of a qualifying associate degree (academic transfer associate degree)

- 2.75 cumulative grade-point average in all transferable course work (test scores not required)

- Submission of all required documents prior to closing date with no more than one quarter of work in progress

- Completion of all core subjects required for admission (as specified under Admission Requirements above)

If the spaces available for students under this agreement are exhausted for a particular quarter before all eligible transfer agreement students have been admitted, remaining applicants are placed on a waiting list and notified that they will be offered admission for the earliest subsequent quarter for which sufficient spaces are available.

The direct transfer agreement ensures admission to premajor status in the College of Arts and Sciences but does not promise admission to any other school or college nor to any particular major or professional field of study within the University.

2. **Transfer of credits:** Students admitted under the direct transfer agreement are granted transfer credit in exactly the same way as are all other transfer students (see below under Academic Credit).

3. **Graduation:** Students admitted under the direct transfer agreement, like other students, must satisfy all the requirements of the academic major, the college, and the University in order to graduate.

Associate Degree Transfer Agreement

Students at Washington community colleges who complete an approved associate degree prior to their first enrollment at the University can transfer with the assurance that the degree will be accepted in partial fulfillment of general education and proficiency requirements in the College of Arts and Sciences. Since each community college has defined its associate degree requirements in a way slightly different from all the others, and since students have options within each degree, the precise application of the associate degree toward College of Arts and Sciences requirements varies from case to case, as determined by each student's adviser.

The class standing (sophomore, junior, etc.) of transfer students at the time of entry to the University is determined by the number of transferable credits completed. Students entering with 90 transferable credits are juniors. Students may consult the Office of Admissions for details of the agreement.

Admission of Special Categories of Students

Postbaccalaureate Students

Students holding baccalaureate degrees from colleges and universities that are fully accredited by their regional accrediting associations may pursue additional undergraduate study leading to a second baccalaureate degree or a teaching certificate by applying for admission to the University for postbaccalaureate (formerly fifth-year) status. Postbaccalaureate status also may be used by students who need to satisfy prerequisites for admission to a particular graduate or professional degree program.

The number of postbaccalaureate students that the University can accommodate is subject to restriction in accordance with enrollment limitations and the University's primary responsibility to first-degree students. In Winter and Spring quarters, admission is not usually open to postbaccalaureate students except for those seeking entry into an initial teaching certificate program.



An applicant's undergraduate scholastic record from four-year institution(s) is the primary criterion for admission. Approval of the department concerned and a grade-point average of at least 2.50 are required for admission. The minimum grade-point average is higher when the University is fully enrolled. In recent years, it has exceeded 3.20. In calculating the GPA, the Office of Admissions routinely uses only those grades earned in seeking the first degree at four-year institutions. Grades earned in any postbaccalaureate work are not considered. Students who do not meet the routine admission standards may inquire about petitioning for special consideration.

Because postbaccalaureate students are not graduate students, they are not permitted to register for courses numbered 500 or above without special permission. Courses completed while in this status may not be applied later to an advanced degree in the Graduate School.

Nonmatriculated Students and Auditors

The nonmatriculated status is a special classification for students who do not wish to pursue a program leading toward a degree or teaching credential at the University and is usually open only in the summer. Among those who enter the University under this category are students who enroll in courses for the purpose of earning credits toward a degree program at another college or university, teachers and school administrators who take special-interest courses to earn additional University credits, postbaccalaureate students who do not desire formal admission to a graduate or second undergraduate program, and others interested in specific course work.

Nonmatriculated students enroll for courses on a space-available basis after all matriculated (regularly enrolled) students have had an opportunity to register. Admission as a nonmatriculated undergraduate does not guarantee subsequent acceptance as a matriculated student in a specific degree program.

If a nonmatriculated student is later admitted as a matriculated undergraduate, the scholastic standing achieved and appropriate credits earned in the nonmatriculated status will apply toward the requirements for the baccalaureate degree. However, the student must subsequently complete at least 45 credits in matriculated status to qualify for a degree. Credits earned by a

nonmatriculated student do not apply to a graduate degree. Nonmatriculated admission is frequently closed because of full enrollment.

Individuals who wish to audit University courses should apply for admission with nonmatriculated standing. Attendance in courses as an auditor is by consent of the instructor involved and is conditioned by the extent to which space is available. Permission to audit is ordinarily granted for lecture classes only. An auditor may not participate in class discussion or laboratory work, and his or her registration may be canceled at the discretion of the instructor. No record of audited courses is kept. Regular tuition and fees are charged. To receive credit for an audited course, the student must register for the class for credit in a subsequent quarter.

Returning Former Students

A returning former student who has been away for one quarter or more or a graduate student returning from official leave status is required to complete and file a Former Student Enrollment Application. An undergraduate is required to pay a \$25 application fee by the closing date. Returning former students who have been away from the University less than two quarters have the highest priority for readmission. A student previously enrolled in an academic program with restricted enrollment and/or special admission requirements should consult his or her adviser about procedures for readmission. Returning nonmatriculated students are enrolled as space permits.

A returning student must pay a nonrefundable enrollment service fee of \$50 by the date indicated in the offer of readmission.

The Procedures and Fees section of this catalog contains additional information on registration, tuition, and fees.

Educational Opportunity Program Students

The University seeks to enroll minority students and others who have not received the usual educational advantages.

American Indian, Black, Asian, Pacific American, Chicano, and White students from disadvantaged backgrounds are urged, regardless of their previous academic records, to apply for admission to the University

through its Educational Opportunity Program (EOP), which is administered by the Office of Minority Affairs.

Students who believe they are qualified to participate in this program should contact the EOP admission office. Students in the Educational Opportunity Program are given special assistance so that they may achieve their potential at the University.

Students From Other Countries

The University believes its greatest contribution to international education can be made in the area of graduate study.

Because of limited University facilities and departmental restrictions, only a small number of foreign undergraduate applicants are accepted directly from abroad. Foreign undergraduate applicants are considered for admission only for Summer Quarter or Autumn Quarter and must present academic records well above the average to be competitive for admission. Such students also must present evidence of English language proficiency by providing scores from the Test of English as a Foreign Language (TOEFL). The only exceptions are native-born citizens of Australia, Canada, Great Britain, Ireland, and New Zealand. More information on the TOEFL appears under English As A Second Language (ESL) Center in the University Extension section of this catalog.

Specific information on admission of foreign undergraduates accompanies the special application form for foreign applicants.

ENGLISH PROFICIENCY REQUIREMENT FOR STUDENTS FROM NON-ENGLISH-SPEAKING COUNTRIES

Immigrant, refugee, or foreign students from non-English-speaking countries who have been attending high school or college in the United States before applying for admission to the University must satisfy the same admission requirements as other applicants. In certain cases, however, a native language other than English can be used to satisfy the foreign-language requirement. Evidence of English language competency is required of all students from non-English-speaking countries, and students may be required to take English As A Second Language courses if their competency in English is below the 580 level on the TOEFL. Specific information on this requirement may be obtained from the Office of Admissions or, for admitted students, from the Office of Special Services.

Students Applying to Programs With Special Admission Requirements

Fulfilling the University's minimum requirements for admission does not guarantee acceptance into a specific department or program. Some academic programs have earlier application dates than, and admission requirements in addition to, those required for entrance to the University. Information on admission to programs with special requirements appears in departmental sections of this catalog.

The following academic units currently have special admission requirements: Architecture, Art, Building Construction, Business Administration, Communications, Computer Science, Dance, Dental Hygiene, Drama (B.F.A. degree), Economics, Education, Engineering (all majors), Environmental Health, Fisheries, Food Science, Forest Resources (all majors), International Studies, Landscape Architecture, Mathematics, Medical Technology, Microbiology and Immunology, Music, Nursing, Occupational Therapy, Pharmacy, Physical Therapy, Political Science, Prosthetics and Orthotics, Psychology, Scientific and Technical Communication, Social Welfare, Society and Justice, Speech and Hearing Sciences, and Speech Communication.

Admission Process and Closing Dates

Application forms, obtained from the Office of Admissions, should be returned before the closing dates listed below, together with the \$25 application fee, the necessary test scores, and transcripts. Applicants in all categories are advised to apply early, because limited space availability may necessitate closure of admissions before the closing dates. Freshman applicants for autumn and summer-autumn admission, in particular, must complete their application files by the March 1 priority date to be assured of consideration.

High school applicants usually apply in December or January of their senior year; students transferring from another school or college apply at the beginning of their final term. Foreign students should apply in December or January to be sure of meeting their early closing date. Applications and credentials should be sent to the University of Washington, Office of Admissions, 320 Schmitz, PC-30, 1400 Northeast Campus Parkway, Seattle, Washington 98195.

Application Closing Dates, Except for International Students

Autumn Quarter

Freshmen:

Application priority date—March 1

Application closing date—July 1

Transfers and Postbaccalaureates:

July 1 closing date

Winter Quarter

November 1 closing date

Spring Quarter

February 1 closing date

Summer-Autumn

Freshmen:

Application priority date—March 1

Application closing date—May 15

Transfers and Postbaccalaureates:

May 15 closing date

Summer Only

June 1—Only nonmatriculated in-person applications accepted for consideration after June 1

Application Closing Dates for International Students

Summer-Autumn or Autumn Quarter

March 1 closing date. International students can apply for matriculation only for these quarters.

Summer Only

June 1—nonmatriculated only. In-person applications accepted for consideration after June 1.

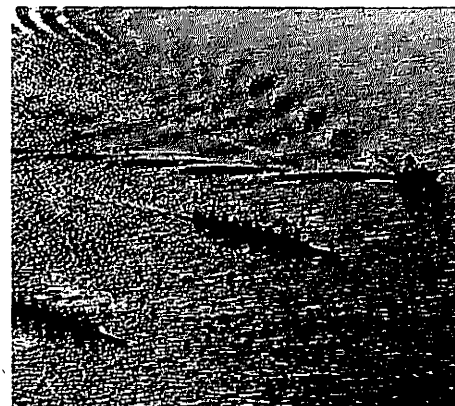
Notification of Admission

Applications are reviewed soon after they are received, and applicants are notified of their admission status as soon as possible. Freshman applicants for Autumn or Summer-Autumn Quarter entry are notified after the priority date of March 1. Eligible applicants receive an offer of admission and a leaflet informing them of procedures required for enrollment. Admission is not confirmed until these procedures are completed.

The offer of admission is valid only for the quarter indicated. Applicants who wish to be considered for a different quarter must file a new application and application fee with the Office of Admissions.

Appeal of Admission Decisions

An applicant who is dissatisfied with the original admission decision may, by writing a letter requesting special consideration, appeal to the Committee on Admissions and Academic Standards with the assurance that any additional evidence in support of the application will be carefully reviewed. Students accepted by the committee are expected to comply with requirements outlined by the committee at the time of admission.



Reapplication

The credentials of an applicant who does not register for the quarter to which he or she has been admitted are retained only for a twelve-month period unless the applicant has notified the Office of Admissions of a continued interest in attending the University or of enrollment in independent study programs. Students who reapply may need to update their admissions file if they have completed additional course work.

Credentials submitted to the Office of Admissions become the property of the University and may not be returned to the student or duplicated for another school.

Transfer Credit

See Academic Credit.

Other Application Forms

Application for Financial Aid

Application for financial aid is a process entirely separate from application for admission. Interested students should contact the University's Office of Student Financial Aid or the counselors at their own school for information about financial aid availability.

Reservations for University Housing

Admission to the University does not automatically reserve residence hall space. Because housing arrangements must be made separately, students do not need to wait until they are admitted to the University before applying for a room in the residence halls. Additional information on student housing appears in The University section of this catalog.

Academic Credit

Credit

The basic rule for determining academic credit is: 1 credit represents a total time commitment of three hours each week in a ten-week quarter, or a total of thirty hours in a single quarter, required of the typical student. Total time includes time spent in class, if any; time devoted to individual conferences with instructors; time devoted to reading or other study, problem solving, writing, laboratory work, exercises, or any other activity required of students. A specified number of credits must be earned for a degree.



There are three basic types of credit:

Residence credit is academic credit earned in courses offered by the University through the quarterly *Time Schedule* and other approved courses offered by University Extension. To gain residence credit, students must register for such courses during the official registration period.

Extension credit or credit earned through examination is that credit earned by completing courses offered as extension courses or credit earned through special examinations. Such courses are not included in the UW grade-point average, although grades are recorded.

No more than 90 extension credits may be counted toward the baccalaureate degree. No more than 45 credits earned in extension courses at other institutions may be counted toward the baccalaureate degree. Ordinarily, extension and independent (correspondence) study credits may not be applied toward the final year.

Transfer credit is that credit earned at another institution that is accepted by the University as being applicable toward satisfaction of degree requirements.

Quarter Credit Versus Semester Credit

Colleges and universities that operate on a semester basis (i.e., divide the academic year into two parts, exclusive of a summer session) give semester credit. Quarter credits multiplied by two-thirds equal semester credits. Semester credits multiplied by one and one-half equal quarter credits. For example, a student attending the University of Washington who earns 45 quarter credits during an academic year would have earned 30 semester credits at an institution operating on the semester plan.

Acceptance of Transfer Credit

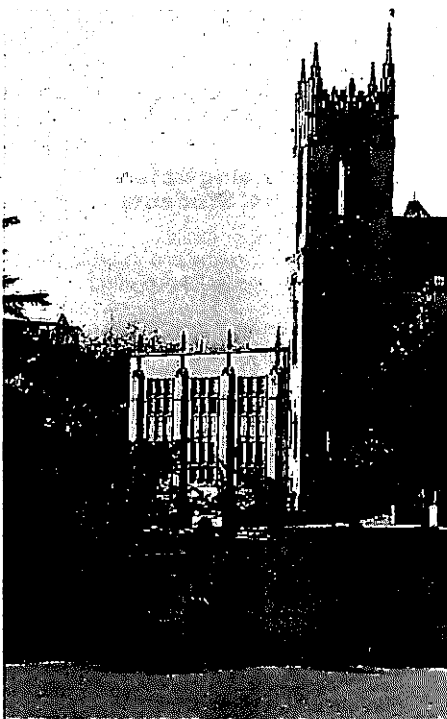
The University reserves the right to accept or reject credits earned at other collegiate institutions. In general, it is the University's policy to accept credits earned at institutions fully accredited by their respective regional accrediting associations, provided that such credits have been acquired through university-level courses appropriate to the student's degree curriculum at the University. In no case, however, may a student apply more than 135 transfer credits to a 180-credit baccalaureate degree program. Transfer credits are not normally accepted for application toward the final year.

Transfer courses equivalent to University courses apply toward the baccalaureate degree exactly as do their counterparts taken at the University. Other transfer courses that are not exact equivalents, but which cover areas of instruction offered by the University, are also accepted. Only 3 credits for physical education activity courses may apply to a baccalaureate degree.

Up to 15 credits for occupational, vocational, and technical programs may be given at the point of admission, depending on the quality of the program and its relevance to University degree programs. The application of such credits toward the student's degree, however, requires the approval of the college or school and department concerned.

Community College Credits

Students may count a maximum of 90 community college credits toward the total number of credits required for a baccalaureate degree at the University. Additional transferable credits from a community college will be posted to a student's University record and, though they do not count toward graduation, may be used to fulfill specific University, college, or department requirements.



CLEP Credit

Credit for the general examinations of the College Level Examination Program (CLEP) is not accepted or awarded by the University.

Armed Forces Training School Credit

The University reserves the right to accept or reject credits earned in educational programs sponsored by the armed forces. In general, consideration is given to work completed according to recommendations made by the American Council of Education. The maximum number of credits obtainable through completion of such programs is 30.

Credit for Courses Completed in Unaccredited Institutions

Course work completed in unaccredited institutions may be validated or certified through examinations described under Earning Credit by Special Examination below.

Credit for Repeated Courses

Credit for a given course is awarded only once. Courses taken at another institution and repeated at the University will carry credit for only the University work. Courses repeated at another institution after being taken at the University will not affect the UW grade-point average. For courses taken twice at another institution transfer credit is awarded only once (although both grades are calculated in the transfer grade-point average).

Students beginning college-level study Autumn Quarter 1987 or thereafter cannot receive University credit for a beginning foreign-language course (101 level) if the course was initially taken in high school (two years) and is used to satisfy the foreign-language admission requirement.

Credit Restrictions

Credit is not awarded for a mathematics or foreign-

language course listed as a prerequisite if taken after the higher-level course. For example, a student who has completed SPAN 201 cannot later receive credit for SPAN 103.

First-year (elementary) or second-year (intermediate) foreign-language credit is not granted either by examination or by course completion in a student's native language. "Native language" is defined as the language, or one of the languages, spoken in the student's home during the first six years of his or her life and in which he or she received instruction through the seventh grade.

Within a given department, credit restrictions may apply to certain combinations of courses (e.g., credit is not given for both PHYS 114 and PHYS 121). See departmental course descriptions for restrictions.

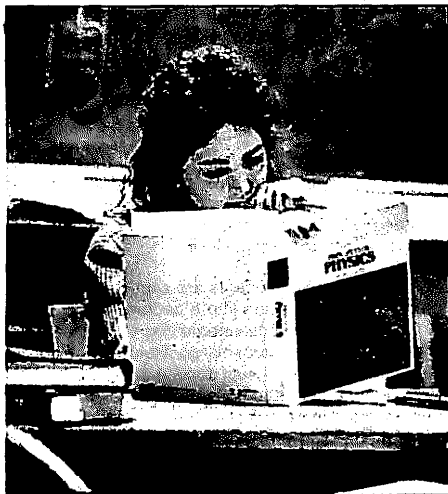
Beginning Autumn Quarter 1987, no credit is awarded for a first-quarter foreign language (e.g. FREN 101) in the language taken in high school to fulfill the University's admission requirement.

Earning Credit by Special Examination

Regularly admitted and currently enrolled students may take special examinations, sometimes known as challenging a course, in subject matter offered by the University to gain credit without being enrolled in specific courses. Credit may be granted—

1. For independent study.
2. For work completed with private teachers.
3. For work completed in unaccredited institutions if a formal examination is deemed necessary by the Chairperson of the concerned department(s). (In some cases, credit may be validated without an examination. Students who wish to validate credit must make arrangements with the Office of Admissions.) The following restrictions apply:
 - a. No one may take a credit examination for a course in which he or she has received prior credit.
 - b. All credits earned by examination are counted as extension credit and are included in the 90-extension-credit maximum that may be applied toward the baccalaureate degree. No credit is allowed by examination if the grade earned is less than 2.0. Grades earned are not included in the grade-point average.
 - c. No student shall receive credit by examination for a course for which the student would not be eligible to receive credit if the course were taken in residence.
 - d. No student is permitted to repeat any examination for credit.
 - e. No student shall receive credit by examination for lower-division courses in the student's native language. (Some language departments have more restrictive policies. Consult the individual language department for details.)
 - f. Credit by examination is not acceptable for application toward an advanced degree in the Graduate School.

A student who wishes to qualify for credit by examination must apply to the Grade Recording Information Office for a certificate of eligibility no later than Friday of the second week of the quarter. The student presents it for signed approval to an instructor responsible for the course in which the examination is to be taken, to the Chairperson of the department concerned, and/or to the Dean of the college or school concerned. It is then returned to the Grade Recording Information Office. Signed certificates and payment of \$25 per examina-



tion to be challenged must be accomplished by Friday of the second week of the quarter.

Examinations are administered by the Educational Assessment Center during the fifth week of the quarter.

No student is permitted to take more than two examinations in 3-, 4-, or 5-credit courses, or more than three examinations in 1- or 2-credit courses in one day. Should the student plan to take more examinations in a given quarter, an additional day may be permitted and arrangements made with the Educational Assessment Center.

Credits Required for Full- or Half-Time Status Requirements

Some agencies require that a student have full-time status to receive maximum benefits or to retain a certain privileged status. To be classified as a full-time student by the University, an undergraduate must register for and complete at least 12 credits per quarter and a graduate student must register for and complete at least 9 credits per quarter. To be classified as a half-time student by the University, an undergraduate must register for at least 6 credits per quarter and a graduate student must enroll for at least 5 credits per quarter.

Students From Other Countries

A student attending the University on a student visa (F-1) must maintain a full course of study, or he or she must be reported to the Immigration and Naturalization Service. For this purpose, to maintain a full course of study as defined by the University—

1. An undergraduate, postbaccalaureate, or nonmatriculated student must register for at least 12 credits each quarter.
2. A graduate student must register for a minimum of 9 applicable credits each quarter.
3. One vacation quarter each year is allowed, provided the student has completed one academic year and intends to register for the subsequent quarter.
4. A student in the final quarter of his or her degree program needs to register for only those credits required for graduation.
5. The Immigration and Naturalization Service requires the University to report a student if he or she fails to register within sixty days of the expected initial registration date or if attendance at the University is terminated.

Advanced Placement (College Board)

Students who do college-level work in high school can receive appropriate credit or placement, or both, at the University on the basis of performance in the Advanced Placement Program (AP) of the College Board.

Listed below are departmental policies on granting placement or credit for AP examinations. Grades range from a high of 5 to a low of 1; in most departments, credit and/or placement is awarded for grades of 3 or higher. In some cases, the student must consult the appropriate departmental adviser after arriving at the University.

Art

Art History

AP-5

ART H X (10 credits); see departmental adviser for placement.

AP-4

Art H X (5 credits); see departmental adviser for placement.

Biology

AP-5

AP-4

See biology adviser for credit and placement. A minimum of 5 credits awarded after conference with adviser; up to 10 credits possible. "BIOL X" AP credit may be counted toward natural science distribution.

Chemistry

AP-5

No credit will be given. Exemption from CHEM 140, 150, 151, 160 granted upon successful completion of CHEM 231 or 335; consult chemistry adviser.

AP-4

Exemption from CHEM 140, 150, 151 granted upon successful completion of CHEM 160 or 164; consult chemistry adviser.

AP-3

Exemption from CHEM 140 granted on successful completion of CHEM 150; consult chemistry adviser.

Classics

Latin Lyric

AP-5

AP-4

LAT 305, 306 (10 credits)

AP-3

LAT 103 (10 credits)

Vergil

AP-5

AP-4

LAT 305, 307 (6 credits)

AP-3

LAT 103 (5 credits)

Latin Lyric and Vergil

AP-5

AP-4

LAT 305, 306, 307 (15 credits)

Computer Science

AP-5

AP-4

AP-3

C SCI X (5, 4, 3 credits, respectively). Credits may count as electives toward a degree but may not count as the equivalent of any specific computer science course (including C SCI 210, 211) and may not count toward requirements for a major in computer science.

English

AP-5

AP-4

AP-3

ENGL 111 (5 credits) For students with AP-5, -4, or -3 scores on *either* the language and composition examination or the composition and literature examination.

AP-5

AP-4

AP-3

ENGL 111, 181 (10 credits) For students with AP-5, -4, or -3 scores on *both* the language and composition examination and the composition and literature examination.

German Language

AP-5

AP-4

AP-3

GERM 201, 202, 203, 207 (15 credits)

GERM 201, 202 (10 credits)

GERM 201 (5 credits)

Literature

AP-5

AP-4

AP-3

See departmental adviser for exact courses and placement. Any AP-3, -4, or -5 score satisfies the Arts and Sciences foreign-language proficiency requirement.

(12 credits)

(9 credits)

(6 credits)

Government and Politics

American

Comparative

No credit will be given. No credit will be given.

History

American

AP-5

AP-4

HSTAA 201 (5 credits)

European

AP-5

AP-4

HST 113 (5 credits)

Mathematics

AB

Examination

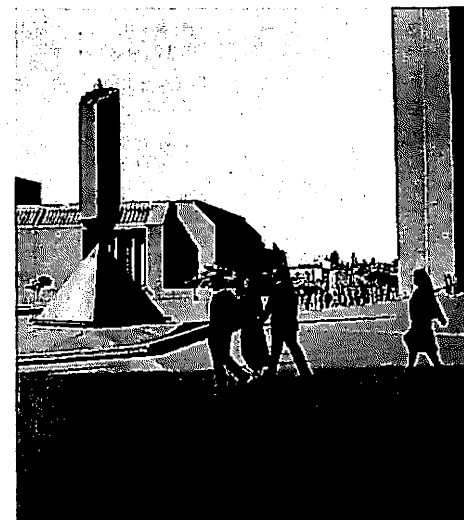
AP-5

AP-4

AP-3

MATH 124, 125 (10 credits)

MATH 124 (5 credits)





BC Examination	AP-5 } AP-4 }	MATH 124, 125 (10 credits)
	AP-3	MATH 124 (5 credits)
Music Appreciation		See departmental adviser for placement and possible credit.
Theory		No credit. See departmental adviser for placement.
Physics	AP-5 } AP-4 }	No credit; exemption from PHYS 121, 122 for Physics C examination, or from PHYS 114, 115, 116 for Physics B Examination.
Romance Languages Language	AP-5	FREN (SPAN) 201, 202, 203 (15 credits)
	AP-4	FREN (SPAN) 201, 202 (10 credits)
	AP-3	FREN (SPAN) 201 (5 credits)
Literature		Credit allowed at second-year level.
	AP-5	FREN (SPAN) X (15 credits)
	AP-4	FREN (SPAN) X (10 credits)
	AP-3	FREN (SPAN) X (5 credits)

Advanced Placement Credit

A student who begins college study in the third quarter of the second-year University language sequence may receive 5 credits for the second quarter of the second-year course, provided the third-quarter course is successfully completed. Similarly, a student who begins

college study with an upper-division course in a language (other than courses in English translation or in conversational practice) may be granted 10 credits for the second- and third-quarter courses of the second-year sequence, provided that course is successfully completed.

A student who is placed by examination at the level of MATH 125 or higher receives additional credits upon completion of the advanced course. If the student's first University mathematics course is MATH 125, credit for MATH 124 is given. A student whose first mathematics course is MATH 126 is given credit for both MATH 124 and 125.

A student must apply for advanced placement credits at the Grade Recording Information Office of the Registrar's Office after having completed the advanced course.

University Placement Tests

Information concerning mathematics, chemistry, and foreign language placement tests is included with the offer of admission or in the leaflet on registration instructions, which is mailed to applicants upon receipt of their enrollment confirmation. Additional information on recommended tests may be obtained from the appropriate college or departmental advising office. Testing information is also available at the Educational Assessment Center in Schmitz Hall.

Grades and Progress

Satisfactory Progress

Students admitted to the University to pursue baccalaureate degrees are expected to make satisfactory progress toward the attainment of that degree and are expected to enter a major and to graduate after completion of a reasonable number of credits.

By the time undergraduate students have completed 105 credits, they either must be accepted in their major or have their premajor status extended temporarily by an adviser.

Students who do not declare a major by the time they have earned 105 credits, or who have exceeded the graduation credit limits, or who have not been accepted in a major as fifth-year or postbaccalaureate students, will have a "hold" placed against registration beginning the following quarter.

Students must graduate with their first baccalaureate degree by the time they have completed 30 credits beyond the credits required for the first degree or concurrent degrees. Departmental advisers may grant extensions beyond the 30-credit limit.

Postbaccalaureate students are expected to be either preparing for admission into a degree program, seeking an additional baccalaureate degree, or working toward a certificate. Students admitted as "postbaccalaureate undeclared" must declare a major by the time they have earned 30 credits beyond their last degree, and once a degree objective has been declared, must make progress toward that degree as evidenced by the courses they have completed satisfactorily. College advisers may grant extensions beyond the 30-credit limit.

The Committee on Admissions and Academic Standards may terminate a student's enrollment if the student demonstrates lack of academic progress as evidenced by excessive course repeats, course drops, or University withdrawals and cancellations. The student may be reinstated with the approval of the student's college and the committee. EOP students will be allowed to be reinstated in consultation with the Office of Minority Affairs.

Grading System

The University of Washington uses a numerical grading system with certain exceptions in the schools of Dentistry, Law, and Medicine. Instructors may report grades from 4.0 to 0.7 in 0.1 increments and the grade 0.0. The number 0.0 is assigned for failing work or unofficial withdrawal. Grades in the range 0.6 to 0.1 may not be assigned. Grades reported in this range will be converted by the Registrar's Office to 0.0. Numerical grades may be considered equivalent to letter grades as follows:

A	4.0-3.9	
A-	3.8-3.5	
B+	3.4-3.2	
B	3.1-2.9	
B-	2.8-2.5	
C+	2.4-2.2	
C	2.1-1.9	
C-	1.8-1.5	
D+	1.4-1.2	
D	1.1-0.9	
D-	0.8-0.7	Lowest passing grade.
E	0.0	Failure or Unofficial Withdrawal.
		No credit earned.

Additional information on grades and scholarship rules may be obtained from the Grade Recording Information Office, 248 Schmitz.

The following letter grades also may be used:

N No grade. Used only for hyphenated courses (courses not completed in one quarter) and courses numbered 600, 601, 700, 750, and 800.

I Incomplete. An Incomplete is given only in case the student has been in attendance and has done satisfactory work until within two weeks of the end of the quarter and has furnished proof satisfactory to the instructor that the work cannot be completed because of illness or other circumstances beyond the student's control. To obtain credit for the course, an undergraduate student must convert an Incomplete into a passing grade no later than the last day of the next quarter. The

student should never reregister for the course as a means of removing the Incomplete. An Incomplete grade not made up by the end of the next quarter will be converted to the grade of 0.0 by the Registrar unless the instructor has indicated, when assigning the Incomplete grade, that a grade other than 0.0 should be recorded if the incomplete work is not completed. The original Incomplete grade is not removed from the permanent record.

An instructor may approve an extension of the Incomplete removal deadline. Such an extension must be received, in writing, at the Grade Recording Information Office no later than the last day of the quarter following the quarter in which the Incomplete grade was assigned. Extensions, which may be granted for up to three additional quarters, must be received before the Incomplete has been converted into a failing grade.

In no case can an Incomplete received by an undergraduate be converted to a passing grade after a lapse of one year.

S Satisfactory grade for courses taken on a satisfactory/not satisfactory basis. An S grade is automatically converted from a numerical grade of 2.0 or above for undergraduates. The grade S may not be assigned directly by the instructor, but is a grade conversion by the Registrar's Office. Courses so graded can only be used as free electives and cannot be used to satisfy a University, college, or department course requirement.

NS Not-satisfactory grade for courses taken on a satisfactory/not satisfactory basis. A grade less than 2.0 for undergraduates will be converted to NS. NS is not included in the grade-point-average calculation. No credit is awarded for courses in which an NS grade is received.

CR Credit awarded in a course offered on a credit/no credit basis only or in courses numbered 600, 601, 700, 750, and 800. The minimum performance level required for a CR grade is determined, and the grade is awarded directly, by the instructor.

NC Credit not awarded in a course offered on a credit/no credit basis only or in courses numbered 600, 601, 700, 750, and 800. The grade is awarded directly by the instructor and is not included in a grade-point-average calculation.

W Official withdrawal or drop during the third and fourth weeks of the quarter for undergraduates. It is not computed in grade-point-average calculation.

***W** Grade assigned when an undergraduate uses an uncontested drop privilege to withdraw from a course after the fourth week of the quarter. It is not computed in grade-point-average calculation.

HW Grade assigned when an undergraduate is allowed a hardship withdrawal from a course after the fourth week of the quarter. It is not computed in grade-point-average calculation.

Nontraditional Grading Options

CREDIT/NO CREDIT-ONLY AS A COURSE OPTION

With appropriate departmental review and approval, a course may be offered on a credit/no credit-only basis. The standard for granting credit in credit/no credit-only courses under this option is the demonstration of competence in the material of the course to the instructor's satisfaction.

SATISFACTORY/NOT SATISFACTORY GRADING OPTION

Certain students are eligible to choose that a limited number of their courses be graded satisfactory/not satisfactory rather than with regular numerical grades.

Any student who wishes to register for a course on a satisfactory/not-satisfactory basis should check first with his or her adviser to determine restrictions and eligibility, because colleges and departments vary in their rules concerning this grading option (e.g., students in the College of Arts and Sciences may not take courses S/NS until they have earned 45 or more college credits). In no case is a student allowed to register for more than 6 credits (or for one course, if that course is offered for more than 6 credits) on a satisfactory/not-satisfactory basis in a given quarter. No more than 25 satisfactory/not-satisfactory credits may be applied to a four-year undergraduate degree. Such courses may not be used to satisfy University, college, or departmental course requirements (i.e., may be applied only to the elective component of a degree).

Generally, a student may not switch to or from satisfactory/not-satisfactory grading for a particular course after the first week of the quarter. Only students in good academic standing (i.e., not on academic warning or probation) are eligible for the S/NS grading option. Veterans should check with the Office of Special Services before requesting S/NS grading option.

It should be noted that the possibility of future objective evaluation of the student's total academic record is reduced by the extent to which the record includes course work that is evaluated by a grading system other than the numerical system. A student should be aware that he or she may jeopardize future educational opportunities, particularly for graduate or postbaccalaureate study, when other systems of performance evaluation are used.

Grade-Point Average

The University's cumulative grade-point average is based solely on courses taken in residence at the University of Washington; this includes some, but not all, courses taken through UW Extension. The UW transcript reflects grades for UW Extension course work that is not residence credit, and the grades for credit by examination. These latter grades do not affect the University cumulative grade-point average.

Computation of Grade-Point Average

The grade-point average for graduation is computed by dividing the total cumulative grade points by the total credits attempted for courses taken in residence at the University. Grade points are calculated by multiplying the number of credits by the numeric value of the grade for each course. The sum of the grade points is then divided by the total credits attempted. Courses elected on an S/NS basis are counted as follows: Satisfactory grades are printed on the permanent record as an S and do not count in the quarterly or cumulative grade-point average, but they do count as credits earned toward graduation. Not-satisfactory grades, NS, do not count in the quarterly and cumulative grade-point averages and do not count as credits earned toward graduation.

EXAMPLE 1

Course	Credits	Grade	Grade points
CLAS 205	3	CR	
OCEAN 101	5	2.7	= 13.5
HST 111	5	4.0	= 20.0
SCAND 100	2	3.3	= 6.6

Total credits earned toward graduation

15

Total graded credits attempted

12

40.1

Grade-point average = $40.1 \div 12 = 3.34$

The total graded credits attempted, not the credits earned toward graduation, are used in computing the grade-point average.

EXAMPLE 2

Course	Credits	Grade	Grade points
ENGL 121	5	2.3	= 11.5
OCEAN 101	5	0.0	= 0.0
SPHSC 100	3	2.7	= 8.1
ART 105	5	I	= 0.0

Total credits earned toward graduation

8

Total graded credits attempted

13

19.6

Grade-point average = $19.6 \div 13 = 1.51$

The student attempted 18 credits, but only 13 are graded, because the I is not computed in the grade-point average. The 0.0 for OCEAN 101 is computed in the grade-point average, but no credit is awarded toward graduation.

If the work in ART 105 is not made up by the end of the next quarter, the I will convert to a numeric grade and the grade-point average will be recomputed.

Repeating Courses

With the approval of the academic department offering the course, an undergraduate may repeat a course once. Both the original grade and the second grade will be computed in the grade-point average but credit will be allowed only once. Veterans receiving benefits must receive approval from the Office of Special Services before a course is repeated.

Grading Procedures

Change of Grade

Except in case of error, no instructor may change a grade that he or she has turned in to the Registrar. A student who finds administrative omissions or errors in a grade report must make application to the Registrar for a review not later than the last day of the student's next quarter in residence, but in no case after a lapse of two years. Grades used to meet graduation requirements cannot be changed after the degree has been granted. Time spent in military service is not counted as part of the two-year limitation. Students are not automatically notified of grade changes posted after the first of the quarter.

Grade Appeal Procedure

A student who believes he or she has been improperly graded first discusses the matter with the instructor. If the student is not satisfied with the instructor's explanation, the student may submit a written appeal to the Chairperson of the department, or in a nondepartmental college, to the Dean, with a copy of the appeal also sent to the instructor. The Chairperson, or Dean, consults with the instructor to ensure that the evaluation of the student's performance has not been arbitrary or capricious. Should the Chairperson believe the instructor's conduct to be arbitrary or capricious and the in-

structor declines to revise the grade, the Chairperson (or the Dean in a nondepartmentalized school or college), with the approval of the voting members of his or her faculty, shall appoint an appropriate member, or members, of the faculty of that department to evaluate the performance of the student and assign a grade. The Dean and Provost should be informed of this action.

Once a student submits a written appeal, this document and all subsequent actions on this appeal are recorded in written form for deposit in a department or college file.

Grade Reports

Grade reports are mailed to all students, except those in the School of Medicine, at the close of each quarter. The grade reports are sent to the mailing address supplied by the student at the time of registration. To ensure delivery of grades, changes in the mailing address should be reported to the Registrar's Office by the last day of instruction. Copies of the quarterly grade reports are also sent to each student's Dean and major department.

Scholarship

Low Scholarship

Academic Warning

An undergraduate student whose grade-point average falls below 2.00 in his or her first quarter at the University receives an academic warning. If a cumulative grade-point average of at least 2.00 for courses earned in residence at the University is not achieved by the end of the next quarter, he or she is placed on academic probation.

Probation and Dismissal for Low Scholarship

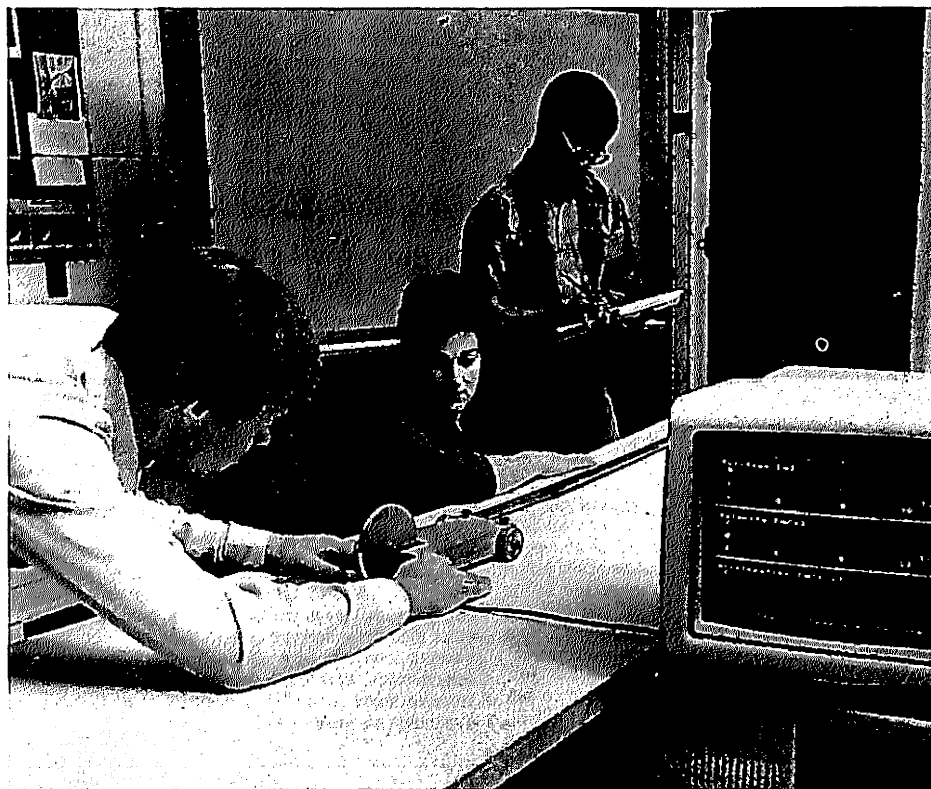
An undergraduate student is placed on academic probation at the end of any quarter (except for the first quarter at the University, when an academic warning is issued) in which his or her cumulative grade-point average falls below 2.00. Once on probation, the student must attain at least a 2.50 for each succeeding quarter's work until the cumulative grade-point average is raised to a 2.00, or the student is dropped for low scholarship.

Reinstatement

A student who has been dropped under low-scholarship rules will be readmitted to the University only at the discretion of the Dean of the school or college to which readmission is sought. A student readmitted after being dropped under these rules reenters on academic probation. The student's grade-point average is the same as when dropped from the University, and the student may not use grades from other colleges or universities to raise his or her UW grade-point average. A readmitted student is dropped if he or she fails to attain either a 2.50 grade-point average for the following quarter's work or a cumulative UW grade-point average of 2.00 at the end of that quarter. The student is removed from probation at the end of the quarter in which a cumulative grade-point average of 2.00 or better is reached.

Senior in Final Quarter

A senior who has completed the required number of credits for graduation, but whose work in what would



normally be his or her final quarter places him or her on probation, does not receive a degree until removed from probation. A senior who has completed the required number of credits for graduation, but whose work in his or her last quarter results in his or her being dropped for low scholarship, does not receive a degree until readmitted and removed from probation.

High Scholarship

Quarterly High-Scholarship List

The quarterly high-scholarship list includes the names of matriculated undergraduate students who have attained a quarterly grade-point average of 3.50 in the final grades for at least twelve graded credits, exclusive of lower-division ROTC courses. Appropriate high-scholarship entries are made on the student's permanent academic record.

Yearly Undergraduate Honors

The yearly award for high scholarship is recorded on the academic transcript of students who have achieved the following:

A cumulative grade-point average of 3.50 in at least three quarters of the academic year (Summer, Autumn, Winter, Spring)

12 graded credits or more for each of the three quarters, exclusive of Satisfactory/Not Satisfactory (S/NS) and Credit/No Credit-only (C/NC) courses

Students who have attended the UW four quarters of the school year (Summer through Spring) must have a grade-point average of 3.50 for each of any three quarters, a minimum of 12 graded credits (exclusive of S/NS and C/NC courses) for each of the three quarters, and a cumulative GPA of 3.50 for the four quarters.

Certificates of High Scholarship

Certificates of high scholarship are awarded to students in the sophomore, junior, and senior classes who have high scholastic records for their freshman, sophomore, or junior years, respectively. The Honors Committee determines the grade-point average required for the awarding of certificates.

Baccalaureate Honors

Baccalaureate honors (*summa cum laude*, *magna cum laude*, *cum laude*) are awarded only to recipients of a first baccalaureate degree. These honors are earned by those students who have completed no fewer than 90 residence credits at this institution. At least 60 of the 90 credits must have been acquired on a graded basis.

The University's Honors Committee determines annually the grade-point requirement for each baccalaureate honor. In recent years, approximately six percent of the students have been awarded baccalaureate honors. Credits earned by correspondence courses are not counted toward honors eligibility.

Sophomore Medal, Junior Medal, President's Medal

Annually, the junior having the most distinguished academic record for the first two years of his or her program receives the sophomore medal from the President of the University. The senior having the most distinguished academic record for the first three years of his or her program receives the junior medal from the President of the University.

The President's Medal, which is conferred at commencement, recognizes the graduating senior who has the most distinguished academic record. Only students who have earned at least 90 credits in residence at the University may be considered.

Graduation

Filing an Application for Baccalaureate Degree

A student should file with the Graduation Office, in Schmitz Hall, a written application for his or her degree three quarters before the expected date of graduation. The absolute deadline for filing an application is Friday of the third week of the quarter the student intends to graduate (Tuesday of the third week for College of Arts and Sciences students, who file their applications at B10 Padelford).

It is the student's responsibility to apply for a degree and/or certificate, because degrees are not automatically awarded when requirements have been satisfied. Application forms and diploma cards are available at the Graduation Office and in the major departments.

The signature of the department head or of an authorized adviser must appear on the application in the space provided for "Signature of major adviser." A student leaves the application (and any supporting documents) at the college Dean's office (B10 Padelford for Arts and Sciences) for signature after obtaining the adviser's signature.

After the application is reviewed, the second and third copies are sent to the department or college office and the original is retained in the Graduation Office. If a problem regarding the application arises, the Graduation Office notifies the student. Departmental advisers should notify the Graduation Office if a course listed on the graduation application is substituted.

If an applicant is ineligible to graduate because of a deficiency, the Graduation Office notifies the student.

University Requirements for Baccalaureate Degree

To graduate, a student must meet University, college or school, and departmental requirements. Only University requirements are listed in this section. Requirements of colleges, schools, and departments appear in the section pertaining to the college, school, or department concerned.

Scholastic Standards Required

To be eligible for the baccalaureate degree, a student must earn a cumulative grade-point average of 2.00 for all work done in residence at the University.

The graduation grade-point average is computed when the student has completed all work for the degree and includes only credits earned while in residence at the University.

Credits Required

To be eligible for graduation from the University with the baccalaureate degree, a student must satisfy all other specific requirements and must offer a minimum of 180 academic credits.

University General Education and Proficiency Requirements

The University has adopted minimum general education and proficiency requirements. Individual schools and colleges may establish general education and proficiency requirements in excess of University requirements. Consult the undergraduate program section of each school or college for specific graduation requirements.

The University Distribution List, from which general education courses are to be selected, appears on page 28.

Limitation on ROTC Credits

Credits earned in first- and second-year military training courses cannot be counted in the basic 180 credits required for graduation. Some third- and fourth-year courses may count, depending on the student's college or school.

Limitation on Physical Education Activity Credits

No more than 3 physical education activity credits can apply toward a degree.

Final-Year Residence Requirement

To be recommended for a first or subsequent baccalaureate degree, a student must complete the final 45 credits as a matriculated student in residence at the University. The granting of exceptions to this rule is the responsibility of the Dean of the college or school awarding the degree. If an exception is granted, the student still must present a minimum of 45 credits taken in residence as a matriculated student to be awarded a UW degree.

Catalog for Graduation Requirements

In general, a student graduates under the requirements of the current catalog. A student may, however, fulfill graduation requirements of the catalog in effect at the time he or she entered the school or college from which he or she is to graduate, provided that (1) not more than ten years have elapsed since the student's entry and (2) the school or college and department agree that the student may graduate under the earlier requirements.

If the student graduates more than ten years after enrolling in the school or college, the current catalog must be used for graduation purposes. Exceptions to this rule cannot be made without official University and college approval.

The above provisions do not apply to the requirements prescribed by the College of Education for teaching certificates.

Waiver of Graduation Requirements

A request for waiver of college or University graduation requirements is petitioned to the college graduation committee, which refers the petition to the Committee on Admissions and Academic Standards if an all-University requirement is involved. These petition forms are available at the Graduation Office or the advisory office and should be filed with the application for degree or as soon as possible after the need arises. A student should see his or her academic adviser to initiate a petition.

ate a petition. Because the Committee on Admissions and Academic Standards meets only quarterly, petitions involving University requirements should be filed early in the quarter.

An exemption from an all-University graduation requirement that is granted by the Committee on Admissions and Academic Standards becomes void at the end of two calendar years from the date such exemption is granted if all degree requirements have not been completed within that period.

Graduation Requirements for ROTC Students

As a prerequisite for graduation from the University, students accepted for the third- and fourth-year advanced ROTC program must complete the advanced program unless excused or dismissed from this requirement by regulations prescribed by the Secretary of the Army, the Navy, or the Air Force, whoever has the authority in the individual case.

Two Majors or Two Degrees

Second Baccalaureate Degree

A second baccalaureate degree may be granted, but a student must earn a minimum of 45 credits beyond the number required for the first baccalaureate degree. These credits usually must be earned in residence, with the granting of exceptions to the residency rule being the responsibility of the college or school awarding the degree. The student must achieve no less than a 2.00 cumulative grade-point average in the credits required for the second degree.

Students working for a second baccalaureate degree are not registered in the Graduate School, but in the academic division of the University with jurisdiction over the degree sought.

Degrees with Two Majors

Some colleges allow a baccalaureate degree with two majors. The student's application for such a degree must show both majors and be approved by the advisers of both departments. Both majors appear on the transcript.

Two Baccalaureate Degrees Concurrently

Two baccalaureate degrees, associated with different majors, may be granted at the same time, but the total number of academic credits earned must reach a minimum of 45 credits in excess of the number required for the first baccalaureate degree.

Requirements for Teaching Certification

The College of Education offers professional programs approved by the State Board of Education leading to teaching and other certificates. Additional information appears in the College of Education section of this catalog, or the student may write to the College of Education advisory office, 211 Miller.

Commencement

Formal commencement exercises are conducted at the close of Spring Quarter. During April of each year, commencement information is sent to each student entitled to participate the following June (i.e., those who graduate the previous August, December, or March and those who anticipate graduating in the current June and August).

Diploma Distribution

Diplomas are available twelve weeks after the end of the quarter in which they are earned. Diplomas are mailed if requested by the student.



University Distribution List

Note: Some schools/colleges do not accept all courses shown on the list below. Others require certain patterns of courses to fulfill the general education requirement. Consult an adviser in the Arts and Sciences Advising Office, B10 Padelford, or in the college/school concerned.

Group I: Humanities

Part A: Language and Literature

Afro-American Studies: AFRAM 211.*
 American Indian Studies: AIS 215, 377.*
 Anthropology: ANTH 203.
 Asian American Studies: AAS 401, 402.
 Asian Languages and Literature: ASIAN 263; CHIN 280, 281; JAPAN 321, 322, 323.*
 Classics: CLAS 101, 205, 210, 322, 424, 427, 428, 430, 435.*
 Comparative Literature: C LIT 200, 240, 300, 301, 302, 310, 350, 351, 352, 357, 375, 396, 401, 405, 407, 410, 415, 424, 440, 472, 476, 480, 496.
 Engineering: ENGR 378.
 English: ENGL 200, 202, 203, 204, 205, 206, 207, 208, 231, 267, 303, 304, 305, 309, 310, 311, 313, 314, 315, 321, 322, 325, 326, 327, 328, 330, 331, 332, 333, 334, 335, 340, 341, 342, 343, 344, 346, 347, 348, 351, 352, 353, 354, 355, 356, 358, 359, 361, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 375, 376, 377, 378, 382, 383, 384, 390, 394, 407, 408, 413, 415, 416.
 Germanics: GERM 210, 340, 341, 342, 345, 346, 349, 350, 351, 352, 353, 355, 390, 497, 498.*
 Linguistics: LING 200, 401.
 Middle Eastern Studies: SISME 210.
 Near Eastern Languages and Civilization: N E 210, 230, 240.*
 Philosophy: PHIL 347.
 Religious Studies/Comparative Religion: RELIG 220.
 Romance Languages and Literature: ROMAN 200; FREN 486; ITAL 481, 482; SPAN 317, 318, 353.*
 Scandinavian Languages and Literature: SCAND 232, 251, 280, 281, 309, 312, 330, 332, 335, 365.*
 Slavic Languages and Literature: RUSS 321, 322, 323, 324, 341, 342, 421, 422, 423, 426, 427, 428, 429; CZECH 420; POLSH 420; SER C 420.*
 South Asia: SISSA 210.
 Speech Communication: SPCH 102, 140, 220, 305, 334.

Part B: Fine Arts

American Indian Studies: AIS 110, 170.
 Anthropology: ANTH 333, 334, 335.
 Architecture: ARCH 150, 151, 250.
 Art: ART 105, 109.
 Art History: ART H 200, 201, 202, 203, 204, 205, 311, 315, 316, 330, 333, 334, 335, 337, 340, 341, 342, 343, 351, 352, 361, 371, 372, 380, 384.
 Classics: CL AR 340, 341, 342, 343.
 Comparative Literature: C LIT 270, 271, 272.
 Dance: DANCE 344, 345.
 Drama: DRAMA 101, 201, 371, 374, 377, 378, 416, 472, 473, 476.
 Landscape Architecture: L ARC 352, 361.

* Language instruction courses, except those designed primarily for conversational practice, may be used for language and literature distribution credit at the second-year level and beyond. First-year language courses in a language that is not being used to meet the foreign-language proficiency requirement can be used for distribution (except in the College of Engineering), but only if the student completes the third-quarter course. All literature courses taught in a foreign language, except independent study projects (e.g., FREN 499), may be used for language and literature credit.

Music: MUSIC 116, 117, 118, 120, 121, 160, 161, 162, 260, 316, 317, 318, 322, 330, 331, 332, 339, 429.
 Philosophy: PHIL 445.
 Scandinavian Languages and Literature: SCAND 360, 484.

Group II: Social Sciences

Part A: Social Science

American Indian Studies: AIS 230, 240.
 Anthropology: ANTH 100, 202, 301, 350, 353, 360.
 Asian American Studies: AAS 205, 206.
 Communications: CMU 202.
 Economics: ECON 100, 200, 201.
 Environmental Studies: ENV S 101, 205, 301.
 Forest Resources: FRM 100, 301.
 Geography: GEOG 100, 200, 207, 277, 300, 342.
 International Studies: SIS 426.
 Linguistics: LING 201, 333.
 Music: MUSIC 345.
 Political Science: POL S 101, 202, 203, 204, 270, 351, 426.
 Psychology: PSYCH 101, 205, 257, 305, 306, 345, 355.
 Social Work: SOC W 300.
 Sociology: SOC 110, 240, 241, 271, 330, 347, 350, 352, 364, 366.
 Speech Communication: SPCH 373, 471, 484.
 Urban Design and Planning: URBDP 300.
 Women Studies: WOMEN 257, 353, 364.

Part B: History, Philosophy, Civilization

African Studies: SISAF 265.
 Afro-American Studies: AFRAM 200, 201.
 American Indian Studies: AIS 102.
 Anthropology: ANTH 230; ARCHY 105, 205.
 Art History: ART H 350.
 Chicano Studies: CHSTU 201.
 Classics: CLAS 320.
 Communications: CMU 201, 203, 377, 479, 483.
 East Asia: SISEA 101, 210, 212, 234.
 Economics: ECON 260, 306.
 Environmental Studies: ENV S 361.
 Geography: GEOG 102.
 History: HST 111, 112, 113, 140, 207, 242, 250, 283, 307, 310, 311, 312, 315; HSTAA 201, 202, 301, 302, 303, 421, 454; HSTAM 201, 202, 203, 336; HSTAS 201, 202, 211, 212; HSTEU 275, 370, 401, 405, 406, 407, 410, 476.
 International Studies: SIS 200, 201, 202; SISAF 265; SISEA 101, 210, 234; SISJE 250; SISRE 140, 220, 243, 324.
 Jewish Studies: SISJE 250.
 Linguistics: LING 402.
 Medical History and Ethics: MHE 401, 403, 417, 418, 430, 481.
 Near Eastern Languages and Civilization: N E 350, 430.
 Philosophy: PHIL 100, 101, 102, 104, 105, 106, 110, 206, 240, 267, 320, 321, 322, 327, 330, 332, 334, 350, 363.
 Political Science: POL S 201, 212, 321.

Religious Studies/Comparative Religion: RELIG 201, 202, 203, 210, 301, 310, 311, 313, 315, 320, 321, 322, 352, 354, 430.

Romance Languages and Literature: SPAN 231.

Russia and Eastern Europe: SISRE 140, 220, 243, 324.

Scandinavian Languages and Literature: SCAND 100, 370.

Sociology: SOC 410.

Speech Communication: SPCH 222, 310, 329, 424.

Urban Design and Planning: URBDP 370, 460, 471.

Women Studies: WOMEN 200, 206, 283.

Group III: Natural Sciences

Anthropology: PHY A 201, 382, 387.
 Astronomy: ASTR 101, 102, 110, 150, 190, 201, 301.
 Atmospheric Sciences: ATM S 101, 102, 301, 321.
 Biological Structure: B STR 301.
 Biology: BIOL 100, 101-102, 103, 104, 210, 211, 212, 454.
 Botany: BOT 110, 113, 220, 371, 372.
 Chemistry: CHEM 100, 101, 102, 140, 145, 150, 151, 155, 157, 160, 164, 167, 231, 232, 235, 236, 241, 242, 335, 336, 337, 346, 347.
 Civil Engineering: CIVE 250.
 Environmental Studies: ENV S 203, 204, 250.
 Fisheries: FISH 101.
 Food Science: FD SC 300.
 Forest Resources: FRM 200, 350.
 Genetics: GENET 351, 360, 453, 455.
 Geography: GEOG 205.
 Geological Sciences: GEOL 100, 101, 205, 300, 302, 306, 308, 313.
 Mathematics: MATH 107, 124, 125, 126, 134, 135, 136, 156, 157, 170, 171.
 Microbiology: MICRO 101, 301, 302.
 Nutritional Sciences: NUTR 300, 421.
 Oceanography: OCEAN 101, 102, 200.
 Philosophy: PHIL 120, 160.
 Physics: PHYS 101-102, 103, 110, 111, 112, 114, 115, 116, 117, 118, 119, 121, 122, 123, 131, 132, 133, 205, 207, 210, 211, 212, 214, 215, 216, 224, 225.
 Psychology: PSYCH 102, 200, 209, 222, 357, 417.
 Speech and Hearing Sciences: SPHSC 300.
 Statistics: STAT 220, 311.
 Women Studies: WOMEN 357.
 Zoology: ZOOL 114, 118, 220, 301.





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Donald R. Baldwin

Director, Graduate Admissions

Josie Croteau

In 1885, the University of Washington awarded its first graduate degree, a Master of Arts in the field of classical languages. In 1914, the University awarded its first Doctor of Philosophy degree, in the field of chemistry. The University has conferred more than forty-five thousand master's degrees and nine thousand doctoral degrees, exclusive of medical, dental, and first legal doctorates.

The Graduate School was created in 1899 and was established permanently in 1910. Its purposes are to exercise leadership for the University of Washington in matters pertaining to graduate education, to facilitate the performance of research by its faculty and students, and to foster the integration of education and research to the benefit of both. Through graduate programs, the University fulfills several functions vital to a healthy society: by fostering research, it advances human knowledge; by educating scholars and teachers, it preserves and transmits our cultural heritage; by training professionals, it makes information and help available to the various sectors of the public; and, by virtue of all of these, it contributes to the resolution of the problems and needs of society.

Graduate study and research is guided by the Dean of the Graduate School and a Graduate Faculty of two thousand members, selected for their scholarly and research qualifications and their concern with graduate education. More than seven thousand graduate students are now in residence, working toward master's or doctoral degrees; several hundred postdoctoral students and appointees also are in residence. Programs in the Graduate School leading to master's and doctoral degrees are offered in eighty-four departments or other organizational units of the University. The Graduate School directly sponsors five interdisciplinary degree programs by organizing Graduate School groups of interested faculty members and assisting them in developing such programs. It also administers the Graduate School of Library and Information Science and its degree program, as well as a small Special Individual Ph.D. program for approved uniquely interdisciplinary dissertations.

Usually focused on a specific field of knowledge, graduate study is conducted through a variety of means, including lectures, seminars, independent advanced study, special reading courses, internships, and participation in research. Graduate programs leading to the Master of Arts, Master of Science, or Doctor of Philosophy degrees emphasize the development of the student's ability for independent scholarly work and the creation of new knowledge through research. Practice-oriented programs, which ordinarily lead to the degree of master or doctor in a particular professional field, emphasize preparation of the student for professional practice at the frontiers of existing knowledge.

Many master's and all doctoral programs culminate in the presentation of a thesis or dissertation conveying the results of the independent study and research carried out by the student. A master's thesis contributes to knowledge, reviews or critiques the state of knowledge in a field, creates a new design or composition, or represents some other appropriate kind of independent contribution. A doctoral dissertation must set forth a significant contribution to knowledge or understanding in the student's field, be presented in scholarly form, and demonstrate that the student is competent to engage independently in the pursuit of solutions to important problems. The student must defend the doctoral

dissertation in a Final Examination conducted by a faculty committee and open to all other Graduate Faculty members. A member of the Graduate Faculty from some other discipline participates as an official representative of the entire Graduate Faculty in all aspects of the student's program, including various major evaluations such as the General Examination and Final Examination.

Acting through an elected council that advises the Dean, the Graduate Faculty establishes Graduate School policies. Each degree-offering unit within the University appoints a graduate program coordinator, who serves as an important link between the unit and the Graduate School. Students are advised to seek the help of the graduate program coordinator when questions concerning Graduate School and departmental degree requirements arise.

In addition to its primary concern with graduate students, Graduate Faculty, and programs leading to advanced degrees, the Graduate School has been given a number of responsibilities that relate to its primary ones. It promotes research throughout the University by administering the Graduate School Research Fund, which is composed of institutional funds and is available to support faculty and student activities. It coordinates all requests to outside agencies for the support of research and advanced training. It awards certain graduate fellowships and assistantships. It also administers a number of centers, institutes, and laboratories for advanced study, as well as such central facilities as the University of Washington Press. A particularly significant responsibility is the selection of scholars to occupy the Walker-Ames and the Jessie and John Danz distinguished visiting professorships.

The University has obligated itself to promote greater access to advanced study by women and members of ethnic minority groups. Within the Graduate School, the Minority Education Division actively solicits applications for admission, facilitates their review, and helps with various procedures related to the enrollment of minority graduate students. In conjunction with the University's Office of Minority Affairs, the division offers financial aid to students who need such help. A special appropriation of funds by the Washington State Legis-

lature permits the award of Graduate Opportunity Assistantships to encourage the recruitment and retention of women and minority students in areas of study where they are particularly underrepresented.

Graduate Degree Programs Offered

Graduate degree programs are reviewed by the Graduate School on a ten-year cycle, or at predetermined shorter intervals. For further information, see Graduate School Memorandum No. 7, Periodic Review of Existing Degree Programs, or contact the Academic Programs Office in the Graduate School.

Academic unit	Graduate degrees offered
College of Architecture and Urban Planning	
Architecture	M.Arch.
Landscape Architecture	M.L.A.
Urban Design and Planning	M.U.P., Ph.D.
College of Arts and Sciences	
Anthropology	M.A., Ph.D.
Applied Mathematics	M.S., Ph.D.
Art	M.F.A.
Art History	M.A., Ph.D.
Asian Languages and Literature	M.A., Ph.D.
Astronomy	M.S., Ph.D.
Atmospheric Sciences	M.S., Ph.D.
Botany	M.S., Ph.D.
Chemistry	M.S., Ph.D.
Classics	M.A., Ph.D.
Communications	M.A., M.C., Ph.D.
Comparative Literature	M.A., Ph.D.
Computer Science	M.S., Ph.D.
Drama	M.F.A., Ph.D.
Economics	M.A., Ph.D.
English	M.A., M.A.T., Ph.D.
Genetics	M.S., Ph.D.
Geography	M.A., Ph.D.
Geological Sciences	M.S., Ph.D.
Geophysics	M.S., Ph.D.
Germanics	M.A., Ph.D.
History	M.A., Ph.D.
International Studies (Includes Comparative Religion, East Asian Studies, Middle Eastern Studies, Russian and East European Studies, and South Asian Studies)	M.A.

Linguistics	M.A., Ph.D.
Mathematics	M.A., Ph.D.
Music	M.A., M.M., D.M.A., Ph.D.
Near Eastern Languages and Civilization	M.A.
Philosophy	M.A., Ph.D.
Physics	M.S., Ph.D.
Political Science	M.A., Ph.D.
Psychology	M.S., Ph.D.
Romance Languages and Literature	M.A., Ph.D.
Scandinavian Languages and Literature	M.A., Ph.D.
Slavic Languages and Literature	M.A., Ph.D.
Sociology	M.A., Ph.D.
Speech and Hearing Sciences	M.S., Ph.D.
Speech Communication	M.A., Ph.D.
Statistics	M.S., Ph.D.
Zoology	M.S., Ph.D.
Graduate School of Business Administration	M.B.A., Ph.D.
Accounting	M.P. Acc.
School of Dentistry	M.S.D.
Oral Biology	M.S., Ph.D.
College of Education	M.Ed., Ed.D., Ph.D.
College of Engineering	M.S., M.S.E., M.Eng.
Aeronautics and Astronautics	M.S.A.&A., Ph.D.
Chemical Engineering	M.S.Ch.E., Ph.D.
Civil Engineering	M.S.Civ.E., Ph.D.
Electrical Engineering	M.S.E.E., Ph.D.
Materials Science and Engineering	M.S.M.S.&E., Ph.D.
Mechanical Engineering	M.S.M.E., Ph.D.
Nuclear Engineering	M.S.N.E., Ph.D.
College of Engineering and School of Medicine	
Bioengineering	M.S., M.S.E., Ph.D.
College of Forest Resources	M.F.R., M.S., Ph.D.
Graduate School	
Biology Teaching	M.A.T.
Health Services Administration	M.H.A.
Library and Information Science	M.Libr.
Nutritional Sciences	M.S.
Physiology-Psychology	Ph.D.
Radiological Sciences	M.S.Rad.Sci.
Special Individual Ph.D.	Ph.D.
School of Law	LL.M., Ph.D.
School of Medicine	
Biochemistry	M.S., Ph.D.
Biological Structure	M.S., Ph.D.
Laboratory Medicine	M.S.
Medical History and Ethics	M.A.
Microbiology	M.S., Ph.D.
Pathology	M.S., Ph.D.
Pharmacology	M.S., Ph.D.
Physiology and Biophysics	M.S., Ph.D.
Rehabilitation Medicine	M.P.T., M.R.M., M.S.
School of Nursing	M.N., M.S., Ph.D.

College of Ocean and Fishery Sciences	
Fisheries	M.S., Ph.D.
Marine Studies	M.M.A.
Oceanography	M.S., Ph.D.
School of Pharmacy (Includes the departments of Medicinal Chemistry and Pharmaceutics)	M.S., Ph.D.
Graduate School of Public Affairs	M.P.A.
School of Public Health and Community Medicine (Includes the departments of Environmental Health, Epidemiology, Health Services, and Pathobiology)	M.S., Ph.D.
Biostatistics	M.S., Ph.D.
Environmental Health	M.P.H.
Epidemiology	M.P.H.
Health Services	M.P.H.
School of Social Work	M.S.W.
Social Welfare	Ph.D.

Because the following professional doctoral degrees offered by the University are not considered to be graduate degrees, they are not administered through the Graduate School.

School of Dentistry	D.D.S.
School of Law	J.D.
School of Medicine	M.D.
School of Pharmacy	Pharm.D.

Graduate Admissions

The Graduate School is responsible for determining the requirements for admission to graduate study. Within the limit imposed on overall graduate enrollment in the University, admission to a specific graduate degree program is limited to the number of students for whom faculty, staff, and facilities can provide graduate instruction and research guidance of high quality. Each graduate student must be admitted into a specific graduate program; the Graduate School does not permit general graduate enrollment.

Admission Procedure

Admission to the Graduate School is granted by the Dean of the Graduate School. Application for admission is made to the Office of Graduate Admissions. Each applicant must submit a completed University of Washington application form and arrange for the receipt of scores on the Graduate Record Examination, or an alternative test approved by the Graduate School Council, and official transcripts from all previously attended colleges, universities, and institutes. Each department or other unit authorized to offer a graduate degree program maintains a Graduate Admissions Committee consisting of not fewer than three Graduate Faculty members. The committee receives from the Office of Graduate Admissions all completed applications for admission to the unit. The Admissions Committee is responsible for the fair and complete evaluation of applicants and for recommending to the Dean of the Graduate School the names of applicants who are considered to be qualified for admission.

Priority for admission of applicants into a graduate degree program is based upon the applicant's apparent ability, as determined by the University, to complete the program expeditiously with a high level of achievement and also upon the applicant's promise for success in his or her subsequent career. In addition, Graduate School admission policy requires that:



No practice may discriminate against an individual because of race, color, national origin, handicap, sex, age, religious preference, or background, or status as disabled veteran or Vietnam era veteran, and that:

Sustained efforts shall be made to recruit qualified students who are members of groups that have been subject to discrimination or are underrepresented in certain disciplines.

In developing a pool of qualified applicants for admission to the Graduate School, the following factors may be taken into account by a degree-offering unit:

1. Undergraduate grades, especially for subjects in, or closely related to, the field of the applicant's proposed graduate work (at least a B, or 3.00 grade-point, average is expected).
2. The applicant's consistency in proceeding through an undergraduate degree program.
3. Scores on the Graduate Record Examination verbal, mathematical, and analytical tests, and on the GRE advanced test or other tests related to the applicant's field and on other aptitude tests that may be required.
4. Personal interviews of the applicant by the department admissions committee.
5. The career objectives of the applicant and the extent to which the graduate degree program may be expected to prepare him or her for those objectives.
6. Written and oral recommendations from persons who are qualified to evaluate the applicant's academic record and promise.
7. The applicant's degree objective (i.e., master's degree, doctoral degree, or a master's degree followed by a doctoral degree).

Weights given to these factors may vary among academic units.

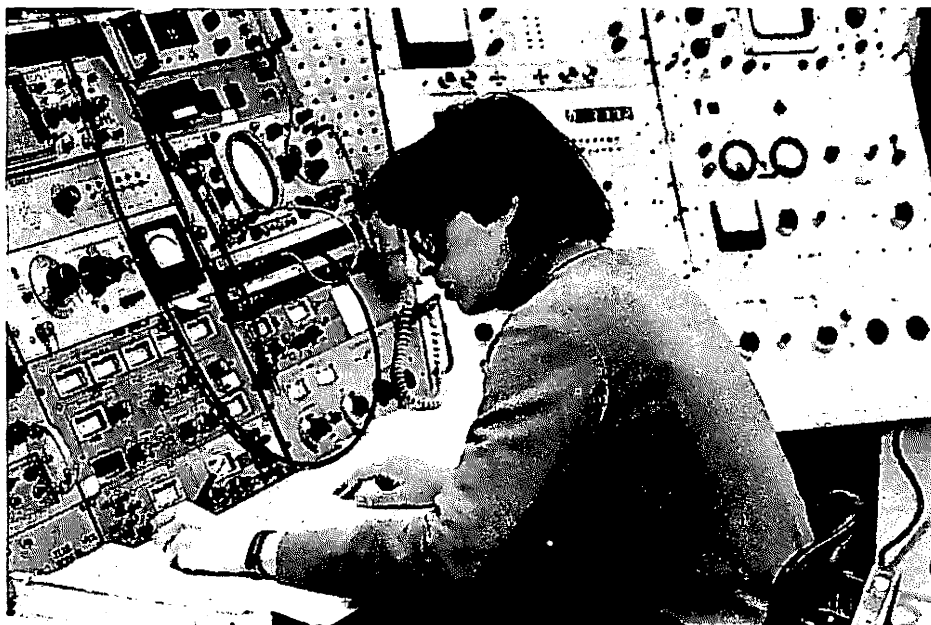
Admission to the Graduate School usually signifies admission into a program of graduate study leading to a master's degree or the equivalent, or into post-master's study if the student admitted already has received a master's degree or has successfully completed equivalent graduate study. Admission does not imply acceptance of a graduate student into a program of study leading to a doctoral degree. A student becomes a candidate for the doctoral degree only on the completion of specific requirements intended to demonstrate to the satisfaction of the student's unit and the Graduate School the apparent ability of the student to progress satisfactorily through the doctoral degree program.

Counseling and Financial Assistance

To assist in attracting individuals from low-income families into the qualified applicant pool, the Graduate School offers certain kinds of financial assistance and works with other University offices to arrange for counseling and financial aid.

Enrollment Limitation

Total Graduate School enrollment is determined by the University administration in furtherance of University intent to maintain proportions of graduate students and other categories of students appropriate to the role of the University in its particular setting. The Dean of the Graduate School, after consultation with other University officers and faculty, assigns enrollment targets to the graduate-degree-offering units. These targets are based on the combined judgment of these parties as to the demand for the program and the resources available to it.



First preference in enrollment is given to continuing graduate students (i.e., those who already have been admitted into a graduate program, who are in good standing, and who have maintained continuous enrollment as in-residence, *in absentia*, or On-Leave students). After continuing graduate students are accommodated, the remaining places are available for the enrollment of new students or the reenrollment of former students who have not maintained continuous enrollment.

Visiting Graduate Students

A student who wishes to enroll in the Graduate School at the University of Washington and who intends thereafter to return to the graduate school in which he or she is working toward an advanced degree may be admitted as a visiting graduate student. This admission is contingent on available space and facilities.

Such a student must have been officially admitted to another recognized graduate school and be in good standing and currently pursuing a graduate program. The student need not submit a full transcript of credits, but must apply for admission, pay a \$35 application fee, and furnish certification of status on a special form entitled Visiting Graduate Student—Certificate of Status, which may be obtained by writing to the University of Washington, Office of Graduate Admissions, AD-10, Seattle, Washington 98195.

Applications must be filed in accordance with instructions on the application form prior to the following dates: July 1 for Autumn Quarter, November 1 for Winter Quarter, February 1 for Spring Quarter, and May 15 for Summer Quarter.

Admission to the University of Washington as a visiting graduate student *does not guarantee* admission to any particular course of study. A visiting graduate student is permitted to register only in those courses for which he or she is judged to be eligible by a faculty adviser or the instructor in the course and if space is available to accommodate registration.

If at any later time the student wishes to apply for admission to the Graduate School of this university to work toward a degree, he or she must make formal application and submit complete credentials. If a visiting graduate student is later given formal admission and begins work toward a degree at the University of

Washington, he or she may petition the Dean of the Graduate School for allowance of credit for courses taken as a visiting graduate student to be applicable toward the graduate program.

How to Apply

Requests for the form Application for Admission to the Graduate School should be addressed to the graduate program coordinator of the department in which the student expects to pursue a program of study or to the Office of Graduate Admissions. Other correspondence relative to admission procedures should be addressed to the University of Washington, Office of Graduate Admissions, AD-10, Seattle, Washington 98195.

Each applicant for admission to the Graduate School as a regular graduate student or as a visiting graduate student must pay an application fee of \$35. Payment, in United States currency only, must accompany the application. This fee is not refundable and is not credited against any other fees charged by the University.

REGULAR GRADUATE STUDENTS

The application for admission, the required transcripts in duplicate, and the \$35 application fee must be filed, in accordance with instructions appearing on the application form, prior to the following dates: July 1 for Autumn Quarter, November 1 for Winter Quarter, February 1 for Spring Quarter, and May 15 for Summer Quarter (these dates are subject to change by the University). Early application is advised, because some departmental targets are filled well in advance of these dates.

The foregoing dates apply to new students as well as to former students of the University who have not attended since receiving their baccalaureate degrees. A former student must apply as a new student for admission to the Graduate School or for admission to an undergraduate college as a postbaccalaureate student. In some cases, departments suggest that applications be submitted earlier than the dates herein set forth.

When the required application, official credentials, and \$35 application fee have been received, an evaluation is made and the applicant is notified of his or her admission status.

All records become a part of the official file and can be



neither returned nor duplicated for any purpose. A student should obtain an additional copy of his or her official credentials to keep for advisory purposes. Failure to submit complete and accurate credentials may result in permanent dismissal from the University.

General information and instructions for registration are mailed to new students with the notice of admission. In the event of a discrepancy, these instructions supersede those found in earlier publications. *The University assumes no responsibility for students who come to the campus before they have been officially notified of their admission.*

The admissions credentials of applicants who do not register for the quarter to which they have been admitted are normally retained in the Office of Graduate Admissions for a period of one year from the date of application. At the end of this period, credentials on file are discarded unless the applicant has notified the Office of Graduate Admissions of a continued interest in attending the University.

University of Washington students who are within 6 credits of completing their undergraduate work and who have met the requirements for admission to the Graduate School may register the quarter immediately preceding admission to Graduate School for up to 6 credits in 500-level courses in addition to the last 6 credits they require of undergraduate work. This registration and these arrangements must be approved by the graduate program that the student will enter; however, students concerned are not reclassified as graduates until the baccalaureate degree has been granted and after their official admission to the Graduate School. At that point, it is necessary to petition the Graduate School to transfer the 6 credits. Only under these circumstances may graduate work taken as an undergraduate be applied toward an advanced degree. Further registration for graduate work is contingent upon completion of the requirements for the baccalaureate degree.

INTERNATIONAL STUDENTS

Students from abroad are expected to meet the same general requirements as applicants educated in American schools. The admission application, official credentials, and \$35 application fee must be received in the Office of Graduate Admissions at the University of Washington before the closing dates for domestic graduate students. In addition, applicants must demonstrate a satisfactory command of English and must

have sufficient funds available in the United States to meet their expenses. The \$35 fee, which must accompany the application, must be payable in United States currency in the form of an international postal money order, a draft on a United States bank, or a traveler's check.

ENGLISH LANGUAGE COMPETENCE

Prospective international, immigrant, and permanent resident students whose native language is other than English and who have not received degrees from institutions in countries where English is the native language are required to submit their scores on the Test of English as a Foreign Language (TOEFL), or the Michigan Test. In addition, scores on the Test of Spoken English (TSE) should be presented by international students who are applying for teaching assistantships.

Students who are admitted with TOEFL scores below 580, or Michigan Test scores below 90, are required to take the University-administered diagnostic English test upon matriculation, and must take the English as a Second Language (ESL) courses identified as required.

Those accepted for Autumn Quarter admission prior to May 15 may register for intensive English through the Language Learning Center for the Summer Quarter. Information may be obtained from the graduate program coordinator.

Graduate Nonmatriculated Students

Under certain conditions, departments, schools, or colleges may choose to offer enrollment in their graduate courses to graduate nonmatriculated students (GNM). The purpose of GNM enrollment is to allow qualified students to earn limited graduate credit in a particular area of need. Applicants who meet graduate admission standards may be enrolled as GNM students and may apply up to a maximum of 18 credits earned while so enrolled toward graduate degree requirements if later accepted into a graduate degree program. (For additional information, see Graduate School Memorandum No. 37.)

The Application to Graduate Nonmatriculated Status form should be completed and filed with the graduate academic unit to which the student is applying.

The student should request the registrars of all collegiate institutions attended to forward official transcripts

to the graduate unit. Only transcripts received directly from these institutions can be considered official.

Complete application and credentials should be received prior to September 1 for Autumn Quarter, November 15 for Winter Quarter, March 1 for Spring Quarter, and May 15 for Summer Quarter.

Graduate Student Registration

A regular graduate student: (1) has been granted regular admission to the Graduate School; (2) has developed a current program of studies satisfactory to the graduate program coordinator; and (3) has completed all of the required steps for registration, including the depositing of registration materials at Sections and the payment of tuition and fees.

Visiting graduate students follow regular registration procedures.

Graduate students are required to maintain continuous enrollment from the time of their first registration until completion of the advanced degree (see section on Continuous Enrollment).

All students currently attending the University who wish to attend a succeeding quarter should participate in preregistration. If this is not possible, however, students can make an appointment with the Registrar to go through in-person registration. Fee statements are mailed to students and must be paid by the stated deadline. Students are held responsible for knowing and observing the registration procedures, dates, and deadlines that appear in this catalog, in official notices in the *University of Washington Daily*, and in the quarterly *Time Schedule*.

After new students are notified of their admission, the Registrar contacts them, requesting a \$50 enrollment service fee. If this payment is received by the date specified, the Registration Appointment Office will mail the new student a registration appointment and instructions for registering. The \$50 enrollment service fee is not required of Summer Quarter students.

Advising

After notification of admission and before registration, the student should confer with the departmental graduate program coordinator about the program for current registration. It is primarily to the graduate program coordinator in the department that the student must look for individual counsel, guidance, and instruction in the scholarly study and research that characterize graduate work.

Financial Aids for Graduate Students

Students applying for fellowships, traineeships, and assistantships or associateships must make certain that complete transcripts and other credentials are on file by February 15 (earlier submission of applications and supporting documents is urged by all departments and required by some). Awards and appointments are usually made about April 1. Application forms may be obtained by writing to the graduate program coordinator of the appropriate department.

Fellowships, Traineeships, and Scholarships

A limited number of fellowships, traineeships, and scholarships are available through the Graduate School or through individual departments to outstanding students in fields of study leading to advanced de-

grees. Application forms may be obtained from the graduate program coordinators in the departments or from the Fellowship and Assistantship Division in the Graduate School.

The Graduate School also provides computer searches to assist enrolled graduate students, faculty, and staff in locating fellowships, grants, and other sources of funding. The data base contains over two thousand awards from foundations, government agencies, associations, and other non-University organizations. These awards are made on a national competitive basis, and application must be made directly to these foundations or organizations.

Graduate Student Service Appointments

The University provides for the employment of many graduate students as teaching, research, and staff assistants, predoctoral associates, predoctoral instructors, and predoctoral lecturers. Approximately two thousand such appointments were made during the past year.

The University's policy regarding these appointments is set forth in detail in Executive Order 28. Copies of this statement are available from the graduate program coordinator or the Graduate School. Some of the information is provided below.

Appointments are granted only to graduate students who have carefully defined educational goals and who exhibit the highest intellectual competence and attainment. Succeeding appointments may be made if the student maintains high scholarship and continues to make satisfactory progress toward the degree.

Graduate appointments are granted to graduate students only. An initial appointment may be offered to a student before being admitted formally to the Graduate School, but the appointment is contingent upon admission to graduate status before the beginning of the appointment.

1988-89 GRADUATE STUDENT SERVICE APPOINTMENTS

Students holding these appointments for at least 20 hours per week and for five of the six pay periods of an academic quarter will receive a waiver of the operating fee portion of "tuition and fees" and will be required to pay \$105 tuition per quarter.

Salary for Half-time Service (20 hours per week)

Effective September 15-December 31, 1988 (a salary increase is expected to be effective January 1, 1989)

Title	Monthly salary	Academic year salary
Teaching Assistant	\$770	\$6,930
Predocutorial Teaching Associate I	826	7,434
Predocutorial Teaching Associate II	890	8,010
Predocutorial Instructor	890*	8,010*
Predocutorial Lecturer	890*	8,010*
Research Assistant	770	6,930
Predocutorial Research Associate I	826	7,434
Predocutorial Research Associate II	890	8,010
Predocutorial Researcher	890*	8,010*
Graduate Staff Assistant	770	6,930
Predocutorial Staff Associate I	826	7,434
Predocutorial Staff Associate II	890	8,010

* Minimum.

Graduate students appointed to the beginning level of graduate teaching appointments are not permitted to be in overall charge of a course, but are given an appropriate degree of responsibility and supervision of laboratory or classroom work so that they may be introduced to teaching activities gradually and effectively. Student appointees may also serve as assistants in research activities for which a faculty member is responsible.

Two special categories for teaching appointments and one for research appointments are provided above the predoctoral associate level: predoctoral instructor, for the graduate student who has achieved Candidate status and is ready for increased teaching responsibility; predoctoral lecturer, for a mature and competent graduate student who, though he or she need not be a Candidate, has had exceptional previous teaching or other professional experience; and predoctoral researcher, for the student who has special skills or qualities obtained outside of his or her experience as a graduate student or who carries major responsibilities in relation to research activities. For the 1988-89 academic year these appointments carry a minimum stipend of \$890 per month (half-time) with no designated maximum so that the stipend may be adjusted to a level appropriate to the appointee's experience and his or her teaching and research responsibilities.

International students with teaching appointments (teaching assistant, predoctoral teaching associate I and II, predoctoral instructor, predoctoral lecturer) must meet a spoken-English requirement before they may be given classroom duties.

An additional series of appointments titled Graduate Staff Assistant and Predocutorial Staff Associates I and II is provided for University service activities that are not appropriately described as teaching or research but are closely related to the student's field of advanced study. Appointments of specific graduate students to these positions may not be made until after the position itself has been specifically approved.

Students who hold any of the above appointments are required to render twenty hours of service per week to the University. The appointments may be on a nine-month basis and ordinarily cover the period from September 16 through June 15. Some of these appointments may be extended to eleven or twelve months. Graduate student appointments do not provide for paid vacations or sick leave. Students who accept these

University service appointments normally confine their employment to such appointments.

A graduate student service appointee must register for, and carry throughout each quarter except Summer Quarter, a minimum of 9 credits in formal courses or in research, thesis, or dissertation work. These credits must be in courses that are applicable toward an advanced degree.

Work Study Graduate Assistantships

Graduate students who are eligible for the need-based college work study program may qualify for work study graduate assistantships in teaching or research. Students must submit financial aid applications to the Office of Student Financial Aid by the March 1 deadline to be considered for these positions. Information is available from the Office of Student Financial Aid.

Employment Opportunities

The campus offers other job opportunities for graduate students. Students may apply directly to the Chairperson of the department in which they hope to work or to the Student Employment Office. Students seeking part-time employment must be enrolled and on campus before they may obtain jobs.

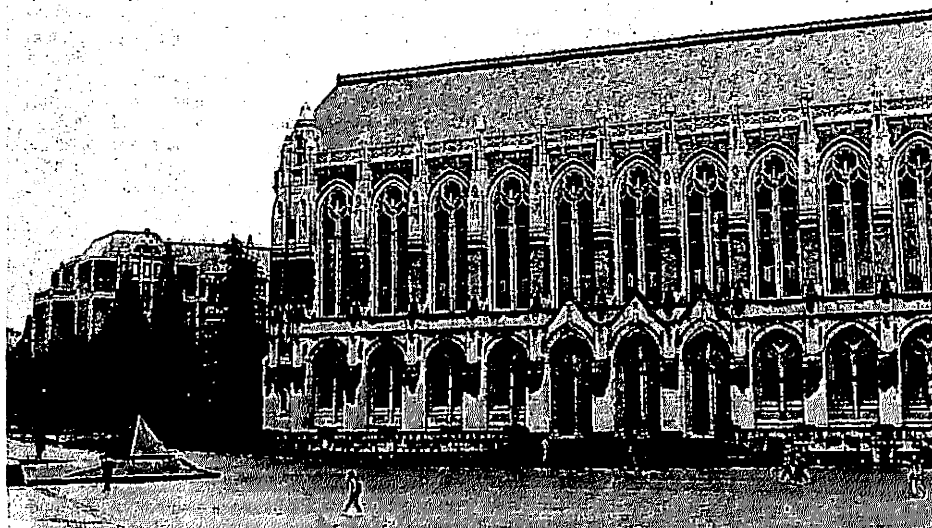
Advisory positions in University residence halls paying room and board are available for single graduate students, both men and women. Additional information may be obtained from the Director of Residence Halls Programs, 301 Schmitz.

The University offers a number of full- and part-time employment opportunities for spouses of married students. These positions offer pay comparable to the prevailing salaries in the community, and some carry such fringe benefits as vacations, sick leave, and opportunities to enroll in University courses. Inquiries may be directed to the Staff Employment Office, 1320 Northeast Campus Parkway, Seattle.

Loans

Long-term educational loans are available to graduate students through the National Direct Student Loan and the Guaranteed Student Loan programs.

The Perkins Direct Student Loan Program usually provides a maximum annual loan to graduate students of \$3,000 and bears an interest rate of five percent. There



are certain cancellation provisions in the Perkins Direct Student Loan Program for combat-zone veterans and teachers of the disadvantaged. Loan application forms for this program are available in the Office of Student Financial Aid, PE-20, 105 Schmitz, telephone (206) 543-6101. The application deadline is March 1 for the following Autumn Quarter.

Students should meet the application deadline even if they have not yet been admitted to the Graduate School.

The Guaranteed Student Loan Program is based on the student's financial need and provides for a long-term bank loan in which the graduate student can borrow up to a maximum of \$7,500 per year, depending on individual lending institutions' policies. This loan currently bears an eight percent interest rate. Nonresident students may obtain application forms at the student's bank. Washington residents must obtain application forms from the Office of Student Financial Aid. Lending institutions establish their own application deadlines and policies for making guaranteed student loans. An early inquiry to the student's bank is advisable. Non-residents should check with the lending institutions in their home states. Three months are usually required to process this loan.

Short-term emergency loan funds also are available through the Office of Student Financial Aid. Several different types of short-term loans are possible, from \$100 interest-free loans to approximately \$600 loans at six percent interest. In an emergency, students may also borrow the amount equal to resident graduate tuition or a twenty-five percent advance on a guaranteed student loan. More information is available from the Office of Student Financial Aid.

Financial Aid for Minority Graduate Students

Fellowships and assistantships based on need and on merit are open to men and women whose ethnic origin is either American Indian, Asian American, Black, or Hispanic American. These awards are generally made through the nomination and support of the department in which the student is enrolled. Supplemental fellowships ranging from \$250 to \$1,000 are also awarded by the Minority Education Division of the Graduate School, based upon an evaluation of the student's need as established by the Office of Student Financial Aid.

Financial assistance from individual departments also may be available, and prospective students should apply directly to the Chairpersons of the departments in which they intend to do their graduate work.

Also available are a limited number of tuition scholarships for minority Washington State residents. Students may also apply for loans through the National Student Loan programs. Additional information can be obtained by writing the University of Washington, Graduate School, Minority Education Division, AG-10, Seattle, Washington 98195.

All awards are contingent upon the student's admission to the University of Washington Graduate School.

Graduate Degree Policies

The following sections contain detailed information concerning policies and procedures relating to admission into, and completion of, graduate degree programs. Students are advised to verify this information with the graduate program coordinator and the supervisory committee.

Graduate Program Coordinator

The graduate student's initial work at the University is



guided by the graduate program coordinator in his or her field. The coordinator must be a senior tenured member of the Graduate Faculty and is the official representative of the academic unit that offers the graduate degree program. The graduate program coordinator maintains familiarity with policies and procedures of the Graduate School and provides overall coordination of graduate activities within the unit.

Graduate Courses

Graduate courses are intended for, and ordinarily restricted to, either students enrolled in the Graduate School or graduate nonmatriculated students, and are given numbers from 500 through 800. Some courses at the 300 and 400 levels are open both to graduates and to upper-division undergraduates. Such courses, when acceptable to the supervisory committee and the Graduate School, may be part of the graduate program. The Graduate School accepts credit in approved 300-level courses for the minor or supporting fields only. Courses at the 300 level are not included in the calculation of grade-point average and will not apply toward the minimum Graduate School requirement of 18 graded credits for the master's or doctoral degree. Approved 400-level courses are accepted as part of the major as well as minor or supporting fields. Courses numbered 498 and entitled Special Topics or Special Projects normally are not applicable to a graduate degree program if addressed primarily to introductory content and undergraduate students. Undergraduate research (499) is not accepted as part of the graduate program. Graduate School Memorandum No. 36 offers additional information on graduate courses.

Grading System for Graduate Students

In reporting grades for graduate students, units that offer graduate degrees use the system described herein. Grades are entered as numbers, the possible values being 4.0, 3.9, . . . and decreasing by one-tenth until 1.7 is reached. Grades below 1.7 are recorded as 0.0 by the Registrar and do not count toward residency, total credit count, or grade and credit requirements. A minimum of 2.7 is required in each course that counts toward satisfying the Graduate School requirement for 18 hours of course work numbered 500-700 at the master's level and for half of the course work at the 500-800 level for the doctoral degrees. A minimum grade-point average of 3.00 is required for graduation.

Correspondence between number grades and letter grades is as follows:

Numeric grade-point equivalent	Letter grade	Numeric grade-point equivalent	Letter grade
4.0	A	2.8	B-
3.9		2.7	
3.8	A-	2.6	
3.7		2.5	
3.6		2.4	C+
3.5		2.3	
3.4	B+	2.2	
3.3		2.1	
3.2		2.0	C
3.1		1.9	
3.0	B	1.8	
2.9		1.7	
		1.6-0.0	E

Repeating Courses

Graduate students may repeat any course. Both the first and second grades will be included in the cumulative grade-point average. Subsequent grades will not be included, but will appear on the permanent record. The number of credits earned in the course will apply toward degree requirements only once.

The following letter grades also may be used:

I Incomplete. An incomplete may be given only when the student has been in attendance and has done satisfactory work to within two weeks of the end of the quarter and has furnished proof satisfactory to the instructor that the work cannot be completed because of illness or other circumstances beyond the student's control. A written statement giving the reason for the incomplete and indicating the work required to remove it must be filed by the instructor with the head of the unit in which the course is offered.

To obtain credit for the course, a student must convert an incomplete into a passing grade by the last day of the next quarter in residence. This rule may be waived by the Dean of the college in which the course is offered. In no case may an incomplete be converted into a passing grade after a lapse of two years or more. An incomplete received by a graduate student does not automatically convert to a 0.0.

N No grade. Used only for hyphenated courses and courses numbered 600 (Independent Study or Research), 601 (Internship), 700 (Master's Thesis), 750 (Internship), or 800 (Doctoral Dissertation). An N grade indicates that satisfactory progress is being made, but evaluation depends on completion of the research, thesis, internship, or dissertation, at which time the instructor or supervisory committee chairperson should change the N grade(s) to one reflecting the final evaluation (normally credit or no credit).

S/NS Satisfactory/not satisfactory. A graduate student, with the approval of the graduate program coordinator or supervisory committee chairperson, may elect to be graded S/NS in any numerically graded course for which he or she is eligible. The choice must be indicated at the time of registration or during the official change period; only in very unusual cases may S/NS grades be converted to numeric grades or vice versa. The instructor submits a numeric grade to the Registrar's Office for conversion to S (numeric grades of 2.7 and above) or NS (grades lower than 2.7).

CR/NC Credit/no credit. With the approval of the faculty in the academic unit, any course may be designated for grading on the credit/no credit basis by

notice in the appropriate *Time Schedule*. For such courses, the instructor submits a grade of *CR* or *NC* to be recorded by the Registrar's Office for each student in the class at the end of the quarter. All courses numbered 600, 601, 700, 750, and 800 may be graded with a decimal grade, a *CR/NC*, or *N* at the instructor's option.

W Withdrawal. Official withdrawal from a course during the first ten class days of a quarter is not entered on the permanent academic record. After the first two weeks and through the seventh week of the quarter, a graduate student may withdraw from a course by filing a form with the Registrar's Office. A grade of *W* is recorded. No official withdrawal is permitted after the seventh week of the quarter except under the conditions described under *Withdrawal Policy*.

Unofficial withdrawal from a course shall result in a grade of 0.0.

The grade *W* counts neither as completed credits nor in computation of the grade-point average.

Of the minimum number of credits required for a graduate degree, a graduate student must show numerical grades in at least eighteen quarter hours of course work taken at the University of Washington. These numerical grades may be earned in approved 400-level courses and 500-level courses.

The student may petition the Dean of the Graduate School to modify the procedures described above. The petition should be accompanied by comments and recommendations from the graduate program coordinator or supervisory committee chairperson.

Withdrawal Policy

1. During the first two weeks of the quarter, graduate students may withdraw from a class for any reason by filing an appropriate form with the Registrar. No entry is made on the student's record.
2. After the first two weeks and throughout the seventh week of the quarter, a graduate student may withdraw from a course by filing an appropriate form with the Registrar. A grade of *W* is recorded.
3. No official withdrawal is permitted after the seventh week of the quarter, except as follows: A student may petition the Registrar in writing to drop a course. The Registrar grants such a petition with the concurrence of the Graduate School if in his or her judgment (a) the student is unable to complete the course in question due to a severe mental or physical disability, or (b) unusual and extenuating circumstances beyond the student's control have arisen that prevented him or her from dropping by the end of the seventh week. Petitions must be filed promptly after the occurrence of the event that gave rise to the need for dropping. The Registrar shall enter the grade of *HW* (Hardship Withdrawal) for all courses approved for drop by petition.
4. The withdrawal schedule shown above applies to quarters of the regular academic year. The deadlines for Summer Quarter are established by the Dean of Summer Quarter.
5. Unofficial withdrawal from a course results in a grade of 0.0.

Scholarship

A cumulative grade-point average of 3.00 or above is required to receive a degree from the Graduate School. A graduate student's grade-point average is calculated entirely on the basis of number grades in 400- and 500-level courses. The grades of *S*, *NS*, *CR*, *NC*, and *N* are excluded, as are all grades in courses numbered 600, 601, 700, 750, and 800, and in courses at the 100, 200, and 300 levels.

Failure to maintain a 3.00 grade-point average, either cumulative or for a given quarter, constitutes low scholarship and may lead to a change-in-status action by the Graduate School. Failure to maintain satisfactory performance and progress toward a degree may also result in a change-in-status action by the Graduate School.

See Graduate School Memorandum No. 16 for additional information.

Language Competence Requirements and Examinations

Competence in one or more languages in addition to English is desirable for all fields of advanced study and is often required, especially in the scholarly and research-oriented programs leading to the degrees of Master of Arts, Master of Science, and Doctor of Philosophy. It is assumed that students from English-speaking countries who are admitted to the Graduate School are competent in the English language; students from non-English-speaking countries must demonstrate a satisfactory command of English, both for admission and for appointment as teaching assistants.

Requirements for foreign-language competence are established by the Graduate Faculty in the unit offering the graduate program. Language competence in certain languages other than English (i.e., languages that may have special significance to the field) may be specified as helpful or desirable or may be required. Students should consult the graduate program coordinator for information and advice about desirable or required competence in foreign languages. Details of completion of this departmental requirement must be transmitted to the Graduate School by the graduate program coordinator.

When appropriate, students are urged to establish foreign-language competence as undergraduates before entering the Graduate School or as early as possible in their graduate careers. The University's language competence requirements in French, German, and Spanish may be satisfied by successful completion of the standardized examinations given by the Educational Testing Service (ETS). These examinations are given at the University and elsewhere throughout the United States on published dates. For other foreign languages, examinations are given at the University of Washington on the day before scheduled ETS examinations.

Residence

The residence requirement for the master's degree is one year (three full-time quarters). For the doctoral degree it is three years (nine full-time quarters), two of them at the University of Washington. One of the two years must be spent in continuous full-time residence (three out of four consecutive quarters). The residence requirement for the doctoral degree cannot be met solely with summer or part-time study. With the approval of the degree-granting unit, an appropriate master's degree from an accredited institution may be applied toward one year of resident study other than the continuous full-time year of study.

Once a student is admitted to a graduate degree program, a full quarter of residence is granted for any quarter in which at least 9 credits in graduate course, research, thesis, internship, or dissertation work are satisfactorily completed.

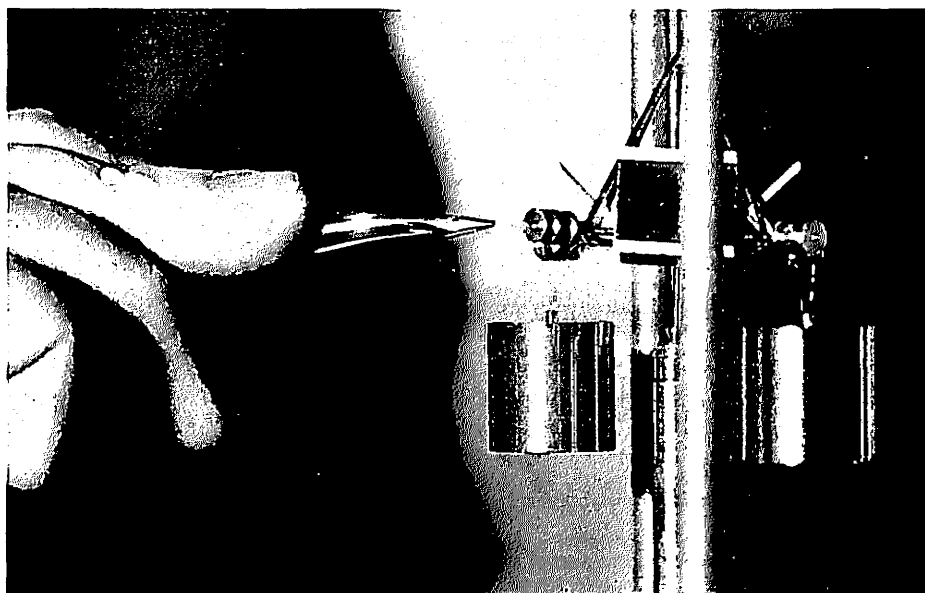
With the exception of the three out of four consecutive full-time quarter requirement for the doctoral degree, students registered for fewer than 9 credits per quarter may add part-time quarters together to achieve the equivalent of one full-time quarter (9 or more credits) to be applied toward fulfilling residence requirements. However, full-time students completing more than 9 credits in any one quarter may not use the credits beyond the minimum registration in the manner described above.

Only courses numbered 400, 500, 600, 700, and 800 can be applied to residence or course credit in the major field for advanced degrees (please see *Graduate Courses* earlier in this section regarding courses numbered 498 and 499). Courses numbered 300 are not applicable to residence or course credit toward advanced degrees except when applied by permission of the graduate program coordinator or supervisory committee toward the graduate minor or supporting courses. Courses numbered below 300 are not applicable to residence or course credit for advanced degrees.

Final Quarter Registration

A student must maintain registration as a full- or part-time student at the University for the quarter the master's degree, the Candidate certificate, or doctoral degree is conferred.





A student who has been approved for the tentative degree list for a particular quarter and does not complete the requirements by the published deadlines (two weeks prior to the end of the quarter), but who does complete all the requirements by the last day of that quarter, receives the degree the following quarter without further registration.

Continuous Enrollment and Official On-Leave Requirement

POLICY

To maintain graduate status, a student must be enrolled on a full-time, part-time, or On-Leave basis from the time of first enrollment in the Graduate School until completion of all requirements for the graduate degree. This includes making application for the master's degree, the passing of the master's or doctoral final examinations, the filing of the thesis or dissertation, and the awarding of the degree. Summer Quarter On-Leave enrollment is automatic for all graduate students who were either registered or On-Leave the prior Spring Quarter. Failure to maintain continuous enrollment constitutes evidence that the student has resigned from the Graduate School.

A student's petition for On-Leave status must be approved by the departmental graduate program coordinator or alternate. The student must have registered for, and completed, at least one quarter in the University of Washington Graduate School to be eligible for On-Leave status. An On-Leave student is entitled to use the University library and to sit for foreign-language competence examinations, but is not entitled to any of the other University privileges of a regularly enrolled and registered full- or part-time student. The student pays a nonrefundable fee to obtain On-Leave student status covering four successive academic quarters or any part thereof. An On-Leave student returning to the University on or before the termination of the period of the leave must file a Former Student Enrollment Application (available at 225 Schmitz) before the deadline stated on the form and register in person in the usual way as a full- or part-time student (see Graduate School Memorandum No. 9 for procedures). Please note: Periods spent On-Leave are included as part of the maximum time periods allowed for completion of a graduate degree.

REGISTRATION IN ABSENTIA

In unusual cases, a graduate student may need to work *in absentia* at a place distant from the campus

and yet actively continue in correspondence or conferences with professors at the University and proceed with the thesis or dissertation research. In this situation the student enrolls and registers as a full-time student *in absentia* or a part-time student *in absentia* and pays the usual fees for a full- or part-time student, after previously having the proposed *in absentia* work approved by the student's graduate program coordinator or supervisory committee chairperson. Periods of *in absentia* registration are counted toward completion of the requirements for residence by graduate students on the campus of the University of Washington.

READMISSION

A student previously registered in the Graduate School who has failed to maintain continuous enrollment but who wishes later to resume studies must file an application in person or by mail for readmission to the Graduate School by the regularly published closing dates. If the student is readmitted, registration will occur during the usual registration period. If the student has attended any other institution during the period when not registered at the University of Washington, official transcripts in duplicate of the student's work must be submitted. An application for readmission carries no preference and is treated in the same manner as an application for initial admission, including the requirement of payment of the application fee of \$35.

The Graduate School normally allows six years to complete requirements for a master's degree and ten years for a doctoral degree.

Master's Degree

SUMMARY OF GRADUATE SCHOOL REQUIREMENTS

It is the responsibility of each master's candidate to meet the following Graduate School *minimum* requirements:

1. Under a thesis program, a minimum of 36 or more quarter credits (27 course credits and a minimum of 9 credits of thesis) must be presented. Under a non-thesis program, a minimum of 36 or more quarter credits of course work is required.
2. At least 18 of the minimum 36 quarter credits for the master's degree must be for work numbered 500 and above. (In a thesis program, 9 of the 18 must be course credits and 9 may be for 700, Master's Thesis.)

3. Numerical grades must be received in at least 18 quarter credits of course work taken at the University of Washington. The Graduate School accepts numerical grades (a) in approved 400-level courses accepted as part of the major, and (b) in all 500-level courses. A minimum cumulative grade-point average of 3.00 is required for a graduate degree at the University.

4. A minimum of three full-time quarters of residence credit must be earned. Part-time quarters may be accumulated to meet this requirement (see detailed information under Residence).

5. A certificate or, where applicable, departmental verification of proficiency in a foreign language if one is required for a particular degree.

6. In a thesis degree program, a thesis, approved by the supervisory committee, must be prepared. A student must register for a minimum of 9 credits of thesis (700).

7. A final master's examination, either oral or written, as determined by the student's supervisory committee, must be passed.

8. Any additional requirements imposed by the graduate program coordinator in the student's major department or by the student's supervisory committee must be satisfied. A master's degree student usually takes some work outside the major department. The graduate program coordinator in the major department or the student's supervisory committee determines the requirements for the minor or supporting courses.

9. The graduate student must make application for the master's degree at the Graduate School within the first two weeks of the quarter in which he or she expects the degree to be conferred, in accordance with Application for the Master's Degree, as described below.

10. The graduate student must maintain registration as a full- or part-time student at the University for the quarter in which the degree is conferred (see detailed information under Final Quarter Registration).

11. All work for the master's degree must be completed within six years. This includes quarters spent On-Leave and applicable work transferred from other institutions (see detailed information under Transfer Credit).

12. A student must satisfy the requirements for the degree that are in force at the time the degree is to be awarded.

A second master's degree may be earned at the University of Washington by completing an additional set of requirements. Please refer to Concurrent Degree Programs later in this section and to Graduate School Memorandum No. 35 (revised November 19, 1985) for more specific information.

TRANSFER CREDIT

A student working toward the master's degree may petition the Dean of the Graduate School for permission to transfer to the University of Washington the equivalent of a maximum of 12 quarter credits of *graduate level* course work taken while a registered graduate student in another recognized graduate school. These credits may not have been used to satisfy requirements for another degree. The petition must be accompanied by a written recommendation from the graduate program coordinator and an official transcript indicating completion of the course work.

Approved transfer credits are not to exceed the equivalent of 12 quarter credits and are applied toward total credit count for the master's degree only. (Transfer credits are not applicable toward a doctoral degree.) The minimum residence requirement of three quarters at the University of Washington, the 18 quarter credits

of numerically graded course work, and 18 quarter credits of 500-level-and-above course work may not be reduced by transfer credit.

Credit by either independent study through correspondence or advanced credit examinations is not acceptable.

THESIS PROGRAM

The master's thesis should be evidence of the graduate student's ability to carry out independent investigation and to present the results in clear and systematic form. Two copies of the thesis, normally written in the English language, along with the appropriate forms signed by the members of the supervisory committee from the student's graduate program, must be deposited in the Graduate School at least two weeks before the end of the quarter in which degree requirements are completed. The faculty in the graduate program may require that the student present an additional copy for its own use. The Graduate School publishes a booklet, *Style and Policy Manual for Theses and Dissertations*, which outlines format requirements. This manual should be obtained from the Graduate School and studied before the student begins writing the thesis. Thesis advisers are available in the Graduate School for consultation during the thesis preparation process.

A \$15 binding fee is payable at 129 Schmitz before the thesis is submitted to the Graduate School.

NONTHESIS PROGRAMS

The faculty in some graduate programs has arranged programs of study for the master's degree that do not require the preparation of a thesis. These nonthesis programs normally include a more comprehensive plan of course work for more extensive examinations than are required in thesis programs, or they may include some approved research activity in lieu of a thesis.

FINAL EXAMINATION FOR MASTER'S DEGREE

As soon as is appropriate, the faculty in the student's graduate program appoints a supervisory committee, ordinarily consisting of two or three members but not more than four. The committee chairperson arranges the time and place of the final examination, the results of which must be reported by the graduate program coordinator to the Graduate School at least two weeks before the date on which the degree is to be conferred. The examination may be oral or written, and all members of the supervisory committee must certify its results. If the examination is not satisfactory, the committee may recommend to the Dean of the Graduate School that the student be allowed to take another examination after a period of further study.

APPLICATION FOR MASTER'S DEGREE

The student must make application for the master's degree at the Graduate School *within the first two weeks of the quarter in which he or she expects to complete degree requirements*. The filing of the application is the responsibility *solely of the student*. When the application is received, the student's record is reviewed in the Graduate School. All requirements for the degree must be met by the end of the current quarter if the application is to be approved. If this is not possible, the applicant is notified of deficiencies by the Graduate School. Once approved, the application is forwarded to the appropriate graduate program. Registration must be maintained for the entire quarter in which application for the degree is made. If a student should withdraw during the quarter, the application is voided and a new one must be submitted at the appropriate time.

Master's degree applications are valid for *two consecutive quarters*, and if requirements for the degree are not completed during the quarter of the initial application, the student's application may be retained by the graduate program coordinator for the quarter *immediately*

following (e.g., Autumn to Winter, Winter to Spring, Spring to Summer, Summer to Autumn) and returned to the Graduate School by the end of the second quarter. Thereafter, the application is void and the student must file a *new* application for the degree in the Graduate School during the first two weeks of the quarter in which work for the degree is to be completed.

Upon completion of departmental requirements, the master's degree application is signed by the Supervisory Committee and returned to the Graduate School. It must be received at least two weeks prior to the end of the quarter if the degree is to be conferred that quarter. If all requirements are completed after this deadline but on or before the last day of final examinations, the degree is conferred the following quarter without further registration.

The student and the graduate program coordinator should be thoroughly acquainted with the requirements for the particular degree.

MASTER OF ARTS FOR TEACHERS

Master's degree programs for experienced teachers, which focus upon the fields of knowledge normally taught in the common school and the community college, have been established at the University. These programs provide alternatives to the research-oriented Master of Arts and Master of Science degree programs, which emphasize particular fields of knowledge. Programs leading to the M.A.T. degree are offered in biology and English.

CANDIDATE'S CERTIFICATE

The Candidate's certificate gives formal recognition of the successful completion of a very significant step toward the doctoral degrees awarded through the Graduate School: Doctor of Philosophy, Doctor of Education, and Doctor of Musical Arts. Students who have passed the Graduate School General Examination and who have completed all requirements for the degree except the dissertation and the Final Examination are awarded the Candidate certificate.

Doctoral Degree

The doctoral degree is by nature and tradition the highest certificate of membership in the academic community. As such, it is meant to indicate the presence of superior qualities of mind and intellectual interests and of high attainments in a chosen field. It is not conferred merely as a certificate to a prescribed course of study and research, no matter how long or how faithfully pur-

sued. All requirements and regulations leading to the doctoral degree are devices whereby the student may demonstrate present capacities and future promise for scholarly work.

SUMMARY OF REQUIREMENTS

In order to qualify for the doctoral degree, it is the responsibility of the student to meet the following Graduate School *minimum* requirements:

1. Completion of a program of study and research as planned by the graduate program coordinator in the student's major department or college and the Supervisory Committee. Half of the total program, including dissertation credits, must be in courses numbered 500 and above. At least 18 credits of course work at the 500 level and above must be completed prior to scheduling the General Examination.
2. Presentation of a minimum of three academic years of resident study (see detailed information under Residence), two of them being at the University of Washington with at least one year in continuous full-time residence. The continuous year must be satisfied with three out of four consecutive full-time quarters being completed at the University of Washington and be completed prior to the General Examination. Residence requirement for the doctoral degree cannot be met solely by part-time study. A minimum of two academic years of resident study must be completed prior to scheduling the General Examination.
3. Numerical grades must be received in at least 18 quarter credits of course work taken at the University of Washington prior to scheduling the General Examination. The Graduate School accepts numerical grades in approved 400-level courses accepted as part of the major, and in all 500-level courses. A minimum cumulative grade-point average of 3.00 is required for a graduate degree at the University.
4. Demonstration of a reading knowledge of one or more foreign languages related to the major field of study, if required for the student's particular degree program. Details of completion of this departmental requirement must be transmitted to the Graduate School by the graduate program coordinator.
5. Creditable passage of the General Examination.
6. Preparation and acceptance by the Dean of the Graduate School of a dissertation that is a significant contribution to knowledge and clearly indicates training in research. Credit for the dissertation ordinarily should be at least one-third of the total credit. *The Candidate is expected to register for a minimum of 27 credits of dissertation over a period of at least three quarters.* Normally, two of these three quarters must come after the student passes the General Examination and before a warrant is authorized for the Final Examination.
7. Creditable passage of a Final Examination, which is usually devoted to the defense of the dissertation and the field with which it is concerned.
8. Completion of all work for the doctoral degree within ten years. This includes quarters spent On-Leave as well as applicable work from the master's degree or a master's degree from another institution, if applied toward one year of resident study other than the continuous full-time year of study.
9. Registration maintained as a full- or part-time student at the University for the quarter in which the degree is conferred (see detailed information under Final Quarter Registration).
10. *A student must satisfy the requirements that are in force at the time the degree is to be awarded.*





aminations, if required, should be completed prior to the request for appointment of the Supervisory Committee. If "preliminary" examinations are not an academic unit's requirement, it is appropriate to request appointment of the Supervisory Committee during the student's first year of study (see Graduate School Memorandum No. 13, Supervisory Committees for Graduate Students).

ADMISSION TO CANDIDACY FOR DOCTORAL DEGREE

At the end of two years of graduate study, the chairperson of the Supervisory Committee may present to the Dean of the Graduate School, for approval, a warrant permitting the student to take the General Examination for admission to candidacy for the doctoral degree. This means that, in the opinion of the committee, the student's background of study and preparation is sufficient to justify the undertaking of the examination. The warrant is approved by the Dean of the Graduate School only after the prescribed requirements of residence and study have been met and any specified language requirement has been fulfilled. The warrant must be received at least three weeks prior to the proposed examination date. Written and other examinations prior to the oral are the responsibility of the graduate program and do not need Graduate School approval. During the oral examination, the chairperson, the Graduate Faculty representative, and at least two additional examining committee members must be present.

If the student's performance is judged by the Supervisory Committee to be satisfactory, the signed warrant certifying successful completion of the General Examination is filed in the Graduate School. Any members of the committee who do not agree with the majority opinion are encouraged to submit a minority report to the Dean of the Graduate School.

Thereafter, the student is identified and designated as a *Candidate* for the appropriate doctoral degree and is awarded the Candidate's certificate described earlier in this section. After achieving Candidate status, the student ordinarily devotes his or her time primarily to the completion of research, writing of the dissertation, and preparation for the Final Examination.

It is expected a student usually will be registered at least two quarters at the University of Washington after passing the General Examination and before a warrant is authorized for the Final Examination.

DISSERTATION AND FINAL EXAMINATION

The Candidate must present a dissertation demonstrating original and independent investigation and achievement. The dissertation should reflect not only mastery of research techniques but also ability to select an important problem for investigation and to deal with it competently. Normally the dissertation is written in the English language. However, if there are circumstances that warrant the dissertation be written in a foreign language, approval must be received from the Dean of the Graduate School. The Graduate School publishes a booklet, *Style and Policy Manual for Theses and Dissertations*, which outlines format requirements. This manual should be obtained from the Graduate School and studied *before* the student begins writing the dissertation. Thesis advisers are available in the Graduate School, and students are encouraged to consult with them throughout the dissertation preparation process.

When the Supervisory Committee agrees that the doctoral Candidate is prepared to take the Final Examination, the Dean of the Graduate School should be informed of the decision and asked to designate a Reading Committee from among the members of the Supervisory Committee.

SPECIAL INDIVIDUAL PH.D. PROGRAMS

The Graduate School maintains the Special Individual Ph.D. (SiPh.D.) Program for exceptionally able students whose objectives for study are so truly interdisciplinary that they cannot be met within one of the University units authorized to grant the Ph.D. degree. The program is intended for dissertation topics that require supervision from two or more of the disciplines in which the University offers the Ph.D. degree. It is not intended as a mechanism for offering the Ph.D. degree within units that do not have their own authorized Ph.D. programs.

A graduate student may apply to the SiPh.D. Program when he or she has completed the master's degree, or has been admitted to the Graduate School and has completed at least three quarters of full-time work at the University of Washington, and has carefully planned an appropriate program of studies.

Proposals, including GRE scores, are due by December 15 of each year, and decisions on admission are made by May 15 of the following year. Graduate School Memorandum No. 25, Special Individual Ph.D. Programs (revised May 15, 1985), contains additional information, proposal forms, and instructions and may be obtained from the Graduate School.

CONCURRENT DEGREE PROGRAMS

Concurrent programs are defined as a pair of programs that may be taken at the University of Washington by a postbaccalaureate student resulting in the satisfaction of the requirements for either two graduate degrees or a graduate and a professional degree. Rather than sequentially completing first one and then the other degree, the student's time and the University's resource allocations may sometimes be conserved by providing arrangements that permit the student to proceed in a coordinated way toward completion of the degree objectives.

To earn two master's degrees, a student must complete two separate sets of minimum Graduate School degree requirements of 36 credits each for a total of 72 credits. If a program requires more than 36 credits for the master's degree, a graduate student, with prior approval of both graduate programs, may petition the Dean of the Graduate School for a maximum of 12 credits beyond 36 earned in one program to be considered applicable for the master's degree in the second program. Thus, the minimum number of additional

credits for the second degree, with these 12 approved credits, is 24. Up to 12 credits earned toward a Ph.D. degree may be counted toward a master's degree in another program with the approval of both degree-granting units.

Graduate School Memorandum No. 35, Concurrent Degree Programs (revised November 19, 1985), contains additional information and is available from the Academic Programs office in the Graduate School.

APPOINTMENT OF DOCTORAL SUPERVISORY COMMITTEE

A *Supervisory Committee* is appointed by the Dean of the Graduate School to guide and assist a graduate student working toward an advanced degree and is expected to evaluate the student's performance throughout the program. The Supervisory Committee must be appointed no later than four months prior to the General Examination. Appointment of the Supervisory Committee indicates that the Graduate Faculty in the student's field finds the student's background and achievement a sufficient basis for admission into a program of doctoral study and research. "Preliminary" ex-





Once the Reading Committee is established officially with the Graduate School, a Request for Final Examination (signed by the Supervisory Committee chairperson and the members of the Reading Committee) is presented to the Graduate School three weeks prior to the Final Examination date, and if the Candidate has met all other requirements, a warrant authorizing the Final Examination is issued by the Graduate School.

The Reading Committee prepares a report briefly summarizing the distinctive achievements of the research, the methods used, and the results. One copy of the report with the original signatures of the Reading Committee must be submitted to the Graduate School after the Final Examination.

If the Final Examination is satisfactory, the Supervisory Committee signs the warrant and returns it to the Graduate School at least two weeks before the end of the quarter in which the degree requirements are completed. Any members of the committee who do not agree with the majority opinion are encouraged to submit a minority report to the Dean of the Graduate School. If the examination is unsatisfactory, the Supervisory Committee may recommend that the Dean of the Graduate School permit a second examination after a period of additional study.

PUBLICATION OF DOCTORAL DISSERTATIONS

Part of the obligation of research is publication of the results, and in the case of doctoral research, this means microfilm publication of the dissertation and/or abstract. This is a Graduate School requirement in addition to any previous or planned publication of any or all of the dissertation and provides worldwide distribution of the work. The Candidate signs the publication agreement when the dissertation is presented to the Graduate School. Publication in microfilm does not preclude other forms of publication.

The following fees for microfilming the doctoral dissertation are paid at the Student Accounts Office, 129 Schmitz (all fees are subject to change):

Microfilming the entire dissertation, \$45; *optional* copyright fee (applicable only when the entire dissertation is microfilmed), \$20;

or

Microfilming of only the abstract, \$30. *These fees are in addition to the \$15 binding fee.*

Research and Scholarly Activities

Research is an essential part of graduate education in the University, and its furtherance is one of the primary concerns of the Graduate School. Grant and contract support of University activities is coordinated by the Graduate School. Additionally, the Graduate School administers certain public and private funds made available to encourage the research activities of faculty and students by support of their research and by securing the services of outstanding visitors to the campus.

External Support for Research and Training

The University of Washington is one of the nation's leading research institutions, receiving more than \$252 million annually in support of a wide array of research and training programs. Since 1969, the University has ranked among the top five institutions in the United States with respect to receipt of federal awards. About eighty-one percent of the University's grant and contract funds comes from federal agencies, most of the remainder coming from foundations, industry, and other private sources. These funds are awarded in response to faculty-initiated, University-approved proposals for funds to support specific projects in accord with the University's educational goals and are apart from legislative appropriations for the basic operation of the University. Grant- and contract-supported programs employ about 3,800 employees and provide significant opportunities for graduate students who work

with faculty members in the conduct of research as a vital component of graduate education.

In addition, private donations to the University, which amount to more than \$44 million a year, add significantly to the opportunities of students and faculty to pursue scholarly interests.

Institutional Support for Research and Training

The objective of the *Graduate School Research Fund* (GSRF) is to support research as an integral part of the mission and graduate academic programs of the University. Support may be provided for (1) initiation or completion of faculty research projects, (2) purchase of equipment, (3) seminars or travel, (4) graduate student recruitment, (5) book publication, or (6) special initiatives.

GSRF revenues come from (1) state funds provided in the University's biennial budget; (2) federal grants to the University that permit discretionary support of research programs; (3) private donations; (4) institutional allowances provided with fellowships and traineeships; (5) patent, invention, and copyright royalties accruing to the University.

GSRF policies and procedures are available from the Graduate School, 201 Administration, AG-10, telephone 545-2628.

Special Lectureships and Professorships

The *Walker-Ames Fund* was established in the 1930s through a bequest from the estates of Maud Walker Ames and her husband, Edwin Gardner Ames. Its stated purpose is to enable the University of Washington "to guarantee to the state of Washington the scholarly and educational services of the most distinguished minds available in this and other countries."

Chaired by the Dean of the Graduate School, a committee of University faculty members considers nominations from their colleagues and makes recommendations to the President for the appointment to Walker-Ames Professorships of distinguished scholars of national and international reputation.

Since 1936, when the first Walker-Ames Visiting Professor was appointed, nearly three hundred scholars and members of the professions have come to the University as temporary members of the faculty, enriching the intellectual life of the University community and the state.

The *Jessie and John Danz Fund* was established in 1961 by a gift and bequest from John Danz; an additional gift was made to the Danz fund in 1969 by his wife, Jessie Mohr Danz. The Danz fund is intended primarily to enable the University to bring to the campus each year one or more "distinguished scholars of national and international reputation who have concerned themselves with the impact of science and philosophy on man's perception of a rational universe."

The Danz fund supports special lectureships and professorships. Appointments are arranged in a manner similar to the Walker-Ames professorships, as well as other types of appointments or arrangements compatible with the terms of the Danz bequest (e.g., the publication and distribution of certain lectures given by Danz lecturers).

Questions pertaining to the Walker-Ames Fund and the Jessie and John Danz Fund may be directed to the Dean of the Graduate School.

Special Programs and Facilities

In addition to regular academic offerings, the University maintains a wide range of programs and facilities that provide special opportunities for graduate study and

research. The following units are administered by the Graduate School:

CENTER FOR LAW AND JUSTICE

Joseph G. Weis, Director
1107 Northeast Forty-fifth Street, No. 505, JD-45

The Center for Law and Justice is a multidisciplinary research center established in 1975. Its goals are to engage in research, to contribute to the education and training of students, to offer consultation, and to provide liaison to the community in the areas of law and justice. To achieve these goals the center: (1) apprises faculty members of research opportunities and assists in the development of proposals; (2) involves students from different disciplines in research training and education and sponsors biweekly colloquia; (3) provides consultation to the criminal justice system and responds to the broader informational needs of the community; and (4) sponsors conferences and functions as the University's planning unit for the allocation of funds from the Law Enforcement Assistance Administration's state planning agency.

FRIDAY HARBOR LABORATORIES

A. O. Dennis Willows, Director
Friday Harbor, Washington 98250

University Office: 208 Kincaid, NJ-22

The Friday Harbor Laboratories facility is the principal marine science field station of the University of Washington. Its faculty comprises members from various academic units of the University, including botany, fisheries, oceanography, and zoology, as well as visiting faculty members from other institutions.

The laboratories, located approximately eighty miles north of Seattle near the town of Friday Harbor on San Juan Island, offers a biological preserve of 484 acres of wooded land with about two miles of shoreline. The island is one of the largest of the 172 that make up the San Juan Archipelago, located in the northwest section of the state of Washington between Vancouver Island and the United States mainland. In addition to the Friday Harbor site, the laboratories' administration has the responsibility for overseeing biological preserves leased or owned by the University on San Juan Island (False Bay and Argyle Lagoon), Shaw Island (uplands adjacent to Point George and Parks Bay; Cedar Rock Biological Preserve), and Lopez Island (Point Colville and Iceberg Point). Goose and Deadman Islands, biological preserves owned by the Nature Conservancy, are under the stewardship of the laboratories.

The laboratories are close to seawaters that range from oceanic to those highly diluted by streams, some with depths to a thousand feet, others with bottoms varying from mud to rock, and water movements ranging from those of quiet bays and lagoons to those of swift tideways. The waters about the San Juan Archipelago abound in varied marine flora and fauna.

During spring, summer, and autumn, the laboratories offer opportunities for independent and supervised research, as well as a varied program of instruction for graduate and undergraduate students. Throughout the year, use of the laboratories' facilities for research in various areas of marine science is encouraged.

INSTITUTE FOR ETHNIC STUDIES IN THE UNITED STATES

John P. Keating, Chairman, Steering Committee
217 Guthrie, NI-25

The institute was established in 1981 to encourage multiethnic and cross-ethnic interdisciplinary research in generic problems of ethnicity, with particular reference to minority groups living in the Pacific Northwest. Its thrust is toward generating significant scholarly publications and other scholarly activity.

JOINT INSTITUTE FOR STUDY OF THE ATMOSPHERE AND OCEAN

John M. Wallace, Director
608 Atmospheric Sciences-Geophysics, AK-40

Established by an agreement between the University of Washington and the National Oceanic and Atmospheric Administration, the institute is intended to facilitate and strengthen cooperation between the two organizations in research and other collaborative efforts in the oceanographic and atmospheric sciences. To the campus it will bring scientists from NOAA laboratories and from other nations to join with University faculty and students in research projects initially directed toward mechanisms of climate change and studies of estuarine processes.

OFFICE OF SCHOLARLY JOURNALS

Kathryn E. Shuman, Administrator
4045 Brooklyn Avenue Northeast, JA-15

The Office of Scholarly Journals provides assistance to members of the faculty who have editorial responsibilities for the publication of scholarly journals originating in, or associated with, the University of Washington.

NORTHWEST CENTER FOR RESEARCH ON WOMEN

Angela B. Ginorio, Director
111 Cunningham, AJ-50

A multidisciplinary center with regional responsibilities, the center is designed to encourage and facilitate research on women and on gender-related issues. The center is governed by a policy board, which is appointed jointly by the deans of the College of Arts and Sciences and the Graduate School, and is advised by a community group.

QUATERNARY RESEARCH CENTER

Stephen C. Porter, Director
19 Johnson, AK-60

Quaternary research focuses on the processes presently shaping the environment and those that have operated on it for the past several million years. To foster such study, the Quaternary Research Center was established at the University in 1967. Cooperating faculty members come from anthropology, atmospheric sciences, botany, chemistry, civil engineering, forest resources, geography, geological sciences, geophysics, oceanography, and zoology. They have in common a commitment to linking the past, present, and future through interdisciplinary study and research. The result is a broad spectrum of interdisciplinary study possibilities.

In addition to various geophysical laboratories, the Quaternary Research-Geophysics Building includes laboratories for palynology, potassium-argon dating, radiocarbon dating research, oxygen isotope research, and periglacial studies.

OFFICE OF TECHNOLOGY TRANSFER

Donald R. Baldwin, Assistant Provost for Research
201 Administration, AG-10

The Office of Technology Transfer (OTT) promotes the early identification of inventions and new technology and helps to facilitate their transfer to the private sector. To achieve this, OTT encourages the faculty, staff, and students to be alert to the commercial potential of their research. Policy dictates that the University share any income from new technologies with the inventor and the inventor's school and department. OTT assists in copyrighting, patenting, and/or licensing the technologies produced by research, safeguarding University and inventor interests while promoting the broadest use of these technologies as part of the University's tradition of public service.

TREATY RESEARCH CENTER

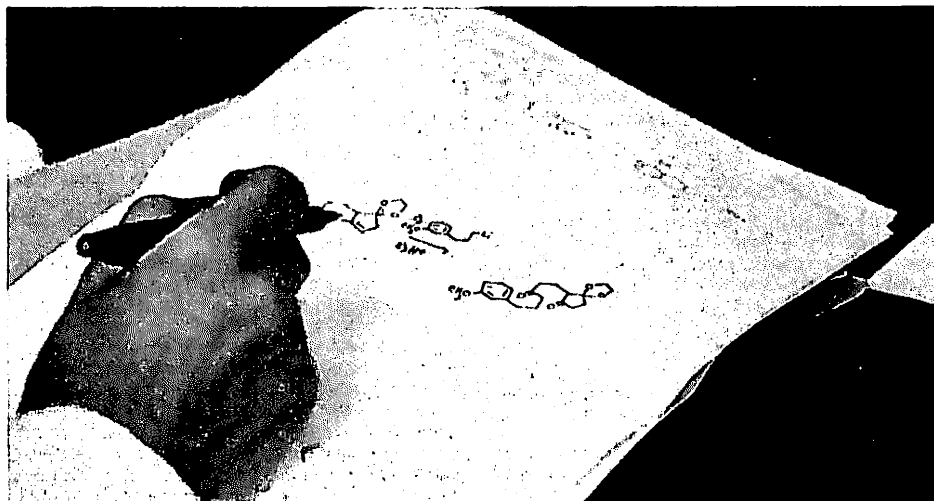
Peter H. Rohn, Director
48 Gowen, DO-30

Opening in 1964 as an interdisciplinary research project, the Treaty Research Center was formally established in 1968 through a major grant from the National Science Foundation. The center created and maintains the world's first and largest computerized data base on international treaties. The data base is the foundation of the center's major publication, the *World Treaty Index*. The 1984 edition of *Index* is a five-volume set of over four thousand pages covering forty-five thousand treaties in fifty languages and is available worldwide in major research libraries. The center also provides treaty information for teaching and research, occasionally sponsors visiting scholars, cooperates with treaty specialists worldwide, and explores new ways of using computers to store information and generate ideas in the field of international law and politics.

UNIVERSITY OF WASHINGTON PRESS

Donald R. Ellegood, Director
4045 Brooklyn Avenue Northeast, JA-20

The University of Washington Press, the book-publishing division of the University, has more than nine hundred titles in print, with special emphasis on art, anthropology, Asian studies, biology, ethnology, history and government, language and literature, oceanography, and regional subjects. The press publishes about fifty new books each year by members of the University





faculty, as well as by scholars outside the University. In addition, the press has a paperback reprint series, entitled *Washington Paperbacks*, and an import program that makes known important books in English published abroad. It produces and distributes phonograph records and films, most of which grow out of original research on campus.

In addition to the Graduate School units described above, the following programs and facilities concerned with graduate education and research are administered by other University units:

CENTERS, INSTITUTES, AND INTERCOLLEGE PROGRAMS

Aerospace and Energetics Research Program. An interdepartmental and interdisciplinary program within the College of Engineering.

Alcoholism and Drug Abuse Institute. Coordination of research and training in the fields of alcoholism and drug abuse; provides community consultation.

Applied Physics Laboratory. A research and development organization with capabilities in ocean and environmental sciences and engineering, arctic technology, energy resource research, biosystems engineering, and forest engineering.

Center for Bioengineering. Program of the College of Engineering and the School of Medicine that applies the concepts and techniques of engineering to problems of biology and medicine.

Center for International Health. A network of approximately two hundred affiliates at the University and other regional institutions, representing several areas of specialization relevant to international health and development. Its purpose is to foster awareness and cross-cultural communication on international health issues.

Center for Process Analytical Chemistry. A facility, funded by the National Science Foundation and private industrial firms, to develop analytical tools that will improve the productivity of industrial processes.

Center for Quantitative Science in Forestry, Fisheries, and Wildlife. A broad program in applied mathematics and in mathematical services concerned with quantitative

descriptions of the management of both aquatic and terrestrial ecosystems.

Center for Research in Oral Biology. Assists in the national effort to reduce the toll of oral disease and to promote the general level of oral health.

Center for Social Welfare Research. Offers policy and practice research in such areas as health and mental health, child welfare, income maintenance, individual and family adjustment, corrections, and gerontology.

Center for Urban Horticulture. Offers research, education, and public service problems in the utilization of plants to create, maintain, and enhance the quality of urban environments. In addition to its research and teaching programs at the Union Bay facility, the center manages the *Washington Park Arboretum*, a 200-acre living laboratory within Seattle devoted to the study of woody plants, and the 130-acre *Bloedel Reserve* (Bainbridge Island), used for the study of plant/human interactions.

Child Development and Mental Retardation Center. Provides facilities for teaching and research programs related to mental retardation and child development.

Fisheries Research Institute. Conducts research in fisheries biology and aquatic ecology in the Pacific Northwest and Alaska.

Institute on Aging. A multidisciplinary educational and research unit designed to focus attention on the social, health, psychological, political, and economic issues of human aging.

Institute for Environmental Studies. An interdisciplinary educational unit established to develop environmentally related programs in teaching, research, and public services.

Institute of Forest Resources. The research, continuing education, and information branch of the College of Forest Resources.

Institute for Public Policy and Management. Coordinates and promotes the efforts of other University units to deal with problems of public policy and administration in the state of Washington and the Pacific Northwest.

Regional Primate Research Center. One of seven throughout the nation; provides opportunities in biomedical research on nonhuman primates.

Washington Mining and Mineral Resources Research Institute. Established at the University in 1980, the institute's purpose is to promote and conduct research in fields related to mining and mineral resources, and by doing so to promote the education and training of engineers and scientists in these fields. Departments and individuals from this university and two other state universities are eligible to participate in institute programs. The institute is administered by an interinstitutional and interdisciplinary policy board and technical steering committee.

Washington Sea Grant Program. Fosters the wise use of the sea and its resources through a regional program of research, education, and advisory services.

Washington Technology Center. Designed as a statewide resource to conduct joint industry-university research in new and emerging technology, resulting in the transfer of commercially applicable technology to industrial companies in Washington State. It is structured to facilitate participation by a wide range of the state's industrial companies and research universities. Current research areas include: microsensors and integrated optics/circuits, biotechnology, plant genetic engineering, computer systems and software, manufacturing engineering and robotics, and advanced materials.

SPECIAL FACILITIES (ON CAMPUS)

Academic Computer Center. Provides instructional and research computing services for the University.

Burke Memorial Washington State Museum. An educational and cultural center whose function is to collect, preserve, research, exhibit, and interpret the natural and cultural objects of the human environment, particularly the Pacific Ocean, its islands, and mainland shores.

Drug Plant Garden. Viable seeds and plants of medicinal and pharmaceutical interest are maintained for experimental purposes.

Henry Art Gallery. The art museum of the University of Washington.

John L. Locke, Jr., Computer. Provides computing services to the health sciences complex and to hospitals and clinics in the community for medical research, teaching, training, and patient-care programs.

KUOW Radio. Broadcasts programs of an educational, cultural, scientific, informational, and public affairs nature; communicates information on University activities to students, alumni, and the public.

Nuclear Physics Laboratory. Houses a Van de Graaf accelerator and a cyclotron for research in physics, chemistry, cancer therapy, nuclear medicine, radiation biology, and related fields.

Observatory. Houses a six-inch refracting telescope, open for public viewing as well as for study and research.

Oceanographic Research Vessels. Operated for field study and research in Puget Sound and the Pacific Ocean.

Speech and Hearing Clinic. Serves as a center for research in speech science, speech and language pathology, and audiology, and provides services to the public.

University Hospital/Harborview Medical Center. The Health Sciences Center operates two major teaching



hospitals: its own 320-bed University Hospital and, under contract with King County, the 300-bed Harborview Medical Center.

University Libraries. With more than 4½ million volumes, an equal number of microforms, several million items in other formats, and more than fifty-five thousand serial titles, the University of Washington Libraries houses one of the top research collections in the country. In 1987, the Online Catalog was introduced. This fully integrated, computerized system provides bibliographic information and circulation status for the cataloged holdings of the Libraries. Most materials received since 1979 are already listed in the Online Catalog with records for pre-1979 items being added on a continuing basis. Under the current schedule, all items now listed in the card catalog should be in the data base by 1990. The Libraries also offers an extensive array of services in each of its twenty-two units, including instruction in the use of library resources and reference assistance. Access to more than three hundred commercially produced data bases in science and technology, the social sciences, business and industry, and the humanities is available on a cost-per-search basis in ten of the campus libraries through Computer-Based Reference Services.

SPECIAL FACILITIES (OFF CAMPUS)

Big Beef Creek Laboratory. Located at Seabeck, Washington; provides opportunities for research and instruction in the School of Fisheries.

Forest Resources. The College of Forest Resources maintains a variety of field facilities throughout the state that provide a general natural science laboratory for research and teaching of natural resource behavioral patterns and management.

Tri-Cities University Center. Administered by the University of Washington and Washington State University, with Oregon State University participating in the academic program. Located in Richland, Washington, it offers graduate-level and upper-division courses in many fields; laboratories owned by the Department of Energy are available for research.

Manastash Ridge Observatory (Kittitas County). A thirty-inch reflecting telescope and auxiliary equipment available for research in astronomy.

Primate Field Station (Medical Lake). A primate breeding facility maintained by the Regional Primate Research Center.

West Seattle Laboratories (Seattle). For research and instruction in electrical engineering and research in physics and medicine.

Research at the University of Washington

The University of Washington has built a reputation for excellence in research. It is one of a handful of research universities with noteworthy programs across the whole spectrum of intellectual disciplines in the sciences, arts, and humanities. For many years, the University has been among the leading institutions in the country in federal money received for research. Achievements of its faculty have been recognized in the form of numerous professional awards and fellowships.

The University of Washington is the major research university in the Pacific Northwest, a region encompassing one-third the landmass of the United States. Its location has led to the development of research programs dealing with regional concerns and has stimulated the growth of disciplines whose interests lie well beyond the nation's borders.

The climate of research excellence offers graduate students the opportunity of learning from, and participating in, research with the leading scholars in virtually every field. Perhaps as important is the opportunity for collaborative ventures with outstanding researchers from related fields. The University's reputation also brings to campus many of the world's outstanding scholars to deliver seminars and lectures and to work with faculty members and graduate students. The University recognizes that graduate students are one of its primary assets, and its degree-granting units make every effort to attract the most promising graduate students from across the country. The quality of graduate students at the University has been acknowledged in reviews by granting agencies and continues to be a determining factor in attracting and retaining a renowned faculty.

The following sections contain brief descriptions of some interesting research under way at the University of Washington:

Earth, Ocean, and Atmospheric Sciences

UW geologists have a long tradition of concentrating on regional studies to learn more about the forces that continue to shape the Pacific Northwest. But studies ranging as far as the Amazon and Africa also form a regular part of the geological scientists' activity.

Recent work suggests that great earthquakes of magnitude 7 or 8 on the Richter scale have occurred in the Pacific Northwest in the not-too-distant past, and, because the forces are the same, are likely to recur at some time in the future.

A network of seismic stations, established to monitor activity in the vicinity of Mount St. Helens, has played an important role in helping scientists examine in detail the forces at work in the region.

Atmospheric scientists are engaged in a variety of research—global, regional, and local—to develop models of weather and climate prediction. Studies range from small-scale phenomena, such as storm cells, to long-term, slow changes in ocean and atmospheric circulation patterns.

Oceanographers, whose studies range worldwide, have made their own contributions to the unfolding story of the region's geological history. A University oceanography team traveling on a U.S. Geological Survey research vessel discovered active hydrothermal vents off the Washington-Oregon coast. Their existence was predicted by a University oceanographer nearly a decade ago. Photographs taken by a camera "flown" several feet from the ocean floor revealed plant and animal life flourishing near the vents. The unusual concentrations of living creatures and their ability to exist without sunshine suggest that they may be among the most ancient forms of life on earth.

UW scientists have long been interested in polar research, including both the arctic and the antarctic. The University is one of the major centers in the country for studies of ocean currents, ice formation, ice movement, and air-sea-ice interaction in these regions. UW personnel have developed unusual expertise for operation in polar regions. Principally through the Applied Physics Laboratory, UW investigators regularly conduct studies from bases sited on arctic pack ice and have deployed a series of weather buoys on the ice and in arctic waters that form part of a worldwide weather-forecasting system.

A group of researchers in atmospheric sciences has pioneered the study of clouds and weather systems by flying into the heart of storms approaching, or at, the Washington coast. Using one of the best equipped research airplanes in the country, they have developed techniques for examining the structure of these storms in detail. Their expanding base of knowledge will one day permit weather forecasting that is more precise than is possible with conventional tools.

A unique scientific resource for the University is Friday Harbor Laboratories. Located on one of the larger islands of the San Juan Archipelago, the laboratories draw researchers from all over the world, who use the pristine Puget Sound water pumped into the laboratories for sensitive studies of reproduction, physiology, and development. One of the most abundant and diverse sources of marine life is found in the surrounding waters; animals and plants that are characteristically found at the bottom of oceans are relatively close to the laboratories.

Physical Sciences

Basic research in the physical sciences is aided by exceptional research tools. The Department of Chemistry has acquired state-of-the-art equipment for studies involving nuclear magnetic resonance (NMR), a sensitive probe for determining complex molecular struc-

tures. Besides being used to determine the rates of chemical reactions, NMR is used by health researchers studying complex biological processes, because it is one of the few tools that can analyze a reaction while it is taking place.

Researchers in the Department of Chemistry have launched a Center for Process Analytical Chemistry. This center is a joint University/industry effort to develop devices and techniques for continuous monitoring of chemical processes.

The University has one of three nuclear physics laboratories located at American universities and supported by the Department of Energy. This laboratory recently added \$8 million to construct a superconducting booster to its accelerator, placing the nuclear physics research facility on a par with the best in the world. The Department of Physics experimental particle physics group and the Visual Techniques Laboratory are engaged in a number of studies at the frontiers of knowledge involving high-energy particles created both in laboratories and by nature.

The University also has been a leader in the development and use of EXAFS, a sophisticated x-ray tool for determining the structure of materials that are not formed from crystals. The use of EXAFS is giving scientists an understanding greater than ever before of how catalysts work, and it is giving life scientists a new tool for exploring the structure of proteins on an atomic scale. EXAFS is also being used by a number of physicists studying condensed matter. Experiments in this field employ the use of monolayer films just one atom in thickness, so that the complexity of interactions is reduced to two dimensions.

Astronomers at the University conduct research on planets in the solar system, such as studies of the meteorology of Mars. Besides helping scientists understand the formation of the universe, the studies are useful for examining aspects of weather forecasting on Earth. Astronomers also seek clues to understanding quasi-stellar objects, or quasars. Current theories advanced by research at the University and elsewhere tie their existence to black holes and suggest they were formed shortly after the universe began. UW astronomers and graduate students have been rewarded for their research excellence by being granted more time per capita on major national telescopes than any other university group in the country.

The University is part of a consortium that is constructing a telescope with a 140-inch mirror, making it one of the largest university-operated telescopes in the country. The telescope will use computer technology to permit remote control of the instruments from any participating institution; it also will allow rapid instrument changes from remote sites.

Applied Sciences

A multidisciplinary approach to the study of materials has led to important discoveries of how to design materials to meet specific needs. An early application of this work made important contributions to the space program. Currently, scientists and engineers are working on developing fundamental design principles for new types of ceramic-polymer composites. These materials have a wide range of applications, including in computer technology, the aerospace industry, and the medical field.

The Washington Technology Center, established in 1983, was designed as a statewide resource to conduct joint industry-university research in new and emerging technology. The center facilitates collaboration by a wide range of the state's industrial companies and research universities. Current research areas include microsensors and integrated optics/circuits, biotechnology, plant genetic engineering, computer

systems and software, manufacturing engineering and robotics, and advanced materials.

Mechanical engineers work on a variety of problems, including the design of special devices to meet the needs of handicapped persons, underground coal-combustion methods, and studies of efficient burning methods for use in home wood stoves. The Aerospace and Energetics Research Laboratory conducts work on efficient heat-rejection systems for space vehicles, innovative methods for heat transfer in power plants, and the use of lasers for photographing and studying eye diseases.

Chemical engineers are studying polymers that may replace metals in many structures, including airplanes. They also are exploring more efficient ways for extracting the last drop of oil from existing wells. Several faculty members and graduate students also are studying processes that occur at the interface between two substances—work that has applications in making better paints and dyes, as well as in improving the technology of oil-spill cleanup.

Civil engineers are studying problems of air pollution and the technology to prevent it; problems of water pollution, acid rain, and lake restoration; methods of predicting the effects of earthquakes on man-made structures; transportation systems that take advantage of the latest advances in technology and computer modeling; and new materials for road surfaces that can replace petroleum-based products with no sacrifice in quality.

In computer science, the University has received a major grant from the National Science Foundation to develop ways of combining the advantages of minicomputers with the power of centralized computing systems. The grant will enable several members of the department to work on advanced software packages that will be especially useful in computer-aided design and office automation. The UW Department of Computer Science was the first in the nation to receive a five-year grant for innovative work in this area. The department is also the hub of a University-industry consortium whose goal is to develop automated tools for integrated circuit design.

In the Center for Bioengineering, problems facing physicians in diagnosis and treatment are solved with the help of engineers from a variety of disciplines. The center is the home of pioneering work in diagnostic ultrasound, which enables physicians to study a patient's circulatory system in detail without surgery. The center's team also has developed a laser scalpel, a device

that can markedly reduce blood loss during surgery, which can be an especially serious problem with burn patients. A renowned group of researchers has made important strides in understanding how to design man-made materials that are compatible with the human body. Such research is important in artificial-organ research as well as in other health-related work.

Life Sciences

A strong program in zoology includes research on the neurological basis of behavior and the origin of circadian rhythms, the physiology of insect development and the role of hormones in metamorphosis, and the ecology of intertidal communities. Understanding why and how certain creatures evolved as they did often requires multiple approaches, including field research, construction of physical models in the laboratory, and computer simulation.

Since its establishment more than thirty years ago, the UW Health Sciences Center has become well known for its teaching, research, and patient care. University physicians and staff members pioneered the first successful long-term kidney dialysis techniques, which have led to lifesaving treatments for tens of thousands of persons. Continuing research in this field has as one of its aims the production of more-portable and simpler devices for persons suffering kidney failure. Medic I, a system of rapid response for victims of accidents and heart attacks, is based at Harborview Medical Center, one of the University's two teaching hospitals. It has provided a national model for immediate prehospital care.

UW research in cancer continues to improve the prognosis for several forms of the disease. University physicians have been leaders in the development of bone-marrow transplantation, which offers the hope of curing several forms of leukemia. University programs explore the genetic basis of cellular abnormalities that occur in response to aging or to environmental insults. An active and recognized group of researchers explores the response of the immune system to cancerous cells.

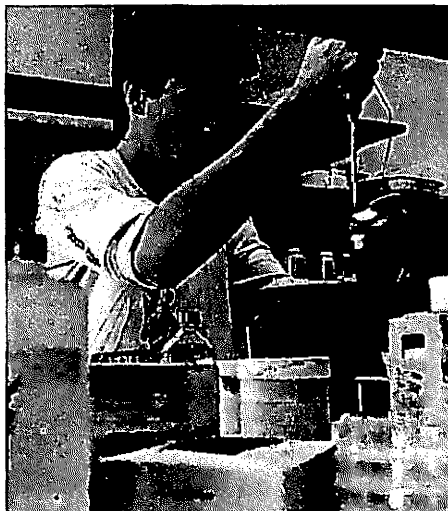
The schools of the Health Sciences Center receive approximately half of all research money that comes to the University, which reflects their strength and diversity. Research programs in the study of heart disease, diabetes, and sexually transmitted diseases have achieved international recognition. The University's Child Development and Mental Retardation Center is recognized for its pioneering work in the causes, prevention, and treatment of diseases and disorders leading to mental retardation.

The School of Pharmacy has a growing program in pharmacokinetics, the study of how drugs are metabolized and the rate at which they affect target organs and are eliminated by the body. Research in this field is aimed at the scientific analysis and prediction of drug effects through the development of sophisticated mathematical models.

The rapidly expanding field of research made possible by genetic engineering techniques is found in the health sciences and in units within the College of Arts and Sciences. The Department of Genetics, a leader in understanding the genetics of yeast, has conducted basic research that could lead to cheaper methods for producing interferon, as well as antigens that are found in hepatitis vaccines. Other projects using recombinant DNA include studies of the immune system and the expression of foreign genes in higher plants.

Social Sciences

Interactions among individuals and groups determine the texture of society. The study of these interactions is the province of social scientists, whose work ranges from basic research on perception to the effect of interest groups on public policy.



Nationwide attention has been given to UW investigators studying couples and the common factors that underlie successful relationships. In related research, several investigators are examining the processes of interaction in small groups, from families to work teams.

Important research in leadership and motivation, in human memory, and in alcoholism and addictive behavior is being carried on in a number of academic disciplines. Alcoholism studies range from physiological experiments to model counseling programs for pregnant women to participant-observer studies of addictive behavior. The focus for this effort is the Alcoholism and Drug Abuse Institute.

Social scientists have performed provocative studies on the changing role of urban neighborhood organizations. Another group has concentrated on deviant behavior, receiving a major grant for the study of juvenile delinquency and possible prevention strategies. This grant is part of a larger effort by faculty members and graduate students to explore the ways that society's institutions react to deviant behavior.

Anthropologists are studying the changes in fertility, medical history, and cultural adaptation of the Japanese-American community in the Pacific Northwest, and the challenges facing immigrants from Vietnam and Laos. Other faculty members are pursuing problems in distant locales and times, such as the beginning of agriculture in the Nile Valley.

Geographers are studying regional issues, such as the economic linkages between the Pacific Northwest and other parts of the country, the design and financing of efficient and equitable transit systems, the recent surge in population of nonmetropolitan areas and its policy implications, and the geography of access to health care.

Economists continue working on models to predict the results of federal monetary and fiscal policy. A group of researchers is breaking ground in a relatively unexplored area, the economics of natural resources, comparing the costs and benefits of different patterns of usage. These investigations are designed to help policymakers evaluate alternatives.

Social scientists at the University have a special interest in international relations. The University has been a pioneer in research concerning the Near and Far East, and this important role was emphasized with the establishment of the School of International Studies in 1978 (now the Henry M. Jackson School of International Studies), the culmination of more than sixty years of scholarly activity in area studies and international relations. Scholars in political science, anthropology, sociology, and the humanities study the role of culture in international affairs. Economists and geographers study development, resource management, and international economics. Historians complement the work of social scientists in exploring the basis of current thought, and scholars in languages and literature provide essential knowledge of original texts and the relationship of language to culture.

One major component of the school is its Center for Contemporary Chinese and Soviet Studies, established with support from businesses and private citizens in the Pacific Northwest. The center gathers information and disseminates it through publications and major conferences that attract participants from around the world.

Humanities and the Arts

Research in the humanities often fulfills a primary mission of humanistic study—the preservation of the literary and artistic achievements of mankind. One aspect of this research is textual scholarship, involving the

identification and authentication of original texts and artifacts. New knowledge is also generated through reassessment of earlier texts and works of art. A University art historian has proposed that a previously unidentified painting was the final work of Leonardo da Vinci. Analysis of his work, using x-rays and infrared photographs, identified the materials used in the painting, the method of application, and the type of wood on which the painting was made.

Texts that form part of Egypt's Nag Hammadi Library, found more than a quarter of a century ago but only recently translated from Coptic, may lead to a reinterpretation of early Christianity. Located near the upper Nile, the library contains documents from little-known monastic groups, previously unknown Christian gospels, and both familiar and unfamiliar sayings of Jesus. A UW scholar studying these texts expects them to have as great an impact as the discovery of the Dead Sea Scrolls. The texts also will shed more light on the heretical Gnostic movement, which offers a radically different interpretation of Genesis.

A faculty member in the Department of English, working in the British Library, discovered several issues of a previously unknown periodical written by Henry Fielding, the famous eighteenth-century novelist. He is currently in the process of preparing annotated facsimiles of the issues, which should shed new light on aspects of Fielding's life, as well as adding some important material to the history of journalism.

Research often is meant to describe exclusively the generation of new knowledge, but in the humanities a growing number of faculty members explore the theoretical basis underlying our knowledge and the means of transmitting it. The focus for these studies is a colloquium in theory that involves faculty members and graduate students. Discussions on problems in the theory of narrative, for instance, may span literature, history, science, and psychoanalysis—in fact, wherever the written word is used. The colloquia have acted as catalysts for several scholarly articles and may lead to an expanded program encompassing other disciplines.

Theoretical studies also form an important component of research in the arts. The UW faculty in the School of Music conducts extensive research in the scientific analysis of sound, known as systematic musicology.

Studies in this field include the influence of vibrato on judgments of vocal blend; context and time in musical perception; and rhythmic responses of preschool children. A number of faculty members are exploring new ways of creating music, including the use of computers.

The concept of scholarly achievement in the arts often is synonymous with performance or exhibition. The UW School of Music has on its faculty a number of nationally recognized composers, including two longtime recipients of research funds from the American Society of Composers, Authors, and Publishers (ASCAP). The awards are designed to encourage and assist writers of serious music. The School of Music also is home to one of the finest opera programs in the country.

The School of Art faculty includes a number of nationally and internationally known artists. The school also has pioneered the introduction of new forms of art to the Pacific Northwest. It contains the most extensive program in video art in the region and has been an innovator in the creation of performance films. Printmaking plays a prominent role in the school, which was among the first in the country to offer training in collagraphy, a technique using burnt-lacquer plates.

The UW School of Drama houses the famous Professional Actors' Training Program, which, besides teaching basic acting skills, provides an intensive introduction to the practice of the theatre arts. The program attracts dedicated students who work for demanding, scrupulous visiting directors from the commercial stage as well as for permanent faculty members with extensive professional experience. Graduate research in the history and practice of theatre forms an integral part of the school's diverse program, which now includes training for the aspiring playwright.

The University's program in creative writing is one of the oldest in the country. It achieved prominence in the 1950s and 1960s, when its faculty included Theodore Roethke, winner of the Pulitzer Prize in 1953. The tradition of excellence continues, with current University poets and authors receiving critical acclaim throughout the nation. This concentration of talent has made the University a center for literary activity in the Pacific Northwest.



**Vice Provost, Continuing Education
Director, University Extension and Summer Quarter**

Richard L. Lorenzen

Associate Directors

Samuel P. Magill
Harry Norman

Established in 1912, University Extension brings the University's resources to the community by providing quality educational programs to meet ongoing professional and personal needs.

This section describes the various programs currently part of University Extension. The quarterly University Extension catalog contains details of the program offerings. It is mailed without charge to residents of western Washington, who may receive it by telephoning (206) 543-2300 or by writing to University Extension, GH-24, Seattle, Washington 98195.

Evening Credit Program

Each quarter a variety of credit courses is offered for those Puget Sound residents who cannot attend the University full-time. Most of the courses are scheduled to begin after 4:00 p.m. The classes, funded primarily by student fees, are intended for traditional degree seekers as well as for postbaccalaureate individuals pursuing new skills and knowledge. Priority in registration is given those out of high school at least two years. All evening credit classes are taught by regular University faculty members and approved extension lecturers. UW credit is awarded for most courses, and the grades earned are included in grade-point-average calculations. Formal admission to the University is not required for enrollment.

Graduate Nonmatriculated Program

Individuals who are seeking enrollment in graduate-level courses, but not admission to a graduate degree program, may apply directly to those academic departments that offer enrollment in their graduate courses to graduate nonmatriculated students. Application forms are available from participating departments, the Graduate School, or University Extension. The Graduate School: Graduate Study and Research section of this catalog offers more details. Additional information may be obtained by telephone, (206) 543-2300, Ext. 434, or by contacting individual departments.

Distance Learning

Distance Learning offers approximately 130 undergraduate courses through independent study by correspondence. Courses typically consist of assigned texts, study guides, assignments and examinations, and such supplementary materials as audiocassettes, records, slides, and laboratory kits. Special arrangements can be made for independent study students to take some University courses not currently listed in the correspondence curriculum. Certain noncredit courses required for University entrance are available for those who wish to qualify for admission. Other courses provide subject matter for professional continuing education.

Courses are open to persons who, because of distance, work schedule, physical disability, or educational preference, require an alternative to on-campus classroom meetings. Resident University students often find correspondence study a convenient way to earn extra credits during summers or leaves of absence or a way of taking courses that would otherwise be unavailable due to schedule conflicts.

Formal admission to the University is not required for enrollment in correspondence courses. Students may



register at any time and have one year in which to complete their work. As many as 90 credits earned through correspondence may be applied to a University baccalaureate degree. Upon successfully completing a course, the grade and number of credits earned are recorded on an official University transcript. Grades earned, however, are not computed in the University grade-point average, which is based solely on courses taken in residence.

A bulletin listing independent study courses may be obtained by telephone, (206) 543-2350, or by writing to Distance Learning, University of Washington Extension, GH-23, Seattle, Washington 98195.

English As A Second Language Center

The English As A Second Language (ESL) Center, 103 Lewis, provides nonnative speakers of English who are interested in improving language skills with the following services and resources:

Academic ESL courses for UW students. English is the language of instruction at the University, and many international students need additional English training to facilitate participation in regular University programs.

International students (whose native language is not English) admitted with TOEFL scores of at least 500 but below 580, or Michigan Proficiency Test scores of at least 80 but below 90, are required to take the University's ESL diagnostic test before matriculating. Students whose test results show their English to be adequate for full-time University study are excused from ESL course work. Others must take those ESL courses designated as required each quarter until the language requirement is completed.

During the academic year, the courses offered are designed for international students officially enrolled in a degree program at the University as either undergraduate or graduate students. These students take ESL courses along with their regular programs of study. English As A Second Language courses count the equivalent of 5 credits each for the purposes of satisfying visa requirements but do not count toward graduation. As they are special tuition courses, fees must be paid before students may register for them.

University Extension ESL courses for all nonnative speakers. The ESL Center offers a separate series of

noncredit courses that are open year-round to any adult nonnative speaker who would like to study English. These courses do not require formal admission to the University. Application may be made to the address below.

Additional information about ESL services, including complete listings and descriptions of current ESL course offerings at the University, is available at the ESL Center, 103 Lewis, telephone (206) 543-6242.

Noncredit Classes

UW Extension offers a broad range of courses, lecture series, workshops, and seminars for adults, students, and children. Many of these programs are open to resident students, faculty, and staff at a reduced fee. Noncredit classes offer opportunities for professional development and personal enrichment. Specific programs are announced quarterly in the UW Extension Catalog. Registration information is available at the extension office and by telephone, (206) 543-2310.

Career Planning

Career Planning assists out-of-school adults, through individual counseling and group guidance, in focusing their resources for professional and career change. Courses and seminars explore educational and vocational choices. Additional information may be obtained by telephone, (206) 543-2300, Ext. 422, or by writing to Career Planning, University of Washington Extension, GH-21, Seattle, Washington 98195.

Conference Management

Conference Management provides services for University academic departments and administrative units, as well as for professional associations and community groups with University sponsorship. Consultative service and assistance with program development and planning are available. Other services include the making of arrangements for meeting and housing facilities, catering, mailing, registration, and promotion. Additional information may be obtained by telephone, (206) 543-2300, Ext. 340, or by writing to Conference Management, University of Washington Extension, GH-22, Seattle, Washington 98195.



The symbols and abbreviations below are used in the listings of faculty members and course descriptions. Colleges, schools, and departments are presented in alphabetical order. If you are unable to locate the department or program of your choice, consult the Index.

Faculty

Entries include year of appointment, graduate-level and professional degrees, dates, and institutions. Entries also may include Clinical or Affiliate (if formally appointed to the Graduate School faculty), Emeritus, Acting, or Research faculty (title indicated in parentheses); area of specialization; and the symbols below.

* Member of the Graduate School faculty.

† Joint appointment (other department name(s) indicated in parentheses).

‡ Adjunct faculty member (primary appointment department name indicated in parentheses).

Course Descriptions

Each course listing includes prefix, course number, title, and credits. Each listing also may include quarter(s) offered, names of instructor(s), description of the course, and prerequisite(s).

Specific information on courses offered in a particular quarter, including descriptions of courses approved since the publication of this catalog, appears in the quarterly *Time Schedule*.

Course Numbers

100-299 Lower-division courses primarily for freshmen and sophomores.

300-499 Upper-division courses primarily for juniors, seniors, and postbaccalaureate (fifth-year) students. Graduate students may enroll in 300- and 400-level courses. When acceptable to the major department and the Graduate School, approved 400-level courses may be applied as graduate credit in the major field and approved 300-level courses may be applied in the supporting field(s).

500- Restricted to graduate students. (Courses numbered in the 500 and 600 series with *P* suffix denote professional courses for students in the schools of Dentistry and Medicine, and such courses may not be applied as graduate credit in the Graduate School.) Undergraduate, postbaccalaureate, and nonmatriculated students who wish to register for 500-level courses must obtain permission from the instructor of the class, departmental Chairperson, or other designated person.

Graduate courses numbered 600, 601, 700, 750, or 800 are restricted to students in the Graduate School. They appear by number and title only where applicable under the departmental course listings in this catalog. Descriptions for these courses are listed below.

(PREFIX) 600 Independent Study or Research (*) Individual readings or study, including independent study in preparation for doctoral examinations, research, etc. Prerequisite: permission of Supervisory Committee chairperson or graduate program adviser. Name of faculty members responsible for supervising the student should be indicated on program of studies.

(PREFIX) 601 Internship (3-9, max. 9) Internship required of students in a graduate degree program other than Doctor of Arts. Permission of Supervisory Committee chairperson or graduate program adviser is a prerequisite. Name of faculty member responsible for supervising the student should be indicated on program of studies.

(PREFIX) 700 Master's Thesis (*) Research for the master's thesis, including research preparatory or related thereto. Limited to premaster graduate students (i.e., those who have not yet completed the master's degree in their major field at the University of Washington). Prerequisite: permission of Supervisory Committee chairperson or graduate program adviser. Name of faculty member responsible for supervising the student should be indicated on program of studies.

(PREFIX) 750 Internship (*) Internship required of all graduate students in the Doctor of Arts degree program.

(PREFIX) 800 Doctoral Dissertation (*) Research for the doctoral dissertation and research preparatory or related thereto. Limited to graduate students who

have completed the master's degree or the equivalent, or Candidate-level graduate students. Premaster students initiating doctoral dissertation research should register for 600. Prerequisite: permission of Supervisory Committee chairperson or graduate program adviser. Name of faculty member responsible for supervising the student should be indicated on program of studies.

Credit Designation

ART 100 (5) 5 credits are received for the quarter.

ART 101-102 (5-5) Hyphenated course. Credit is earned, but may not be applied toward graduation until the entire sequence is completed. (An *N* grade may be given the first quarter and the final grade the second quarter.)

ART 100- (5-) Course may take longer than one quarter to complete. Repeated registration may be necessary. An *N* grade is received until the final grade is submitted.

ART 100 (2, max. 8) 2 credits per quarter; course may be repeated up to four times to earn a maximum of 8 credits.

ART 100 (1-5) Up to 5 credits may be taken in a given quarter. Specific number is determined in consultation with instructor or adviser.

ART 100 (1-5, max. 15) Up to 5 credits may be taken in a given quarter. Course may be repeated to a maximum of 15 credits.

ART 100 (*, max. 10) Credit to be arranged per quarter; course may be repeated to a maximum of 10 credits.

ART 100 (3 or 5) 3 or 5 credits are earned in a given quarter. Specific amount is determined by school or college offering the course. The *Time Schedule* may indicate 3 credits, 5 credits, or 3 or 5 credits. Credits may vary by section.

ART 100 (3 or 5, max. 15) 3 or 5 credits are earned in a given quarter. Course may be repeated to earn a maximum of 15 credits.

ART 700 (*) Credit is to be arranged with school or college offering the course. No maximum stated. Only 600-, 700-, and 800-level courses do not require a maximum.

May be repeated for credit. This statement can appear in the course description, giving permission for repetition of the course for credit.

Background Required

Prerequisites Courses to be completed or conditions to be met before a student is eligible to enroll in a specific course.

Quarters Offered

A,W,Sp,S Indicates the quarter(s) the course is offered. A = Autumn, W = Winter, Sp = Spring, S = Summer.

Examples:

ART 100 AWSp ART 100 offered Autumn, Winter, and Spring quarters.

ART 100, 101 A,W ART 100 offered Autumn Quarter. ART 101 offered Winter Quarter.

ART 100, 101 AW,WSp ART 100 offered Autumn and Winter quarters. ART 101 offered Winter and Spring quarters.

ACADEMIC PROGRAMS, FACULTY, AND COURSES

College of Architecture and Urban Planning

224 Gould

Dean

Gordon B. Varey

Associate Dean

David L. Bonsteel

The College of Architecture and Urban Planning brings together into one unit four departments that are directly concerned with the design and development of the physical environment: Architecture, Building Construction, Landscape Architecture, and Urban Design and Planning.

The college offers a variety of programs and degrees. The departments under the administration of the college offer an undergraduate four-year degree that is interdisciplinary and preprofessional in nature, focusing on the environmental design disciplines within a liberal arts education. The undergraduate programs of the departments of Building Construction and Landscape Architecture, on the other hand, lead to the professional degrees that serve as the educational credentials for careers in their respective fields. Graduate degrees are also offered in the college: Master of Architecture, Master of Urban Planning, and Master of Landscape Architecture. Students at that level may elect to work toward the certificate in Urban Design or the certificate in Preservation Design. In addition, the Department of Urban Design and Planning offers a doctoral program. All curricula encompass an appropriate level of design and technical understanding and also include broader social, economic, and cultural issues fundamental to understanding, preserving, and enriching our built and natural environments.

The grouping of these departments within the college is an acknowledgement of their mutual interests and responsibilities and the opportunities they present for interdisciplinary exchanges. All students share the specialized physical facilities and educational resources available in the college. As part of a major university and of the larger community composing the major metropolis in the Pacific Northwest, the college is able to reinforce its program and to use its setting as a laboratory for study. It also works closely with its various professional communities to build curricula and a faculty attuned to the understanding and creation of an appropriate physical environment.

Center for Planning and Design

116 Architecture

David L. Bonsteel, Director

Judith Heerwagen, Associate Director

The Center for Planning and Design in the college was established to facilitate the interdisciplinary study of the

environment and to integrate scholarly knowledge and field experience in meeting the needs of local and regional clients. It has three primary objectives:

1. To make available the expertise and services of college disciplines in a variety of specializations through consulting, research contracts, seminars, and workshops.
2. To develop opportunities for students to obtain practical professional experience by participating in field studies.
3. To assist faculty members of the college in their research, teaching, and community-service functions.

The center is a member of the Architectural Research Center Consortium (ARCC), which was organized by United States architectural and planning schools to contract for research to be performed by member schools and to furnish research and advisory services to governmental agencies and others. ARCC is, in turn, a member of the National Institute of Building Sciences and the International Council for Building Research, Studies, and Documentation. The center is thus able to obtain information on research and technology transfer from a broad community of interest while participating on a regional basis in research and related activities.

Urban Design Certificate Program

410 Gould

Anne Vemez-Moudon, Director

The Department of Urban Design and Planning administers a special graduate program that leads to the Certificate of Achievement in Urban Design. Since 1970, this interdisciplinary program has provided a collective framework that allows students to specialize in the design of the urban environment as part of their professional education.

The ten-member faculty offers backgrounds in urban design as well as in architecture, landscape architecture, and urban planning. In addition, the communities of the Puget Sound region provide a unique learning laboratory for students to experience the issues and professional activities of urban design. A core curriculum and mandatory course work in five substantive areas provide the student with a firm grounding in theory, methods, and practical skills.

Students are eligible to participate in this certificate program, normally seven quarters in length, if accepted for graduate work by the departments of Architecture, Landscape Architecture, or Urban Design and Planning, and if they possess the necessary design abilities prior to enrollment in advanced studios.

International Programs

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The departments of the college offer many opportunities for foreign study in which participants earn academic credit while studying abroad. Those programs most specifically sponsored on a regular basis within the college are Architecture in Rome I and II, Rome Studies, Italian Hilltowns, and Landscape in Great Britain. In addition, various study and exchange opportunities exist through the college's agreements with similar international institutions in such locations as Germany, the Scandinavian countries, People's Republic of China, Mexico, and Japan. College faculty exchanges with foreign institutions occur regularly.

Center for Italian Studies

95 Piazza del Biscione, Rome, Italy

Astra Zarina, Director

The college maintains a permanent year-round facility in Rome. Studio and classroom spaces, as well as limited living accommodations for visiting scholars participating in Italian studies, are provided in the Palazzo Pio on the Campo Dei Fiori. A library shared with the Department of Classics and a substantial slide collection and a resident support staff are accessible to students. The Palazzo Pio is arranged to enhance interaction among students from the University and students from other institutions, together with practicing professionals residing in or visiting Rome. Several major universities regularly share studio critics and lecturers with college staff members in a spirit of cooperation.

Remote Sensing Applications Laboratory

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Arthur Grey and Frank Westerlund, Co-Directors

The Remote Sensing Applications Laboratory (RSAL) is a facility for teaching, research, and public service applications of remote sensing and geoinformation technologies in environmental planning and design. Remote sensing includes aerial photography and such newer techniques as Landsat for recording earth surface data in image or digital form for subsequent interpretation by visual or computer techniques and incorporation into geographic information systems. Research applications have included land-use mapping, urban form and growth studies, development siting, natural resource inventories, and environmental analysis. Teaching activities include two courses in the Department of Urban Design and Planning and participation in other College of Architecture and Urban Planning courses. The RSAL houses an extensive collection of air photo, satellite data, map, and documentary resources. In addition to optical photo interpretation equipment, the laboratory utilizes the NASA-developed VICAR software system for digital image processing. The RSAL shares in the use of the college's ARC/INFO geographic information system.

Computer Aided Design Center

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Brian Johnson, Director

Several levels of computing facility are available to students of the college. Numerous graphics terminals permit access to centrally operated Digital Equipment (VAX) and Control Data (Cyber 855) computers used for research and instruction. Software supports perspective-drawing and rendering, thermal and lighting simulation, structural analyses, analysis and display of regional mapping data, and other applications. Located within the college are both MS-DOS and Macintosh microcomputer facilities, with eight computers each, used for instruction, studio work, and student projects. These facilities are made available to students for their own work during off hours, and the college library maintains a wide selection of commercial software, including business and computer-aided design (CAD) packages. For advanced course work and research, the college operates a VAX 11/750 minicomputer with two high-performance graphics workstations, digitizers, a printer, and a plotter. This system acts as a host to both the RUCAPS building modeling (CAD) system and the ARC/INFO geographic information system, used both for instructional and research work.

Facilities

Design Graphics Laboratory

The center for all graphics courses in the college provides video recording and playback facilities, a sixteen-foot drafting machine for demonstrations of drafting techniques, a light table, a rear-projection table, and di-

azo printers, in addition to other specialized drawing equipment available to students. The laboratory offers live and video-taped lectures on a wide variety of graphics subjects and is staffed for consultation during regularly scheduled hours.

Lighting Applications Laboratories

The Lighting Applications Laboratories include a variety of facilities for use by students and faculty members in conjunction with lighting classes, design studio courses, and research work. Equipment in the lighting workshop includes lighting fixtures and lamps, model-building materials, an artificial sky, a direct-beam sunlight simulator, assorted light meters, and demonstration displays. The Lighting Simulation Laboratory contains dimmable task and ambient lighting, a simulated window, and computerized data-gathering facilities.

Environmental Measurement Facilities

The college and the Department of Mechanical Engineering have jointly created a series of facilities for studying energy usage in buildings. One facility is a pair of two-room test cells, one of which contains direct-gain and Trombe wall-passive solar test bays, while the other serves for the evaluation of alternative envelope insulation types. The second facility is an atmospheric radiation measurement station at which solar irradiance, daylight illuminance and luminance, and long-wave irradiance (from/to the sky) are recorded. The third facility is a group of four houses plus a large test cell, which are being used to compare the energy-efficiencies for houses built to standards (a) prevailing in Washington State in 1980 and (b) proposed as a Model Conservation Standard (for adoption in 1990). This project is funded under a contract arranged with the Washington State Energy Office.

Photography Laboratory

A photography laboratory is provided with studio and darkroom facilities for use by photography classes, design studio classes, special instruction, and independent activity.

Shop

A fully staffed and equipped wood-, plastic-, and metal-working shop provides students with an opportunity to design and build selected projects. The shop is used in conjunction with studio, structures, and materials classes as an instructional facility. Thesis and other individual activity also can be accommodated.

Library

The UW library system (Suzzallo Library, Odegaard Undergraduate Library, East Asia Library, Health Sciences Library, and seventeen branch libraries) contains over four million volumes, thirty-nine thousand currently received serials in addition to sizable numbers of government publications—federal, state, and international—maps, manuscripts, microforms, and newspapers. The Architecture-Urban Planning Library in Gould Hall is the branch within the University system that has the primary collection of materials on the subjects of architecture, building construction, landscape architecture, and urban design and planning. It includes more than thirty thousand books and bound periodicals, 280 currently received serial titles, and five thousand microforms.

Audiovisual Center

This center is a fully equipped laboratory to serve the college. It houses slide projectors, screens, opaque and overhead projectors, light tables, and a collection of over sixty-five thousand slides covering architectural, landscape, planning, and construction subject matter. A photocopy setup provides faculty members and students of the college with new material for lectures and class projects and adds to the constantly growing slide collection. This service center also supervises an array of equipment for building science studies.

Student Organizations

Chapters of American Institute of Architects Students, American Society of Landscape Architects, Associated General Contractors, Planning Students Association, and the Historic Preservation Association provide opportunities for undergraduate and graduate students to meet informally and to participate in a variety of projects and events.

Sigma Lambda Chi and Tau Sigma Delta, national honorary societies, are represented in the college.

Admission Requirements

Admission to the college is highly competitive, and preference is given those applicants who, in the judgment of the department or program concerned, are the best qualified to undertake its curriculum. As a participant in the University's affirmative action program, which is intended to increase the number of minority group members and women in education and in the professions, the college encourages their applying for admission.

More specific admissions requirements and application procedures are listed separately under each department.

Undergraduate Program

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James J. Donnette, Director

The college administers a nondepartmental Bachelor of Arts degree program in interdisciplinary environmental design and planning in which undergraduates may major. Built on a firm liberal arts foundation, the program has a core curriculum of required course work comprising college courses with a CAUP prefix and regular departmental offerings. This is followed by a selection of departmental offerings that may be concentrated within one department to prepare a student to enter a professional program, or the selection may be made from several departments to meet special individual objectives that no single department can satisfy.

A student is admitted to the program as a major in the college and does not join a department. Courses with a CAUP prefix are taught by regular faculty members of the departments of the college.

The educational goal of this program is to provide the student with a balanced undergraduate learning experience encompassing the diverse range of knowledge represented by the college's professional programs in the departments of Architecture, Building Construction, Landscape Architecture, and Urban Design and Planning.

The three basic educational objectives are to provide:

- A well-balanced program of undergraduate studies in environmental design and planning for the student who has not yet made a career choice.
- A well-balanced program of undergraduate studies for the student planning to enter a graduate-level professional program in architecture, landscape architecture, urban design and planning, or other related professions (e.g., facilities management, interior architecture).
- Undergraduate course offerings that accommodate the person interested in environmental design and planning processes, but who does not intend to pursue professional studies in these areas.

The program is a traditional four-year liberal arts education leading to the Bachelor of Arts degree. It requires the satisfactory completion of 180 credits of course work. The program has three basic components:

- Liberal Arts Distribution (90 credits)
- Interdisciplinary Core Program (45 credits)
- Pre-Professional Studies (45 credits)

Liberal Arts Distribution

1. To be completed prior to admission to the College of Architecture and Urban Planning:

Credits	
5	English composition
20	Humanities
20	Social sciences (to include ENV S 205)
15	Natural sciences (to include ENV S 204)
15	Mathematics sciences (to include MATH 124 or 157)
75**	

2. To be completed prior to graduation:

15	Additional liberal arts electives
90*	

In fulfilling the requirements above, students must include:

* 10 W courses from the University list

** 18 2 or 3 linked sets from the University list to include one natural science set in physics or chemistry.

Admission Requirements

1. Junior standing (90 or more credits completed).

2. Course requirements.

Credits	
75	Liberal arts component (see above)
9	CAUP 200
6	Electives
90	

3. Acceptance by the Program Admissions Committee. While the cumulative grade-point average is an important admissions evaluation factor, the committee will place emphasis on evaluation of performance in those Bachelor of Arts core courses the student has taken. It is to the student's advantage to take as many of these courses as possible before applying. An application portfolio is required. Majors normally will be admitted in Autumn and Spring quarters. (Application deadlines are January 15 for Spring Quarter and May 15 for Autumn Quarter.)

Interdisciplinary Core

This 45-credit component provides course work in introductory environmental design knowledge and beginning skills development. It comprises two parts:

Core courses. There are seven required courses for a total of 36 credits.

Core distribution electives. There are 9 credits required. They are distributed over two subject areas. The student must take a minimum of one course from each area.

A listing of short descriptions of the seven core courses follows, as does a list of core distribution electives identified by subject area.

Core Requirements

CAUP 200, 270, 300, 301, 340, 401, and 470.

Core Distribution Electives

History and theory (6 credits required): ARCH 350, 351, 352, 460; B CON 350; URBDP 410, 460, 461, 471; L ARC 352, 353, 361.

Policy, law, and professional roles (3 credits required): B CON 301, 480; CAUP 380, 475; ENV S 481; LAW 442; L ARC 473; URBDP 300, 340, 401, 481.

Preprofessional Studies

Professional Group Electives: This 45-credit component allows the student to pursue course work in areas of personal interest as well as to formulate a beginning program in chosen professional areas. Electives will be drawn from the various departmental offerings of the College of Architecture and Urban Planning and other departments as appropriate.

Current opportunities include majors in design and planning studies, architectural studies, planning studies, urban design studies, construction studies, facilities management studies, interior design studies, architectural history studies, and landscape studies.

Advising

Advising for program premajors will be done by the College of Arts and Sciences advising office, and advising for majors will be provided by the program director and program faculty adviser in the College of Architecture and Urban Planning.

Graduation Requirements

Satisfactory completion of 180 credits with a minimum grade-point average of 2.50 that include 90 distribution credits, 36 core credits, 9 core elective credits, and 45 credits in upper-division approved electives.

Preprofessional

Course Descriptions

CAUP 200 Introduction to Environmental Design and Planning (9) ASp Laboratories, lectures, demonstrations introducing basic curricular elements. Development of basic skills in methods and graphic expression of design and planning process—analysis, synthesis, evaluation in building technology; simulation, modeling; person-environment relations; history; theory; policy; professional roles. Prerequisites: ENV S 204 and 205 or permission of program director.

CAUP 270 Computers in Environmental Design and Planning (3) AWSpS Laboratories, lectures, and demonstrations that introduce computing in environmental design and planning, as well as a survey of the primary elements of computing in general. Basic skills development in text and word processing, data-base management; two- and three-dimensional graphics; land-use mapping and modeling; spread-sheet analysis, utilizing VAX, CDC, and microcomputer systems. Prerequisites: ENV S 204 and 205 or permission of program director.

CAUP 300 Environmental Design and Planning I: Visual (6) ASp Laboratories, lectures, and demonstrations in the perception of visual qualities, in the principles of visual structure and organization, and in the fundamentals of the design process. Prerequisites: 200 and 270 or permission of program director.

CAUP 301 Environmental Design and Planning II: Technology (6) AW Laboratories, lectures, and demonstrations in the technological foundations of the design and planning process. Prerequisite: 300 or permission of program director.

CAUP 340 People-Environment Relations (3) W Dynamics of people-environment interactions. An appropriate spectrum of environmental scales will be addressed, building on practical and empirical work of several faculty members in the college. Prerequisite: ENV S 205.

CAUP 380 Technology of Urban and Regional Development (3) Sp Lectures and demonstrations in the technological, economic, and social determinants of urban development patterns. Survey of basic knowledge and technology of physical infrastructure systems, urban public facilities, and community energy considerations. Prerequisites: ENV S 204, 205.

CAUP 401 Environmental Design and Planning III: Interdisciplinary (6) AW Laboratories, lectures, and demonstrations in the integration of the architecture, landscape architecture, and urban design and planning disciplines in a design studio problem-solving format. Prerequisite: satisfactory completion of pre-professional bachelor of arts program core course requirements or permission of program director.

CAUP 470 Society and Environmental Design and Planning Policy (3) W Historical evolution of national environmental policies. Institutional and legal frameworks, nature and value of policy, and process of community/society decision making at all scales. Faculty members from various departments. Prerequisites: ENV S 204, 205.

CAUP 475 The Environmental Design and Planning Professions (3) An analysis of the roles and mutual support of professions focusing on environmental design and planning, and relationships with other professions dealing with aspects of this activity. Competence and training needed by each of these, ethics that inform these professions, and typical careers of persons working in each of them. Guest lecturers include practicing professionals.

Architecture

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The Department of Architecture serves two roles at the University: it offers the Master of Architecture degree, the only professional architectural degree, and it is a collaborator with other departments in the college undergraduate degree program. The professional program is based on the architect's need to be a generalist who is well-rounded in the liberal arts, who possesses a full command of the practical arts of the profession of architecture, and who can assume an enlightened, responsible, and creative role in society. The faculty of the department and related departments offers a range of both broad and focused courses that cover the many and various aspects of architecture: design, graphics, structural engineering, building sciences, history, theory, ecology, sociology, psychology, law, and professional practice. The faculty comprises a large and diverse group of teachers, practitioners, scholars, and researchers, who represent a wide spectrum of background, experience, and viewpoints. Thirty-five permanent faculty members are supplemented by dozens of part-time professional practitioners from the region and around the country, as well as by exchange scholars and foreign institutions. A design graphics laboratory, photography laboratory, lighting application laboratory, and shop, which are described elsewhere, are staffed by the department.

The department is responsible for a broad subject area, offering an intensive core of required courses, studios, and thesis and a wide array of elective courses. Seattle and its region serve as a laboratory for design and research in most studios, as well as in some lecture courses and seminars. In addition to this focus, there is a theme for each of the three years of the M.Arch. degree program. Year one is "the dwelling place"; year two, "the public realm"; and year three, "the rich panoply." Support courses in theory, building science, and person-environment relations are integrated with studio in year one. Support courses in preservation design, urban design, and interior design enrich a three-quarter studio sequence in these three subjects in year two. Elective studios and courses are offered in year three. These themes not only help to clarify the student's experience, but also to ensure a wide and coherent variety of design problems and instructors. Year three is followed by the master's thesis on a research or design topic of the student's choice, culminating in a public presentation to the faculty and guests.

Undergraduates preparing for a graduate professional architecture program here or elsewhere may apply for

the undergraduate degree program offered by the college. Students interested in applying for two-year graduate professional architecture programs take most of their electives, including design studios, within the Department of Architecture.

The Master of Architecture (M.Arch.) degree is the only degree offered by the Department of Architecture. Completion of the requirements of this nationally accredited degree program satisfies the usual educational requirement for licensing (registration) as an architect. The program accommodates three groups of undergraduate-degree holders: (1) persons holding a preprofessional four-degree, such as the college's Bachelor of Arts with a concentration in architectural studies, (2) persons holding an undergraduate degree in a field other than architecture, (3) persons holding a professional degree such as a five-year Bachelor of Architecture. The program varies in duration and specific course work required, depending on the student's prior academic and professional experience and whether the student elects to pursue a Certificate of achievement in Urban Design or Preservation Design.

Candidates with a preprofessional four-year degree, such as Bachelor of Arts (in architecture) or the equivalent, usually undertake six full-time quarters of study plus completion of a thesis for the M.Arch. degree. This program requires 90 credits of course work, including 36 of design studio, 27 of approved core courses, 9 of thesis, and 18 of electives. Special interests and certificate programs often can be accommodated within the 18 credits of electives and design studio options. Students are reviewed for satisfactory progress in their first year, and some may be required to take additional studio(s) or other course work.

Persons holding degrees in other fields normally undertake three quarters of preparatory course work to develop knowledge and skills equivalent to those of students who enter the program from undergraduate architecture programs. Some entering students are required to take courses during the summer quarters prior to matriculating as well as additional preparatory studio(s). Upon completion of preparatory course work, the students merge with students in the two-year program described above.

Persons holding a five-year Bachelor of Architecture professional degree (or M.Arch. degree) who desire to do postprofessional study or research may enroll with advanced standing in the Master of Architecture program. This program can usually be completed in four quarters and requires 45 credits, including thesis.

Students are admitted to the program in architecture only in Autumn Quarter. All application materials should be received by the department no later than the preceding February 15. Notices of admission are mailed in early April. The prospective applicant should note that Graduate Record Examination general test scores, three letters of recommendation, transcripts of previous degree programs and of additional academic study, a letter of intent, and a portfolio of work in some field or aspect of art, craft, or design are required as part of the application. Incomplete applications and those received after announced deadlines are not considered by the admissions committee.

The Certificate of Achievement in Urban Design, administered by the Department of Urban Design and Planning (see college description), is a specialized graduate-level option available to students in the Master of Architecture degree program. It is awarded to students who complete a required curriculum necessary for a firm grounding in history, theory, methods, case studies, and practical skills in urban design. The option emphasizes process and problem solving, including abilities to analyze problems and opportunities, to develop and evaluate alternative concepts, and to manage implementation strategies.

The department also offers a Certificate of Achievement in Preservation Design as a specialization within the Master of Architecture curriculum. This option is not

only designed to promote an understanding of historic buildings but also to develop skills in designing new structures and adapting existing structures within historic districts. It seeks to prepare professionals skilled in dealing with historically important issues rather than restorations or historic preservationists *per se*.

The department offers the architecture in Rome program at the Palazzo Pio, described under Center for Italian Studies. Students may study for one or two quarters in Rome with departmental faculty members and guests. A summer program on Italian hill towns at Civita di Bagnoregio also is offered.

Financial Aid

Each Spring Quarter, the department awards many scholarships and assistantships that apply to the following academic year. These are more typically available to students already enrolled in the program in architecture at the time of the awarding, although some financial aid is offered to newly entering students. Other financial aid and assistantship possibilities may be found through the Graduate School Fellowship Division and the Financial Aid Office in Schmitz Hall.

Faculty

Chairperson

Douglas S. Kelbaugh

Professors

Bonsteel, David L.,* 1964, M.Arch., 1964, Washington; design process, computer applications, research.

Bosworth, Thomas L.,* 1968, M.A., 1954, Oberlin; M.Arch., 1960, Yale; design process, history, professional practice.

Dietz, Robert H., 1947, (Emeritus), M.Arch., 1944, Massachusetts Institute of Technology.

Emery, Ashley F.,* 1961, ‡(Mechanical Engineering), M.S., 1958, Ph.D., 1961, California (Berkeley); bioengineering, energy conservation in buildings, and air conditioning.

Fritschen, Leo J.,* 1966, ‡(Atmospheric Sciences, Forest Resources), M.S., 1958, Kansas State; Ph.D., 1960, Iowa State; biometeorology, micrometeorology, measurement and instrumentation of the environment.

Hawkins, Neil M.,* 1968, ‡(Civil Engineering), M.S., 1959, Ph.D., 1961, Illinois; structures and materials.

Herrman, Arthur P.,* 1923, (Emeritus), B.Arch., 1921, Carnegie Institute of Technology.

Hildebrand, Grant,* 1964, (Drama), (Art), † M.Arch., 1964, Michigan; history, preservation design, design process.

Jacobson, Phillip L.,* 1962, (Urban Design and Planning), † M.Arch., 1969, Finnish Institute of Technology (Helsinki); design, professional practice.

Johnston, Norman J.,* 1960, (Emeritus), (Landscape Architecture, Urban Design and Planning), † M.C.P., 1959, Ph.D., 1964, Pennsylvania; urban design, history.

Kelbaugh, Douglas S.,* 1985, M.Arch., 1972, Princeton; design, energy conservation, professional practice, theory.

Kelley, Charles M.,* 1964, (Emeritus), M.Arch., 1952, Harvard.

Kippenhan, Charles J.,* 1963, ‡(Mechanical Engineering), M.S.M.E., 1946, Ph.D., 1948, Iowa; energy conservation in buildings, heat ventilating and air conditioning, heat transfer, fluid mechanics.

Kolb, Keith R.,* 1952, M.Arch., 1950, Harvard; design, professional practice.

Lovett, Wendell H.,* 1948, (Emeritus), M.Arch., 1948, Massachusetts Institute of Technology; design.

Nyberg, Folke E.,* 1969, (Scandinavian Languages and Literature), (Urban Design and Planning), † M.Arch., 1960, Yale; theory, urban design, professional practice.

Pundt, Hermann G.,* 1968, (Art), † M.A., 1960, Illinois; Ph.D., 1969, Harvard; history, historical preservation.

Schneider, Raymond C.,* 1984, (Emeritus), (Education), M.S., 1952, Kansas State; Ed.D., 1955, Stanford.

Seligmann, Claus A.,* 1984, Dipl.Arch., 1950, London Polytechnic Institute; design, design process, theory.

Small, Robert E.,* 1965, (Landscape Architecture), † M.Arch., 1955, Oregon; design for elderly disabled, housing, site planning, design process.

Staub, Christian, 1967, Certificate, 1944, Switzerland; photography.

Streissguth, Daniel M.,* 1955, (Emeritus), M.Arch., 1949, Massachusetts Institute of Technology; design process.

Thiel, Philip,* 1961, (Urban Design and Planning), † M.S.Nav.Arch., 1948, Michigan; visual design, design process, person-environment relations, experiential notation.

Varey, Gordon B.,* 1982, (Building Construction), † M.Arch., 1966, California (Berkeley); building technology and construction, professional studies, research.

Vernez Moudon, Anne,* 1980, (Landscape Architecture, Urban Design and Planning), † Dr.èSc., 1987, Ecole Polytechnique Federale de Lausanne (Switzerland); urban design, city form and neighborhood studies, design research.

Zarina, Astra,* 1964, (Urban Design and Planning), † M.Arch., 1955, Massachusetts Institute of Technology; design, foreign studies.

Associate Professors

Albrecht, Robert G.,* 1960, M.S.C.E., 1960, Massachusetts Institute of Technology; structures.

Alden, Richard S.,* 1961, M.Arch., 1960, Yale; Ph.D., 1971, Pennsylvania; design process, environment/behavior, research, photography.

Clausen, Meredith L.,* 1979, (Art History), † M.A., 1972, Ph.D., 1975, California (Berkeley); ethics and contemporary architecture.

Curtis, J. William,* 1962, M.A., 1969, Washington; design process, professional studies.

Donnette, James J.,* 1966, M.Arch., 1969, Washington; graphics, design.

Goldblatt, Steven M., 1982, ‡(Building Construction, Education, Civil Engineering), J.D., 1977, Golden Gate; law for architects.

Heerwagen, Dean R.,* 1975, M.S., 1967, B.Arch., 1971, Massachusetts Institute of Technology; environmental controls (passive and active).

Hill, Warren T.,* 1959, M.A., 1961, New York; interior design, design, history.

Kiyak, Asuman H.,* 1977, ‡(Oral and Maxillofacial Surgery, Psychology), M.A., 1974, Ph.D., 1977, Wayne State; gerontology, geriatric dentistry, behavioral aspects of health care.

LaTourelle, Elaine D.,* 1975, M.Arch., 1964, Yale; design, professional practice.

Lebert, Edgar A., 1967, M.S., 1967, Washington; structures.

Milliet, Marietta S.,* 1976, M.Arch., 1972, Massachusetts Institute of Technology; illumination, environmental controls.

Minah, Galen F.,* 1970, M.Arch., 1968, Pennsylvania; design process, design, professional practice.

Rohrer, John A., 1948, (Emeritus), B.Arch., 1937, Washington.

Rolfe, George R., 1984, ‡(Building Construction, Urban Design and Planning), M.Arch., 1968, M.P.H., 1968, Pennsylvania; management, development, and history.

Rosner, Arnold S.,* 1966, M.S.C.E., 1949, California Institute of Technology; design process, building technology, computers.

Ryan, Dennis M.,* 1975, (Urban Design and Planning), † M.A., 1968, Ph.D., 1976, Pennsylvania; urban design and planning, community design principles and practice, urban change and continuity.

Sasanoff, Robert,* 1963, M.C.P., 1968, California (Berkeley); design process, person-environment relations.

Sproule, John, 1948, (Emeritus), B.Arch., 1934, Washington; architecture.

Assistant Professor

Loveland, Joel E., 1985, (Research), M.Arch., 1980, California (Los Angeles); energy conservation, design, research.

Lecturers

Dee, Jennifer, 1985, M.Arch., 1984, Washington; theory, community design.

Deines, Katrina,* 1985, M.Arch., 1979, Washington; design, theory, foreign studies.

Johnson, Brian R., 1980, M.Arch., 1981, Washington; computer graphics, computer applications, CAD systems.

Mohler, Richard E., 1986, M.Arch., 1984, Pennsylvania; design.

Onouye, Barry S., 1969, M.S.C.E., 1969, Washington; structures, design.

Vanags, Andris, 1976, B.F.A., 1968, Washington; building science, design.

Williams, Roger B., 1976, M.Arch., 1969, Washington; design.

Zuberbuhler, Douglas R.,* 1968, M.Arch., 1968, Washington; graphics, design.

Course Descriptions

Some aspects of the program, including course numbers and content, may change after the printing of this catalog. The department may be contacted for updated information.

Courses for Undergraduates

ARCH 150, 151 Appreciation of Architecture I, II (2 or 3, 2 or 3) Asp,WS Bosworth, Pundt Historical survey of the architecture of Western civilization. For nonmajors.

ARCH 250 American Architecture and Urban Environments (2) Pundt Study and critical investigation of architecture and the problems of urban design in North America from colonial times to the present. For nonmajors.

ARCH 302 Architectural Design I (6) WSp Studio problems in dwelling design, with emphasis on regionalist building typology and on design methodologies.

ARCH 303-304-305 Introduction to Architectural Design I, II, III (6-6-6) A,W,Sp Studio problems that develop initial awareness, knowledge, and basic skills needed in synthesis of building form and integrative aspects of architectural design; emphasis on the dwelling place. Limited to students entering the graduate program in architecture with baccalaureate degrees in other fields. Prerequisite: first-year student standing in three-year M.Arch. program.

ARCH 310 Graphic Visualization and Representation (2) AWSpS Zuberbuhler Concepts, conventions, and techniques of graphic visualization and representation in the design of professions: lettering, drafting, multiview projections, descriptive geometry, and topographical drawing.

ARCH 311 Graphic Simulation and Presentation (2) AWSpS Concepts and techniques of graphic simulation and presentation of the experiential quality of design proposals: perspective projection and sun and shadow. Prerequisite: 310.

ARCH 312 Design Graphics Laboratory (2) Sp Additional laboratory exercises as continuation of 310 and 311 with emphasis on advanced graphics specific to particular design majors. Student proposals for projects are encouraged. Prerequisite: 311.

ARCH 313 Introduction to Architectural Photography (2) AWSpS Basic elements and processes of architectural photography to include: camera controls, exposure technique, and photo processing. Student must provide own camera with lens, shutter, and aperture controls.

ARCH 314 Introduction to Architectural Drawing (2) AWS Skill development in conceptualization of forms and their relationships through observation and recording in freehand graphic manner. The course deals with proportion, scales, light effect, value texture, and various perspective techniques.

ARCH 320 Introduction to Structures I (3) Statics and strength of materials.

ARCH 321 Introduction to Structures II (3) Design of structural elements in timber and steel.

ARCH 322 Introduction to Structures III (3) Building framing systems; wind and seismic loads, long-span structures.

ARCH 330 Construction Materials and Techniques I (3) Fundamentals of building construction with emphasis on wood structures. Laboratory exercises designed to develop student intuition and understanding of how tools, materials, and structure interact in building design and construction.

ARCH 350 Architecture of the Ancient World (3) A Bosworth Architectural history in the Western world from beginnings to A.D. 550.

ARCH 351 Romanesque, Gothic, and Renaissance Architecture (3) W Hildebrand Architectural history in the Western world from A.D. 550 to 1750.

ARCH 352 History of Modern Architecture (3) Pundt Architectural history in the Western world from 1750 to the present.

ARCH 360 Introduction to Architectural Theory (3) Function of architectural theory in comprehending and ordering various human purposes in architecture, types of architectural purpose, types of theories. Current concerns.

ARCH 400 Architectural Design II (6) Asp Various studio problems in nonresidential building design to develop basic skills in the synthesis and integration of building form. Prerequisite: 302.

ARCH 402 Architectural Design III (6) In this course, the student chooses from among many separate sections that introduce particular architectural design theories and methodologies. Focus and format vary. Prerequisite: CAUP 401.

ARCH 403 Architectural Problems (6) AWSpS Entry card required.

ARCH 410 Architectural Working Drawings (2-3) Lectures and optional laboratory exercises focusing on the content, organization, and conventions commonly used in preparing working drawings for the building industry, specifically in relation to the other contract documents, construction practices, and legal considerations. Prerequisite: 310.

ARCH 411 Computer Graphics Applications (3) AWS Johnson Lectures and hands-on laboratory experience that focuses on learning to use general purpose graphics software, including VISIT, the MOVIEBYU programs and AutoCAD.4. Prerequisite: CAUP 270.

ARCH 412 Architectural Illustration and Presentation (3) Sp Zuberbuhler Issues, conventions, and techniques used in architectural renderings: line drawings, shaded drawings, use of color, composition, organization, advanced perspective, scale figures, entourage, reflections, and media. Prerequisite: 311.

ARCH 413 Architectural Photography Projects (2) AWSp Staub Projects involving the study of illumination and perspective as related to the representation and perception of space, form, color, texture, pattern, and scale of architectural subjects. Student must provide own camera with lens, shutter, and aperture controls. Prerequisite: 313.

ARCH 414 Freehand Drawing (3) Thiel Introduction, emphasizing accurate observation of visual qualities of a variety of forms and an experimental approach to their coherent freehand representation using uncorrected contour line.

ARCH 415 Architectural Sketching (3) Exercises in freehand representational drawing using charcoal, graphite, and conte crayon with emphasis on line, proportion, values, composition. Studies progress from geometric to nongeometric forms.

ARCH 420 Structural Design I (4) A Reinforced concrete fundamentals. Prerequisite: 322.

ARCH 421 Structural Design II (4) W Design of steel structures.

ARCH 422 Structural Design III (4) Sp Design of reinforced concrete structures.

ARCH 426 Structural Unit Masonry (3) S Lebert Structural behavior and design of reinforced brick, tile, and unit masonry structures. Joint with CESM 487. Entry card required.

ARCH 430 Materials and Processes (3) A Vanags Lectures, field trips, and laboratory sessions directed toward the nature, potentials, and limitations of a variety of materials (wood, metal, plastics, inorganic cementing materials, minerals, rocks, and clay) and the processes involved with their production, fabrication, and system compatibility. Entry card required.

ARCH 431 Environmental Controls (3) A Description of thermal comfort needs and the means by which buildings can be designed to satisfy those needs. Consideration of how climate determines building forms, site analysis and planning vis-à-vis the local climate, basic heat transfer mechanisms, and design strategies for overcoming heat loss through the building envelope.

ARCH 432 Construction Materials and Techniques II (3) Survey of construction materials and techniques of steel, masonry, and concrete buildings. Prerequisite: 330 or CAUP 301. Entry card required.

ARCH 433 Active Control Systems for Building Operation (3) Heerwagen Electrical, mechanical (HVAC), plumbing, and fire safety systems for buildings; descriptions of what these systems do, where they are used, how they are integrated into the overall building design; rules of thumb, design strategies, and other short cuts for anticipating system design and use. Prerequisite: 431.

ARCH 435 Principles and Practices of Environmental Lighting (3) Millet Perception-based approach to the principles of natural and artificial lighting; practical considerations of lighting involving environmental evaluations, calculations and the use of lamps and fixtures; sketch and model studies for applications; impact of lighting design on energy conservation; relation of lighting design process to architectural design concepts. Prerequisite: 431.

ARCH 436 Building Acoustics (3) Description of principles and practices for manipulating and enhancing sound in buildings. Information about sound behavior and the organization of architectural elements (de-

ployment of design features, including various geometries and materials) for the control of sound in enclosed spaces and between adjacent spaces. Entry card required.

ARCH 437 Passive Thermal Controls (3) W Heerwagen Devices for achieving energy-efficient buildings, analytic methods for evaluating likely thermal performances of buildings and building envelopes, resistance and capacitance of building materials, air flow through and around buildings, energy codes and industry standards, and strategies for integrating analytic techniques and guidelines into architectural design process. Prerequisite: 431.

ARCH 439 Light Frame Building Assemblies (3) Sp Vanags Fundamentals of light-frame construction from soils examination, foundation systems to framing systems, and the integration of electrical, plumbing, and heating/cooling into the structure. Prerequisite: College of Architecture and Urban Planning major or permission of instructor.

ARCH 441 Methods and Techniques of PER Research (3) Introductory course to ways and means of discovery in person-environment relations. Requires a working knowledge of data summary measures, but is nonquantitative except in application of measures to class projects data. Involves reading and application of research techniques including: unobtrusive measures, direct assessment through interview and survey, simulation and experimental observation, and phenomenological research. Entry card required.

ARCH 442 Intermediate PER Research and Analysis (3) Extends material introduced in 440 to include multivariate studies and a more thorough treatment of statistical decision procedures. Understanding simulation and quantitative modeling procedures as a means of pretesting and evaluating design proposals is stressed along with the treatment of this information by appropriate decision-theoretic methods. Applied research problems as a means of developing the techniques. Entry card required.

ARCH 443 Experiential Design Notation (3) Thiel Lectures, seminars, and studio/field studies in philosophy, theory, and practice of intervention in the physical environment for socially preferred human experiences. Entry card required.

ARCH 445 Environmental Design Research Through Photography (3) Alden Photographic approach to collection, analysis, and presentation of visual information relevant to design and evaluation of built environments. Case studies, lectures, and class discussions on technical, social, psychological, and visual aspects of environmental design problems, followed by individual and team photographic projects resulting in completed visual or audiovisual presentations.

ARCH 447 Physical Structure and Human Interactions (3) W Sasanoff Effect of physical structure on human interaction.

ARCH 449 Designing Environments for the Elderly (3) Kiyak Introduces students of design disciplines to gerontology and considerations necessary in designing for an aging population. Entry card required.

ARCH 452 Characteristics of Puget Sound Architecture and Towns (3) Hildebrand Puget Sound architectural and town environment in terms of its historical development, but specifically including recent and pending changes affecting this environment in significant ways. Entry card required.

ARCH 454 Greek Architecture (3) Sp Langdon Detailed study of Greek architecture from its beginnings, with special emphasis on the Periclean building program in fifth-century Athens. Joint with ART H 446 and CL AR 446. Entry card required. (Offered alternate years.)

ARCH 455 Special Studies In Gothic Art and Architecture (3) *Hildebrand* Detailed study of Gothic architecture and its accompanying sculpture and stained glass, with special emphasis on the twelfth and thirteenth centuries in France and England. Joint with ART H 455. Entry card required.

ARCH 458 South Asian Architecture (3) *Curtis* Introduction to South Asian architecture, its generating forces, parameters, and consequent environments. Entry card required.

ARCH 460 Design Theory and Analysis (3) Problematic nature of philosophies of architecture; interaction of philosophical concepts and architectural form and expression. Fundamentals of architectural criticism.

ARCH 481 Recent Developments In Architectural Theory (3) Concentrates particularly on developments that spring from recent work in the epistemology of science and in philosophy. Entry card required.

ARCH 478 Architectural CAD Systems (4) *WSp Johnson* Development, use, and limitations of architectural computer-aided design systems in the professional office. Lectures, readings, and exercises utilizing the college's CAD system as well as other computers. Prerequisites: 411 and CAUP 270.

ARCH 493 Rome Preparation Seminar (2) Seminar dealing with history, culture, topography, and customs of Rome, Italy. Required for students enrolling in 495, 496, or 497.

ARCH 494 Rome Studies (9) While resident in Rome, students study the urban fabric, art, and architecture of Italy with aid of illustrated lectures, walking tours, museum visits, and field trips to important sites around Rome and in northern and southern Italy. Projects and lectures supplemented with language classes, sketching sessions, and group workshops. Entry card required.

ARCH 495 Architectural Studies Abroad (9) Urban history and development of the city of Rome through first-hand studies of its topography and morphology. City's more recent quarters become subject of group research relative to problems and potentials of growth and future development. Students may be registered concurrently in an appropriate studio section. Prerequisite: 493. Entry card required.

ARCH 496 Architectural Studies Abroad (9) Studio-oriented projects and application of experience gained during preceding program. Seminars held in collaboration with Italian students, professionals, and educators. Prerequisite: 495.

ARCH 497 Italian Hilltowns (9) *S Zarina* Introduction to origins and development of built forms prevalent in the hilltowns of central Italy, a comparative analysis of domestic architecture in the agricultural context of the confluence zone of Tuscany, Umbria, and Latium and a historical survey of fortresses, castles, palaces, villas, and gardens of upper Latium. Prerequisite: 493. Entry card required.

ARCH 498 Special Projects (1-12, max. 12) *AWSpS* Instructor-initiated and department-approved systematic study and offering of specialized subject matter. Topics vary and are announced in preceding quarter. Entry card required.

ARCH 499 Undergraduate Research (1-6, max. 6) *AWSpS* Entry card required.

Courses for Graduates Only

ARCH 500-501-502 Architectural Design Studio (6-6-6) A,W,Sp Theories and processes in architectural design, with emphasis on development of professional skills in design synthesis. Urban design, preservation design, and interior design. Prerequisites: 305 or equivalent and admission to the graduate program in architecture.

ARCH 503-504-505 Architectural Design Studio Options (6-6-6) A,W,Sp Advanced architectural studios in general architectural design, in special projects examining particular architectural determinants, and in architectural research. Focus and format vary with instructor. Prerequisite: 502.

ARCH 506 Advanced Architectural Studies (6) *AWSpS* Advanced experimental studies dealing with significant architectural relationships that involve scholarly investigation, development, and presentation of results. Entry card required.

ARCH 520 Advanced Wood Structures Design (3) *Albrecht* Design methods related to wood structures. Nature of wood as a building material, plywood, glued laminated wood structures, timber piles and pile foundations, pole buildings and conventional wood building framing. Entry card required.

ARCH 521 Structural Design Through Model Studies (3) *Albrecht* Theory of models, dimensional analysis, direct model analysis; studies employing specific materials, techniques of testing and measurement. Joint with CESM 477. Entry card required.

ARCH 522 Skin-Resistant Structures (3) *Albrecht* Resistance mechanisms, structural systems employing plates, folded plates, shells, and membranes with applications to the structural design process. Entry card required.

ARCH 523 Industrialized Building Systems (3) *Rosner* Consideration of the evolution of prefabrication, building products, components, construction methods, and building systems through the nineteenth and twentieth centuries. Entry card required.

ARCH 535 Graduate Seminar, Study Topics In Environmental Lighting (3) *Millet* Focus on individual student projects involving research and design for lighting. Entry card required.

ARCH 551 Scandinavian Architecture of the Nineteenth and Twentieth Centuries (3) *Nyberg* Introduction to the contribution of Scandinavian architecture to early functionalism with emphasis on its relationship to neoclassicism and vernacular architecture.

ARCH 553 Special Studies In Architecture In the Ancient World (3) *Bosworth* Study and critical analysis of a selected topic from classical or preclassical periods. Prerequisite: 350.

ARCH 554 Special Studies In Modern Architecture (3) *Pundt* Study and critical analysis of a selected number of distinguished professionals (architects, planners, educators, critics) and their contributions to the evolution of modern and contemporary architectural practice and thought. Entry card required.

ARCH 556 History of Chicago School Architecture (3) *Pundt* Study and critical investigation of the contribution of major architects in Chicago, the Midwest, and the West Coast from circa 1870 to 1920. Entry card required.

ARCH 557 Neoclassicism and Romanticism In Europe and America (3) *Pundt* Study and critical investigation of European and American architecture and urban design from 1750 to 1850. Entry card required.

ARCH 559 American Utilitarian Architecture (3) Significant American environmental design efforts arising from utilitarian needs (e.g., factories, bridges, skyscrapers, and associated technical building innovations). Entry card required.

ARCH 560 Graduate Seminar on Architectural Theories (3) *W Nyberg, Seligmann* Recent developments in architectural theory, urban design theory, criticism, and the methodology of criticism. Entry card required.

ARCH 561 Urban Design Theory (3) *Nyberg* Theories of nineteenth- and twentieth-century urban design; closely parallels directions in architecture and urban planning. Theoretical premises of these movements related to current practices of urban design in various sociopolitical contexts, European and American. Evolutionary nature of theory. Prerequisite: previous classes in environmental history or permission of instructor.

ARCH 571 Project Feasibility (3) *Wright* Social, political, and economic factors affecting the location, design, financing, construction, and marketing of buildings.

ARCH 572 Specifications and Contracts (3) Detailed organization and composition of contracts, specifications, and related contract documents.

ARCH 573 Professional Practice (3) *Sp* Operation of an architectural office and professional practice. Entry card required.

ARCH 574 Law for Architects and Engineers (3) *Sp Goldblatt* Legal issues facing architects and engineers, focusing on liability avoidance. Topical areas include basic doctrines, the design professional/client relationship, the construction process, and professional practice problems. Entry card required.

ARCH 575 Graduate Seminar: Research/Study Methods (3) Methods and techniques used in research/study, with particular emphasis on investigative procedures for graduate students in architecture; includes a review of methodologies from related disciplines as applied to recent and ongoing research/study decision making. Assistance and guidance is given in the selection of a research/study topic, proposal writing, and thesis preparation. Offered on credit/no credit basis only. Entry card required.

ARCH 577 Design Development (3) Lectures and drafting room practice emphasizing development phase of contract documents. Entry card required. (Formerly 480.)

ARCH 578 Computer Applications In Architecture (3) Feasibility for application of computing techniques and systems to professional practice. Entry card required.

ARCH 580 History of Historic Preservation In Europe (3) *Pundt* European achievements in historic preservation and restoration of architecture. Prerequisite: specialization in preservation design or permission of instructor.

ARCH 581 Historic Preservation of Architecture, U.S.A. (3) *Sp Pundt* American achievements in historic preservation and restoration of architecture. Prerequisite: specialization in preservation design or permission of instructor.

ARCH 582 Technical Issues In Preservation Design (2) *W Murphy* Issues, practices, and procedures involved in preservation and reuse of old and historic buildings; technical and esthetic means by which practicing professionals approach analysis, interpretation, and resolution of problems such work creates. Recent and local projects and related experiences. Entry card required.

ARCH 583 Graduate Seminar on the Theory of Housing Design (3) Entry card required.

ARCH 594 Health Facilities Planning (3) Examination of the organization and execution of the total planning process for health-care facilities, with individual parallel studies in selected topics. Entry card required.

ARCH 596 Fieldwork In Professional Practice (*, max. 9) *Donnette, Kelbaugh* On-location study under the supervision of a practicing professional involved in an aspect of environmental design. Offered on credit/no credit basis only. Entry card required.

ARCH 598 Special Topics for Graduate Students (1-6) AWSp Systematic study and offering of specialized subject matter. Topics vary and are announced in the preceding quarter. May be repeated for credit. Entry card required.

ARCH 600 Independent Study or Research (*) AWSps Offered on credit/no credit basis only. Entry card required.

ARCH 700 Master's Thesis (*) AWSps Offered on credit/no credit basis only. Entry card required.

Building Construction

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The goal of the Department of Building Construction is to provide education that will prepare individuals (1) to be motivated, well-rounded, responsible citizens and (2) to assume technical positions, senior levels of management, or business ownership in construction, development, and related industries. The educational program focuses on four areas: (1) courses providing the broader perspectives of humanities and social and natural sciences, (2) course work that develops self-discipline and analytical and reasoning skills, (3) courses that develop technical skills necessary to define and solve practical construction problems, and (4) course work to build those managerial skills necessary to make sound decisions and to implement those decisions on prudent, timely, and legal bases. An ability to communicate clearly and concisely, with sensitivity to human relations, is essential to the successful completion of this academic program.

The core curriculum is concentrated in the upper division during a typical student's junior and senior years. Engineering courses are concerned with theory and tools useful for creating buildings to meet broad human needs. Technological courses deal with the practical application to building construction of scientific knowledge and methods. Developing an understanding of the utilization, coordination, and control of the people, materials, equipment, and money that compose the construction and development process is the concern of management courses.

The combination of courses provides a unique interdisciplinary experience with proven effectiveness in educating managers to be dynamic leaders in construction, development, and related industries.

The department's faculty comprises an unusual mix of permanent members with part-time professional practitioners. Including many firms' principals, these contractors, architects, engineers, attorneys, and others also serve as advisers to the department and help shape the program to respond to a changing society.

The department, which is celebrating its twenty-fifth year in 1988/89, is a member of the Associated Schools of Construction.

Undergraduate Program

Bachelor of Science in Building Construction Degree

Because the number of applicants is large and the department's resources are limited, the process of admission is very selective. Admission decisions are based on an applicant's academic performance and potential, extent and quality of relevant experience, apparent aptitude, and personal motivation.

Full-time students receive priority over part-time students. The department strongly urges ethnic minorities and women to apply for admission.

Applicants must contact the department to obtain its individual application form and prospectus, which con-

tain details of requirements for admission and continuation. Closing date for receipt of applications by the department is April 1; however, the University admissions application form and its accompanying material must be filed separately at the admissions office much earlier than the department's closing date. Selection for acceptance into the program, which begins Autumn Quarter, is made each year by early May, and all applicants are notified of the admissions committee decision shortly thereafter. Because each application is valid only once, a student whose application for admission is denied must reapply if consideration is desired in any subsequent year.

The first two years of the program can be completed at the University as a premajor in the College of Arts and Sciences or at other four-year institutions or community colleges and consist of the following University courses or their equivalents: ACCTG 210, 220; CHEM 101; CIVE 213; ECON 100; English (writing), 8 credits; I S 200; MATH 156, 157; O E 200; PHYS 114, 115, 117, 118; QMETH 201; SPCH 220; humanities (linked set), 6 credits; natural sciences, 5 credits; social sciences (linked set), 6 credits; electives, 10 credits.

The following upper-division courses integrate the areas of engineering, technology, and management into a perspective of the building industry: ARCH 310, 320, 321, 322, 410, 420, 421, 422; B CMU 301; B CON 301, 330, 331, 332, 350, 370, 390, 401, 420, 440, 470, 480; CETS 405; planning and development, 6 credits; electives, 26 credits.

The program is fully accredited by the American Council for Construction Education.

Graduation Requirements

The Bachelor of Science in Building Construction degree program requires completion of the four-year curriculum with (1) a minimum of 192 applicable credits, (2) a minimum of 2.50 cumulative grade-point average in required upper-division core courses, and (3) a minimum of 2.30 cumulative grade-point average in a student's final six quarters. The last 45 credits must be earned as a matriculated student in residence at the University.

Enriched Undergraduate Program

Students are encouraged to explore the major through an alternative, "enriched" program built on a stronger foundation of liberal arts and environmental design and planning. By initially completing the college's Bachelor of Arts degree program—directed toward the courses listed below—a student can complete the B.S.B.C. degree program in one additional academic year. Having earned no fewer than 225 applicable credits, a student can graduate with both degrees at the end of five years.

The first two years of the enriched program consist of the following University courses or their equivalents: ACCTG 210, 220; CAUP 200; CIVE 213; ECON 100; English (writing), 5 credits; ENV S 204, 205; MATH 157; O E 200; PHYS 114, 115, 117, 118; QMETH 201; SPCH 220; humanities (linked set), 15 credits; social sciences (linked set), 10 credits.

Upon admission to the college's B.A. degree program, the next two years include: ARCH 302, 310, 320, 321, 322, 352, 410; B CON 330, 331, 332, 350; CAUP 270, 300, 301, 340, 401, 470; L ARC 403, 463; URBDP 407; upper-division electives, 15 credits.

Upon admission to the B.S.B.C. degree program, the last year includes: ARCH 420, 421, 422; B CMU 301; B CON 301, 370, 390, 401, 420, 440, 470, 480; CETS 405.

Construction Practice

Although an internship is not required for completion of the degree program, every student is encouraged to seek summer employment in the building industry. This work experience lends reality to later, practice-oriented

courses and sharpens the student's perceptions of developing perspectives. Part-time positions during the academic year often are available to those students who also meet class-related responsibilities.

The department offers to a limited number of its qualified students a formal work/study program with participating contractors. A student receives upper-division elective credits for successfully completing B CON 496 (Construction Practice) during the Summer Quarter following at least one academic year in the program.

Faculty

Chairperson

Steven M. Goldblatt

Professor

Varey, Gordon B.,* 1962, (Architecture),† M.Arch., 1966, California (Berkeley); history of construction.

Associate Professors

Goldblatt, Steven M., 1982, (Architecture, Education, Civil Engineering), J.D., 1977, Golden Gate; construction accounting, labor relations, and law.

Rolfe, George R., 1984, (Architecture), (Urban Design and Planning),† M.Arch., 1968, M.C.P., 1968, Pennsylvania; development, finance, history.

Torrence, Gerard R., 1954, (Emeritus), M.S., 1950, Massachusetts Institute of Technology; structural design.

Lecturers

Aaronson, Barry L., 1980, M.Arch., 1981, Washington; construction technology.

Anderson, Frances J., 1984, M.A., 1979, Washington; construction communications.

Clark, Christopher L., 1986, B.A., 1971, Whitman; building industry.

Harrison, José, 1977, M.S., 1965, Borocourt Institute (England); construction safety.

Hopkins, James W., 1971, M.Arch., 1970, Virginia Polytechnic Institute; construction technology.

Le Tourneau, Michael W., 1985, B.S., 1975, California Polytechnic State; estimating and productivity.

Lewis, William L., 1984, M.S.C.E., 1975, Stanford; project management.

Modawell, Mark A., 1987, B.S.B.C., 1983, Washington; computer applications.

Olson, R. Court, 1984, M.S.C.E., 1972, Stanford; project management and productivity.

Ossinger, Thomas C., 1978, B.S.B.C., 1976, Washington; construction estimating and computer applications.

Rafferty, M. Christopher, 1987, M.S.C.E., 1978, Stanford; project management.

Ratti, Dean B., 1987, M.S.C.E., 1952, Washington; structural design.

Rowley, Louis B., 1984, studied at California (Los Angeles); construction communications.

Siqueland, Herman S., 1975, LL.B., 1960, Michigan; construction law.

Starr, Kenneth F., 1983, M.A., 1975, Minnesota; building finance.

Twelker, Neil H., 1979, A.M., 1954, Ph.D., 1958, Harvard; soils engineering.

Course Descriptions

Courses for Undergraduates

B CON 301 Building Industry (3) A Clark Organization and functioning of the building industry: legal, ethical, business, and management aspects. Entry card required.

B CON 330, 331, 332 Building Technology I, II, III (3,3,3) A,W,Sp Aaronson, Hopkins Introduction to the functional and constructional characteristics of building components: electrical distribution, lighting, heating, air conditioning, plumbing, fire protection, walls, floors, roofs, etc. Prerequisites: 330 for 331; 331 for 332. Entry card required.

B CON 350 History of Building (3) Sp Rolfe Historical survey of building techniques and materials as conditioned by environmental, technical, and social influences. Entry card required.

B CON 370 Construction Accounting (3) A Goldblatt Introduction to accounting for the contractor, placing emphasis on the analysis and use of financial statements and a job cost accounting system. Entry card required.

B CON 390 Construction Labor Relations (3) W Goldblatt Introduction to construction labor topics, including labor-management organization, legislation and regulation, collective bargaining, and job site administration. Entry card required.

B CON 395 Construction Safety (2) Sp Harrison Explanation of the requirements of the Occupational Safety and Health Act and other related federal and state legislation, as applied to the building construction industry. Standards for accident prevention and responsibility for compliance are emphasized. Offered on credit/no credit basis only. Entry card required.

B CON 401 Building Estimating I (5) AW Ossinger Introduction to residential and commercial cost estimating: principles of building costs, estimating, and construction cost control. Entry card required.

B CON 402 Building Estimating II (3) Sp Ossinger Estimating the major CSI divisions of work for large-scale projects. Labor rates, specifications, budget estimating, assembling bids, use of estimating manuals, and estimating change orders. Prerequisite: 401. Entry card required.

B CON 403 Computer Applications in Construction (2) Sp Modawell, Ossinger Introduction to microcomputer applications in construction industry. Discussion of available hardware and software is combined with practical assignments using estimating and scheduling programs designed for contractors, architects, and developers. Entry card required.

B CON 405 Heavy Estimating Techniques (3) Sp Le Tourneau Introduction to principles and techniques of estimating and bidding heavy construction/highway projects. Prerequisite: 401. Entry card required.

B CON 410 Using Contract Documents (3) A Rolfe Introduction to the organization and uses of architectural/engineering drawings and specifications as components of construction contract documents, role they play in communicating among participants in the construction process, and how that role varies depending on the form of contract for construction. Entry card required.

B CON 415 Analysis of Development Processes (3) A Rolfe Introduction to processes of developing real estate and the people involved, and an analysis of their interrelationships. Entry card required.

B CON 420 Building Financing (3) W Rolfe, Starr The financing of building construction: financial institutions, regulations, government participation, and financing principles. Entry card required.

B CON 440 Soils and Foundations (3) A Twelker Origin, classification, and physical properties of soil as used in engineering and construction applications, together with loads and stresses of soil on, and from, the more common types of engineering structures. Entry card required.

B CON 460 Construction Communications (2) W Anderson, Rowley Communication skills for the contractor. Developing those communication skills necessary to manage multimillion-dollar projects. Entry card required.

B CON 470 Project Management (3) Sp Lewis, Olson, Raftery Systematic study of management functions in the building industry: planning and scheduling, organization, time and equipment utilization, monitoring and expediting, project administration, cost control. Entry card required.

B CON 480 Law and the Contractor (3) Sp Siqueland Basic legal aspects of construction of private and governmental projects. Survey of general principles relating to rights and liabilities of the contractor and other parties under construction contracts, including union-labor agreements. Major statutory and regulatory requirements affecting the contractor, including lien laws, environment, and minority hiring practices. Entry card required.

B CON 490 Field Productivity (3) W Le Tourneau, Olson Influences that affect field productivity in construction. Such management factors as job organization and motivation. Fieldwork in production analysis techniques, including time-lapse photography and activity sampling. Entry card required.

B CON 496 Construction Practice (3) S Goldblatt Integration of classroom theory with practical experience through direct, on-the-job application for one summer. For majors in building construction with 135 credits completed. Applicants are selected under competitive application during Spring Quarter. Offered on credit/no credit basis only. Entry card required.

B CON 498 Special Topics (1-10, max. 20) AWSp Systematic study of specialized subject matter. Topics vary each quarter. Entry card required.

B CON 499 Undergraduate Research (*, max. 12) AWSps Individual or small-group studies in which students may select topics with approval of faculty sponsor and department. Entry card required.

Landscape Architecture

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The expanding roles and opportunities for landscape architects are related to the increasing concern for the wise use of America's natural resources and for the quality of design in the built environment. These trends place great demands on landscape architecture programs to develop technical knowledge, analytical skills, and research balancing human needs with the requirements of a healthy natural environment.

Undergraduate Program

Bachelor of Landscape Architecture Degree

The Bachelor of Landscape Architecture degree program is an accredited, professional program that develops analytical and design skills and focuses on an understanding of the landscape resource. The overall objective of the program is to provide learning experiences whereby the program graduate: (1) is capable of identifying landscape issues and problems in terms of human functional needs, natural resource systems, and the interaction between both; (2) develops basic skills to design, implement, and evaluate workable solutions to meet these landscape needs; (3) is knowledgeable of the history, theory, major directions, and service responsibilities of the profession; (4) is able to contribute to the advancement of knowledge within the profession; (5) is knowledgeable of, and sensitive to, the esthetics of our culture; and (6) is aware of his or her individual creative capabilities.

Of the five-year program, applicants complete the first two years in the College of Arts and Sciences, or its equivalent in another junior college, college, or university. All applicants must have a minimum cumulative grade-point average of 2.50. Students are eligible to apply for regular major status upon completion of 75 university- or college-level credits, including departmental prerequisites. The department strongly recommends the student complete 90 credits before entering the major program. Students are normally admitted for Autumn Quarter, with departmental applications due March 1 prior to the autumn in which entry in the program is desired.

Students are admitted as departmental majors in the third, fourth, or fifth year of the program and continue toward completion of the 225 credits required for the degree in studies in the following areas: landscape architectural courses, such as site planning, small-scale site design, urban recreational design, visual assessment, natural processes, project design, site construction, materials and structures, large-scale site construction, plant identification, planting design, professional practice, and practicum; controlled electives, including city and regional planning, geography, soils, geology, and sociology; environmental history and environmental legislation; and free electives.

Individuals with prior degrees may apply to either the undergraduate or graduate program. Advising is available as to which program best suits individual needs. Contact the department for additional information as to prerequisites, application requirements, procedures, and scheduling.

Graduate Program

Master of Landscape Architecture Degree

The Master of Landscape Architecture is an accredited professional program that balances design and research, encompassing a broad spectrum of landscapes extending from the center of metropolitan areas into the surrounding countryside. The Pacific Northwest offers unparalleled opportunities for design case studies and research in a rich diversity of landscape settings. Students desiring additional specialization in urban situations may pursue an M.L.A. degree with certification in urban design.

The M.L.A. curriculum is designed to meet the needs of graduates from B.L.A. programs, other environmental design programs, and nondesign programs. All students complete a core curriculum emphasizing design and research. Students with no design background and/or science background are required to complete additional foundation course work in the deficiency area. On a limited basis, students with professional experience or expertise may propose a specialized course of study toward the M.L.A. degree.

Students are admitted to the graduate program primarily in Autumn Quarter, and all application materials should be received by the department no later than the preceding February 1. The prospective applicant should note that Graduate Record Examination scores, three letters of recommendation, transcripts of previous degree programs, a departmental questionnaire application, and a portfolio for students with design degrees are required for application. The department should be contacted for application forms and additional information.

Faculty

Chairperson

Sally Schauman

Professors

Beyers, William B.* 1967, ‡(Geography), Ph.D., 1967, Washington; economic geography, regional analysis.

Buchanan, Robert T.,* 1970, M.L.A., 1956, Harvard; design, graphic communications, landscape esthetics, environmental art.

Cole, Dale W.,* 1960, ‡(Forest Resources), M.S., 1957, Wisconsin; Ph.D., 1963, Washington; soils and land-use planning, nutrient cycling in forest ecosystems, effects of forest management operations.

del Moral, Roger,* 1968, ‡(Botany, Environmental Studies), M.A., 1966, Ph.D., 1968, California (Santa Barbara); plant ecology, competition, succession, vegetation management.

Haag, Richard, 1958, M.L.A., 1952, Harvard; theory and perception of design, reality of the practice.

Johnston, Norman J.,* 1960, (Emeritus), (Architecture, Urban Design and Planning), † M.C.P., 1959, Ph.D., 1964, Pennsylvania; history of city development, urban design, landscape architecture.

Small, Robert E.,* 1965, (Architecture), † M.Arch., 1955, Oregon; architecture and landscape architecture, theory and design of housing environments, environments for disabled and elderly.

Untermann, Richard K.,* 1971, (Environmental Studies), (Urban Design and Planning), † M.L.A., 1967, Harvard; urban design and site planning, housing, recreation, nonmotorized circulation.

Vernaz Moudon, Anne,* 1980, (Architecture, Urban Design and Planning), † Dr.èsSc., 1987, Ecole Polytechnique Fédérale de Lausanne (Switzerland); urban design, city form and neighborhood studies, design research.

Associate Professors

Schauman, Sally,* 1979, M.S., 1971, Michigan; visual resource theory and assessment, landscape restoration, resource planning and conservation.

Streatfield, David C.,* 1971, (Urban Design and Planning), † M.L.A., 1965, Pennsylvania; regional landscape planning, environmental history, landscape studies, historic landscape preservation, landscape theory.

Assistant Professors

Heerwagen, Judith H., 1981, (Research), ‡(Architecture and Urban Planning), Ph.D., 1982, Washington; environmental esthetics and preferences, children and the natural environment.

Rice, Arthur R., 1981, M.L.A., 1978, Harvard; natural processes, regional planning, computer applications in design, design theory.

Robertson, Iain M., 1982, M.L.A., 1975, Pennsylvania; planting design, landscape design.

Lecturers

Austin, Gary D., 1985, M.L.A., 1981, California State Polytechnic; landscape construction, natural processes.

Ching, Francis D. K., 1985, (Architecture), B.Arch., 1966, Notre Dame; design, graphics, construction.

Nakano, Kenichi, 1973, M.L.A., 1973, Harvard; project design, multimedia presentation techniques, site planning.

Promer-Nichols, Sarah, 1987, M.L.A., 1982, Harvard; project design, site planning, graphics.

Course Descriptions

Courses for Undergraduates

L ARC 200 Landscape Architecture Field Trips (2) Five field trips introduce typical landscape architecture projects and demonstrate scope of the landscape architecture field. Visits to major projects in the Puget Sound region include city and county parks, river parks, harbors, downtown redevelopments, street-scapes, campus headquarters, and others.

L ARC 300 Introductory Landscape Architecture Design Studio (6) AS Develops basic design and graphic skills. Studio, lectures, field trips, and one-day workshops. Students conduct site analyses and produce drawing to convey design concepts. Relationship of visual perception to drawing, role of values in design, verbal communication, and behavioral analysis of design process.

L ARC 301 Site Planning (6) A Introduction to site planning and landscape design, covering the factors of site analysis and planning, resource utilization, site suitability related to specific programs and activities; and planning, design, construction, and behavioral studies for selected case study projects.

L ARC 302 Site Design in Urban Context (5) W Buchanan, Robertson Design of public use areas in the urban area. Project types for this course are waterfront development, commercial areas, campus and cultural centers, plazas and historical sites; recommendation for policy to be established as part of the design solution.

L ARC 303 Natural Processes Studio (5) Sp Rice, Streatfield Project design studies in areas of "critical concern," related to environmental restraints, natural systems, landscape character, and capacity of site to recover from human intervention. Generally deals with environmental issues in relation to federal, state, and local legislation, policies, and funding. Computer applications in design. (Formerly 403.)

L ARC 310 Landscape Architecture Field Sketching (2) Buchanan Introductory level sketching of landscape subjects: natural and urban sites, plants, animals, architectural elements. Emphasis on perspective. Various media, including pencil, charcoal, markers, ink wash, water color.

L ARC 311 Introduction to Design Graphics (2) A Introduction to communication techniques for various phases of the design process. Many techniques are introduced and their suitability and appropriateness for different purposes explored.

L ARC 322 Introduction to Planting Design (3) A Robertson Traditional ways plants are used in landscape design. Composition and design characteristics of plant materials. Technical considerations for selection, climate, cultural suitability, availability, costs, and maintenance. Open to nonmajors.

L ARC 331 Landscape Construction (4) W Basic course in site engineering, correlating the design and technical aspects of site development and suitability. Grading, drainage, circulation requirements and alignment, organization concepts relative to landscape resources, site evaluation, utilization and protection, and building and site program analysis and coordination.

L ARC 332 Landscape Construction (4) Sp Materials and structures in landscape construction. Design criteria and construction techniques for detail elements of landscape architecture. Working drawings, specifications, cost estimates, and procedures.

L ARC 341 Site Planning (3) A Untermann Introduction to site planning and landscape design, covering the factors of site analysis and planning; resource utilization; site suitability related to specific programs and activities; and planning, design, construction, and behavioral studies for selected case study projects. Open to nonmajors.

L ARC 352 History of Landscape Architecture (3) W Analysis of the landscape as an art form and its relation to the culture of each period. Open to nonmajors.

L ARC 353 History of Modern Landscape Architecture (3) A Streatfield Development of profession and art of landscape architecture in the United States, Europe, and South America in context of prevailing social, economic, political, and cultural factors. Relation-

ships with other professions, especially architecture and urban planning, and other arts, such as painting and sculpture. Open to nonmajors.

L ARC 361 Theory and Perception of Landscape Architecture (3) AW Haag Reciprocal relationships of man/nature are explored, with particular attention given to the cultural variations and interpretations of esthetics, landscape materials, and human behavior and their effects on site planning and project design. Landscape architecture philosophy related to the physical design problems and potentials of the Pacific Northwest. Open to nonmajors.

L ARC 362 Landscape Design in Urban Contexts (3) W Introduction to site design in context of urban setting. Discussion related to role of landscape architect as contributor to quality of urban environment. Case study material covers diversity of design concepts and vocabulary utilized in landscape design. Recommended: 341, 361.

L ARC 363 Natural Processes as Planning and Design Determinants (3) Sp Streatfield Introductory lecture course relating methods, procedures, and rationale for use of natural process information—soils, vegetation, hydrology, physiography, wildlife, and geology. The planning/design process covers areas of critical concern, environmental restraints, natural systems, landscape character, and capacity of site to recover from human intervention. Open to nonmajors. (Formerly 463.)

L ARC 401 Urban Recreational Design (6) Sp Untermann Special studies in metropolitan, urban, and neighborhood recreation areas; the design, policies, and behavioral studies of existing parks, playgrounds, public places, and commercial areas. Design projects dealing with the play environment for all ages. (Formerly 303.)

L ARC 402 Landscape Design Studio (6) W Untermann Large-scale site planning and design. Generally related to housing, new communities, and institutional development. Identification of landscape character, resources, and problems of site, cost factors, design alternatives and implications for architectural direction, policy for land acquisition. Program development to maximize site utilization and preservation of natural attributes.

L ARC 403 Landscape Visual Assessment (6) A Schauman Studies of the landscape at various scales and in diversified contexts. Offers better understanding of visual components of landscapes, designer's capacity to evaluate and change these components, and resultant interaction with, and effect on, landscape user. (Formerly 401.)

L ARC 406 Individual Design Studio (6) AWSps Senior projects in landscape architecture; projects vary according to the student's particular emphasis and needs.

L ARC 411 Landscape Graphics (3) A Buchanan Delineation techniques for landscape perspectives, sections, rendering of plant materials. Historical and contemporary examples of landscape drawing.

L ARC 412 Landscape Communications (2) Sp Office presentation techniques for various phases of landscape architectural projects. Multimedia techniques and presentation methods suitable for public hearings, citizen groups, design commissions, and private clients. Individual projects and case-study examples.

L ARC 423 Planting Design Studio (3) Sp Robertson Utilization of plants as design elements to manipulate space and modify the landscape for various activities and resolutions of site problems. Factors that determine the appropriate use and arrangement of plant materials in an urban context. Composition, plant selection, planting techniques, and maintenance requirements are major components of this class. Prerequisites: 322 and BOT 331 or equivalent.

L ARC 424 Advanced Planting Design Seminar (2) Sp Analyzes the complex relationship between plants, man, and environment and affords opportunity to explore methods of utilizing these relationships to plant and to design more responsive landscapes. Prerequisites: upper-division standing and permission of instructor.

L ARC 425 Advanced Planting Design Studio (5) Sp Advanced seminar/studio in planting design. Provides opportunity to explore ecological, technical, and esthetic principles for selecting plants to meet specific site conditions (e.g., problem soils, winds, waters). Project types include historical sites, multifamily housing projects, plazas, landfills, and reclamation sites. Prerequisites: upper-division standing and permission of instructor.

L ARC 433 Large-Scale Site Construction (4) A Includes studies of natural determinants and restraints on large-scale construction, development affected by service and utility systems, physiographic suitability of site, cost-benefit analysis, and critical path methodology for site construction projects. Prerequisites: 331, GEOL 313.

L ARC 450 History of Environmental Design in the Pacific Northwest (3) S *Streafeld* Development of landscape architecture, architecture, and urban planning in the Pacific Northwest from nineteenth century to the present, with major emphasis on twentieth century. Open to nonmajors.

L ARC 451 History of Environmental Design on the West Coast (3) S *Streafeld* Development of the environmental parts of landscape architecture, architecture, and urban planning from the eighteenth century to the present, with major emphasis on twentieth century. Open to nonmajors.

L ARC 463 Urban Recreational Design (3) Sp *Untermann* Special recreational studies in metropolitan, urban, and neighborhood areas; the design, policies, and behavioral studies of existing parks, playgrounds, public places, and commercial areas. Design projects dealing with the play environment for all ages. Open to nonmajors. (Formerly 363.)

L ARC 470 Landscape Architecture Tutorial (2, max. 6) Various aspects of project organization, programming, scheduling of work loads, graphic and verbal communication problems, data collection methods and interpretation, methodologies for landscape planning and design. Prerequisites: fourth- or fifth-year standing and one quarter advance permission of instructor.

L ARC 473 Professional Practice (3) Sp *Schauman* Professional practice in private office, academic institutions, and public agencies. Evolution of landscape architecture as a profession, possible scenarios for future, variety of practice types and their relationships, ethical and legal/contractual responsibilities of a professional.

L ARC 474 Project Design (8) Sp *Nakano* Detailed design studies of small-to-medium-scale projects. General focus on public landscape areas and social/psychological uses of site: design master plan and details, planting and construction documents, and professional office presentation of material. Prerequisite: fifth-year standing in the department.

L ARC 476 Professional Operations (3-6, max. 6) AWSp *Untermann* Practicum course for landscape architecture majors for internship and exposure to the profession with working experiences at various levels of professional endeavor. Student apprenticeship in selected private offices and public agencies. Prerequisite: permission of instructor.

L ARC 477 Landscape Architecture Consultancy Studio (3-6) AWSpS Simulation of the professional relationship of the landscape architect as a consultant to University students in other design planning and

management disciplines. Focus is on site analysis, master planning, schematic designs and detailed design, working drawings, and planting plans associated with student projects. Prerequisite: fourth- or fifth-year standing in the department.

L ARC 495 Landscape Architectural Studies Abroad (1-10, max. 30) S Studies conducted under faculty supervision in various locations outside the United States. Prerequisite: permission of instructor.

L ARC 498 Special Projects (1-10, max. 30) AWSpS Special projects as arranged. Open to nonmajors.

L ARC 499 Undergraduate Research (1-6) AWSpS Individual or small-group studies pertaining to special problems, theories, or issues of landscape architecture and environmental issues. Prerequisite: approval of application by a faculty sponsor.

Courses for Graduates Only

L ARC 501 Landscape Design and Planning I (6) A Enhances perceptual awareness and design sensitivity to natural and man-made landscapes. Basic skills necessary for more advanced course work required in the master of landscape architecture degree program (i.e., relationship between landscape perception, graphics, site analysis, and design). Examination of landscape environment through problem-solving techniques that acknowledge holistic approach to the environment. Prerequisite: permission of instructor.

L ARC 503 Landscape Design of Communities (6) Sp Studios methods and techniques for developing physical design solutions and implementation strategies in neighboring and small communities. Social, economic, political, and individual forces affecting community development and growth. Comparison of several communities, identifying pertinent landscape issues, potential design solutions, and methods for achieving design goals through the political process.

L ARC 504 Regional Landscape Planning (6) A *Rice* Studio in applied regional landscape planning in metropolitan regions to examine conflicting land-use pressures of urban/rural fringe. Ecosystematic approach emphasizes maintenance of landscape quality. Computer applications in design. Open to nonmajors. Prerequisite: permission of instructor.

L ARC 505 Regional Landscape Design (6) W *Streafeld* Theory/techniques of regional design to analyze, evaluate, plan, design, and manage the resources of the regional landscape continuum. Open to nonmajors. Prerequisite: permission of instructor.

L ARC 506 Landscape Visual Resources (6) Sp *Schauman* Survey of existing theory/techniques and the generation of new methods to analyze, evaluate, plan, design, and manage the visual resources of the landscape. Open to nonmajors. Prerequisite: permission of instructor.

L ARC 507 Landscape Art (6) Sp *Buchanan* Public art placed in, or developed for, specific landscape settings. Various aspects and benefits of public art, including materials, technologies, philosophies of landscape imagery and meaning. General planning criteria for location for maximum public benefit and identification of objectives for a specific site and artwork. Open to nonmajors. Prerequisite: student standing in architecture, art, or landscape architecture or permission of instructor.

L ARC 511 Visual Learning (3) A Seminar/laboratory to develop visual learning processes and skills for applying these processes to landscape architecture. Related visualization concepts. Prerequisite: permission of instructor.

L ARC 523 Landscape Technology (6) A *Schauman* Studio on application of technologies and their appropriateness for rehabilitation, restoration, and creation of landscapes at site-specific scale. Examination

of maintenance programs, implementation problems, and public policy. Open to nonmajors. Prerequisite: permission of instructor.

L ARC 550 History and Theory of Modern Landscape Architecture (3) A *Streafeld* Lecture/seminar on history and theory of landscape architecture from the eighteenth century to the present. Relation to theory in related environmental design disciplines such as architecture and urban planning and other disciplines such as geography. Open to nonmajors. Prerequisite: permission of instructor.

L ARC 561 Regional Landscape Planning and Design (2) A *Streafeld* Seminar on objectives, philosophy, history, and theory of regional landscape planning and design. Overview of the context of regional landscape planning, examination of critical issues in the Pacific Northwest, and opportunities and role of the landscape architect in addressing these issues. Open to nonmajors. Prerequisite: permission of instructor.

L ARC 562 Landscape Art (2) Sp *Buchanan* Process of developing and placing artwork in specific landscape settings. Types of artwork and landscape settings; ways for artist and site designer to interpret, alter, and incorporate factors of landscape; viewer's perception and experience; examples of public and private support.

L ARC 570 Design Evaluation (3) W *Rice* Design evaluation as a means to improve results. Esthetic, behavioral, and environmental evaluation issues, addressing role of each in design context and discussing impact of divergent viewpoints in evaluation process. Purposes, methods, and inherent biases of design evaluation. Prerequisite: permission of instructor.

L ARC 590 Seminar in Landscape Architecture (1-3, max. 12) AWSpS Advanced topics in landscape architecture with focus on unpublished areas of research. Prerequisite: permission of instructor.

L ARC 598 Special Topics (1-6, max. 9) AWSpS Systematic study of specialized regional landscape subject matter, including history, technology, implementation, and other topics depending on current interest/needs. Topics vary and are announced in the preceding quarter. Prerequisite: permission of instructor.

L ARC 600 Independent Study or Research (*) AWSpS

L ARC 601 Internship (3-9, max. 9) AWSpS Offered on credit/no credit basis only. Prerequisite: permission of instructor.

L ARC 700 Master's Thesis (*) AWSpS

Urban Design and Planning

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Urban planning is a field that deals with critical issues of human settlement and urban development requiring special knowledge and skills to provide communities with an informed basis for coordinated action. Urban planning and design constitutes a professional field of growing complexity to respond to the urban complexities of the twentieth century. The Department of Urban Design and Planning fosters an integrative approach to education and research in planning the physical environment. The academic program includes the social, behavioral, and cultural relationships between people and the form and quality of their built environment; the financial, administrative, and participatory dimensions of planning, design, and development; and the informational base for making deliberate decisions to shape urban areas. The department is a participating partner in offering a new Bachelor of Arts degree integrating architecture and urban planning, described under the college's Bachelor of Arts degree program.

The department administers the Remote Sensing Applications Laboratory (RSAL), which has as its primary mission the development of applications for information produced by remote sensing technology. This includes aerial photography and newer systems, such as Landsat. The college has recently acquired the ARC/INFO geographic information software system, which provides a vast array of techniques for the research and geographic educational activities in which the department is involved.

Graduate Program

The Department offers two graduate degrees: the Master of Urban Planning (M.U.P.) and the Doctor of Philosophy (Ph.D.). The M.U.P. is the professional degree, and the Ph.D. is for students planning to enter research and teaching positions in urban planning and design.

The graduate program focuses on physical land-use planning and urban design. Students are encouraged to conduct research and studies in specializations such as urban design dealing with physical form, character, and quality issues; urban and real estate development focusing on the public/private context of development processes, public policy, physical development and design, finance, and community development processes; and land-use planning, including its environmental, socioeconomic, legal, information systems, and administrative aspects.

Master of Urban Planning Degree

The Master of Urban Planning degree is the usual educational qualification for professional practice of city and regional planning, including generalist planning, research, urban design, and administrative positions in a wide variety of public agencies and private consulting firms. It is a two-year, or six-quarter, program.

Requirements for graduate-level study include a satisfactory academic record and undergraduate training in one of a variety of disciplines, including urban planning and environmental design or in other appropriate fields, such as geography, economics, or other social sciences; English and other humanities; civil engineering and environmental studies; or architecture and landscape architecture.

The primary objective is to educate professional planners with a broad range of competence in planning and design; a second objective is to provide opportunities for individual studies in selected professional areas. All students are required to complete a core curriculum of essential knowledge in urban planning, design, and development covering urban form and history of urban development; theory; planning and design methods; processes of planning; legal, political, and administrative frameworks; implementation; communication methods; current issues; research methods; and studio experiences.

The core provides a foundation in urban design and planning for all students. A specialization in one area of planning is encouraged. Three major specialized areas offered in the department include physical land-use planning, urban and real estate development, and urban design. Other opportunities include transportation planning with Civil Engineering, public policy and management with Public Affairs, environmental resource planning with Forest Resources, and environmental studies and coastal planning with Marine Studies.

Urban Design Certificate Program

The department administers a certificate program for those who desire extended work in urban design. The option emphasizes process and problem solving, including abilities to analyze problems and opportunities, to develop and evaluate alternative concepts, and to manage implementation strategies. The certificate is awarded to students who complete the specialized curriculum (see college description).

Doctor of Philosophy Degree

Attainment of the Doctor of Philosophy degree indicates scholarly abilities, long-term intellectual interests in the profession, and substantial achievements related to the discipline and practice of urban planning and design. Students in the program must demonstrate exceptional qualities and capabilities for independent work worthy of attention of their peers in the academic and professional planning communities.

Admission to the doctoral program is similar to that for the master's, with the added understanding that the student is essentially interested in an academic or research career within the planning and design field and has demonstrated outstanding intellectual and academic competence. Most applicants will have completed the M.U.P. or other master's degrees. Persons whose native language is not English must be able to demonstrate command of English before enrolling.

The program requires a comprehensive preliminary examination, normally taken after three quarters of preparatory study. A Supervisory Committee is then appointed to direct the student's individualized study and research in planning and design prior to the taking of the General Examination. Candidates are awarded the doctorate upon completion of the dissertation and satisfactory passing of the Final Examination.

Faculty

Professors

Amoss, Harold L.,* 1963, (Emeritus), M.A., 1947, New Mexico; Ph.D., 1951, California (Berkeley); planned social change, community development.

Beil, Earl J.,* 1966, (Fisheries), Ph.D., 1965, California (Berkeley); application of operations research methods to urban and regional planning problems, mathematical programming models.

Grey, Arthur L.,* 1963, Ph.D., 1954, California (Berkeley); scope of urban planning, land and development policy, uses of remote sensing in urban planning, economics of land use, professional practice experience, use and need analysis.

Hancock, John L.,* 1969, (Environmental Studies), M.A., 1955, Minnesota; Ph.D., 1964, Pennsylvania; planning history, urban history, planning theory, social analysis and social evaluation methods, comparative urbanism.

Jacobson, Phillip L.,* 1962, (Architecture),† M.Arch., 1969, Finnish Institute of Technology (Helsinki); housing, neighborhood development.

Johnston, Norman J.,* 1960, (Emeritus), (Architecture, Landscape Architecture),† M.C.P., 1959, Ph.D., 1964, Pennsylvania; history of city development, urban design, landscape architecture.

Miller, Donald H.,* 1970, M.C.P., 1960, Ph.D., 1973, California (Berkeley); urban spatial structure, consumer behavior and demand for public services, planning theory and evaluation; urbanization processes.

Nyberg, Folke E.,* 1969, (Scandinavian Languages and Literature), (Architecture),† M.Arch., 1960, Yale; urban design, commercial/residential, residential additions, institutional/industrial design.

Schneider, Jerry B.,* 1968, ‡(Civil Engineering, Environmental Studies), M.C.P., 1961, California (Berkeley); Ph.D., 1966, Pennsylvania; metropolitan and regional planning, transportation and land-use interrelationships, computer graphics, forecasting methods, futures research.

Seyfried, Warren R., 1956, (Emeritus), M.B.A., 1954, D.B.A., 1956, Indiana; urban economics, urban development.

Thiel, Philip,* 1961, (Architecture),† M.S.Nav.Arch., 1948, Michigan; architectural design.

Untermann, Richard,* 1971, (Environmental Studies), (Landscape Architecture),† M.L.A., 1967, Harvard; community design, site planning, landscape construction, implementation strategies.

Vernez Moudon, Anne,* 1980, (Architecture, Landscape Architecture),† Dr.èsSc., 1987, Ecole Polytechnique Fédérale de Lausanne (Switzerland); urban design, city form and neighborhood studies, design research.

Wolfe, Myer R.,* 1949, (Emeritus), M.R.P., 1947, Cornell; urban planning, planning-design process, planning in other countries.

Zarina, Astra,* 1964, (Architecture),† M.Arch., 1955, Massachusetts Institute of Technology; inner-city planning, architecture history.

Associate Professors

Ludwig, Richard L.,* 1971, M.U.P., 1965, Washington; Ph.D., 1971, Pittsburgh; housing development planning, social factors in development planning.

Norton, Thomas J.,* 1961, M.U.P., 1960, Washington; urban community facilities, planning administration.

Rolfe, George R.,* 1984, (Architecture), (Building Construction),† M.Arch., 1968, M.C.P., 1968, Pennsylvania; real estate; city planning and management.

Ryan, Dennis M.,* 1974, (Architecture),† M.C.P., 1968, Ph.D., 1976, Pennsylvania; urban design and physical planning, community design principles and practice, urban change and continuity.

Streatfield, David C.,* 1971, (Landscape Architecture),† M.L.A., 1965, Pennsylvania; regional landscape planning, environmental history, history/landscape preservation, landscape theory.

Westerlund, Frank V.,* 1977, (Research), M.U.P., 1971, Ph.D., 1977, Washington; remote sensing applications; energy development and conservation, regional environmental planning.

Assistant Professor

Pivo, Gary, 1987, M.R.P., 1979, Cornell; land use, physical and environmental planning.

Course Descriptions

Courses for Undergraduates

URBDP 300 Introduction to Urban Planning (3) AWSps Principles and theories of urban structure and institutions. Concepts and logic of planning as a community process and a professional activity. Evolution of planning ideas in response to changing social, economic, and environmental conditions within the American political framework. Complementary nature of public and private responsibilities. Major procedures used by planners. Prerequisite: junior standing or permission of instructor.

URBDP 340 American Urban Problems (3) AS Major trends and problems in urban America that grew out of our past or are developing today. A new topic and new materials are presented each quarter. Topics are selected for their contemporary importance, environmental (biocultural) impact, and planning implications. History is used as our chief record of the past, not as a blueprint of the present and future.

URBDP 350 Urban Development and Real Estate (4) AWSps Introduction to real estate markets, investment, appraisal, accessibility concepts, urban history, urban research, and related topics.

URBDP 351 Urban Development and Real Estate Finance (4) AW Emphasizes the role of the private sector in urban development; valuation and investment theory; techniques of investment analysis and capital allocation.

URBDP 370 Reading the City (3-5) Sp Comprehending cities as reflections of individuals and societies. Students trained to read and analyze everyday, visible evidence of the city. Addresses interests of travelers as well as students wanting to become active participants in decisions affecting the quality of the urbanized environment. Field trips, readings, lectures, visual learning techniques.

URBDP 399 Future Patterns of Settlement (3) W Study of possible future patterns of human use of the environment from apocalyptic to glorious. Review of landscape evolution. Problems of long-range regional and national planning. Joint with GEOG 399. Prerequisite: 340 or GEOG 207 or 277, or permission of instructor.

URBDP 407 Urban Planning Studio (5) Sp Synthesis of urban planning problems and methods in a laboratory section.

URBDP 410 Planning Theory (3) A Synthesis of theories and theorizing drawn from several disciplines and applied to urban planning. Particular emphasis on explanatory concepts associated with a future-oriented rational decision process.

URBDP 411 Planning Process and Methods (3) W The urban plan and plan making. Emphasis on comprehensive, coordinative urban planning. Methods and analytical techniques used in planning public actions and policies. Various planning surveys and methods. Prerequisite: 410.

URBDP 420 Introduction to Quantitative Analysis in Urban Planning (3) A Data analysis for urban planning, statistical description, probability, sampling, estimation, hypothesis testing. Examples, including computer exercises, to be taken from planning literature using real data from assessors' files, building permit files, etc., and from other environmental design fields. Prerequisite: MATH 105.

URBDP 421 Quantitative Analytical Models and Methods (3) W Survey of probabilistic and mathematical models and other techniques of operations research relevant to planning. Linear and dynamic programming, critical path methods, queuing models, networks, and the Bayesian approach to decision making under uncertainty. Stress placed upon the underlying model and implications for planning. Prerequisite: 420 or permission of instructor.

URBDP 429 Computer-Aided Planning of Urban Systems (3) W Survey of on-line planning applications; use of various on-line systems to solve urban systems design problems; investigation of hardware/software trade-offs; human factors in man-computer systems design theory as it relates to problem-solving activity. Joint with CETS 472.

URBDP 444 User Analysis of Urban Spaces (3) Sp Development and application of techniques for appraisal of the built environment so as to imply planning and design criteria for urban open spaces. Joint with ARCH 444. For students in behavioral field studies in architecture, landscape architecture, and urban planning; others by permission of instructor.

URBDP 446 Practical Experience (4, max. 8) AWSp Off-campus experience under academic supervision in situations useful to the education of planners, such as planning offices, public bureaucracies, projects related to the environment, cross-cultural matters, and decision making. Assistance in identifying appropriate projects. Prerequisite: permission of instructor.

URBDP 450 Urban Community Facilities (3) WS Relationships of goal structure and physical requirements of public facilities. Criteria pertinent to schools, parks, utilities, etc., and their effect on the comprehensive plan. Prerequisite: 300.

URBDP 451 Housing (3) W Survey of housing and redevelopment problems, theories, standards, and practice. Development of public policies, finance, technological considerations, social factors, and priorities. Prerequisite: 300.

URBDP 452 Urban Development and Spatial Structure (3) Sp Physical and functional structure of urban areas, with major focus on locational decision making in households, firms, and other organizations,

and space demands of these urban activities. Selected land-use models illustrating use of this theoretical understanding for forecasting competition, land-use conflicts, and the land-conversion process.

URBDP 460 History of City Development (3) A Analysis of city forms and designs, emphasizing their relation to the culture of each period.

URBDP 461 History of Urban Planning in the United States (3) W Seminar in origins, development, and significance of the American planning movement and the profession that emerged from it, as defined by some of its seminal innovators, theories, practices, and achievements, and as evaluated by cultural realities thereby served.

URBDP 465 Land Use (3) W Substantive presentation of land use as a focus for planning issues. Development of problems: consideration of analysis, programming, and implementation methods. Seminar and group project sections.

URBDP 467 Urban Planning Uses of Remote Sensing (3) Sp Using aerial photographs, related data, and maps in urban planning. Urban change analysis, land-use classification systems, other planning applications. Scale and resolution considerations. Development of proficiency through laboratory exercises. Prerequisite: 300 or equivalent; recommended: 465.

URBDP 468 Land Use From Satellite Data (3) W Digital data from Landsat, etc., are used to determine land-use and land-cover classification in urban and rural areas. Hands-on exercises on computer. Photo interpretation, statistics, land-use classification, and verification are incorporated. Prerequisite: 465, 467, or permission of instructor.

URBDP 470 Introduction to Urban Design (3) A Definitions and examples of urban design; heritage of urban design; theories of city building; the role of urban design in the fields of architecture, landscape architecture, and urban planning.

URBDP 471 History of Urban Design (3) Sp Aspects of form, pattern, and space that mark efforts of individuals and groups to express their values and goals in the design of their cities. Special attention given to both historical and modern examples.

URBDP 472 Graphic Communication in Urban Planning (3) W Use of graphics and other representational techniques as a means of conceptualizing and expressing ideas, and for recording, analyzing, and controlling environment. Covers use of drawing, diagrams, report layout, photography, exhibit preparation, as tools for effective communication.

URBDP 475 Town as Artifact (3) Sp Studies of contemporary and historic towns, utilizing work in cultural anthropology and settlement geography to examine urban form and structure. Focus on the physical environment of the town as the container of social interaction. Prerequisite: 479.

URBDP 479 The Urban Form (3) A Physical patterns of urban areas related to the forces producing them. Identification, and methods of recording aspects of the urban scene.

URBDP 480 Introduction to Urban, Suburban, and Metropolitan Political Systems (5) Causes and consequences of variations in urban form and political structure. Social, economic, and cultural characteristics of different urban forms, and processes by which they have developed; emphasis on suburbanization and metropolitanism. Joint with POL S 480. Recommended: POL S 101 or 202.

URBDP 481 Legal Basis for Planning (3) A Political, legal, and administrative institutions closely related to the planning process. Issues of devolution of authority and public representation and participation. Legal basis for planning and associated regulation. Prerequisite: 300.

URBDP 488 Special Topics (1-9, max. 15) AWSpS Systematic study of specialized subject matter. Topics for each quarter vary, depending upon current interest and needs, and are announced in the preceding quarter. Prerequisite: permission of instructor.

URBDP 499 Special Projects in Urban Planning (*, max. 6) AWSpS Independent/tutorial study for undergraduates. Individual reading, research, fieldwork, or other special project, outlined in advance, approved by, and under the direction of, the faculty adviser most appropriate for the project proposed. A report on the purposes, procedures, and results of the study is required. Prerequisites: senior standing and permission of the supervising instructor.

Courses for Graduates Only

URBDP 500 Survey of Urban Planning (3) A Concepts and logic of planning as a professional activity. Evolution of guiding ideas in relation to changing social, economic, and environmental conditions within the American political framework. Major procedures used by planners. Critical appraisal. Open to graduate students in urban planning and to graduate students in architecture seeking the urban design certificate.

URBDP 501 Resources for Urban Planning (2) A Introduction to areas of specialized study in environmental planning and policy programming. Organization for planning in the Seattle region; range of activities and emphases, established and changing roles. Required of new graduate students.

URBDP 502 Metropolitan Planning (3) Sp Metropolitan planning concepts, processes, methods, and impacts in several North American cities. Special attention to major shapers of urban development patterns: transportation, utilities, open space, and major activity centers. Prerequisite: 500 or permission of instructor.

URBDP 506- General Urban Planning (2-) W Introduction to applied professional planning. Consideration of analysis, programming, and implementation methods in preparation for general urban planning laboratory. Prerequisites: 500, 501.

URBDP 507 General Urban Planning Laboratory (-5) Sp Laboratory exercise in applied professional planning, utilizing a local study area to examine the realities of problem solving in situations of functional and normative conflict. Integration of analysis, programming, implementation, and presentation phases of the planning process. Prerequisite: 506.

URBDP 508 Specialized Planning Laboratory (5, max. 10) A Several options are offered each year, such as regional-environmental planning, urban systems analysis, housing, metropolitan planning, urban design, and community services and organization. Prerequisites: 500, 501; some sections may have prerequisite urban planning lecture or seminar courses.

URBDP 510 Theories and Methodologies of Planning I (4) W Survey of the philosophy, methods, and analytical techniques used in planning public actions and policies, with emphasis on the logic and assumptions upon which these are based. Various planning surveys and methods. Open to graduate students in urban planning and to graduate students seeking the urban design certificate. Prerequisite: 500.

URBDP 511 Theories and Methodologies of Planning II (4) Sp Factors relating to the timing, phasing, and programming of urban development. The bearing of amenity, density, etc., on the actual development process. Prerequisite: 510.

URBDP 512 Research Seminar (2) A Development and presentation of advanced topics of individual investigation.

URBDP 525 Evaluation in Urban Planning (3) W Methods and techniques for *a priori* assessment of physical improvement plans, program designs, public

policies. Includes cost effectiveness and matrix or goal achievement, as well as more conventional cost-benefit and cost-revenue forms of analysis. Emphasis on understanding the reasoning and issues in evaluation, and gaining a working competence in at least one of the methods treated.

URBDP 529 Urban Region Geocoding and Land-Based Information Systems (3) Multipurpose street network and land-based information systems. The U.S. census geocoding system, automated map overlay systems, and cadastral file information use. Applications to land surveying, urban and transportation planning, and geographic analysis. Joint with GEOG 529 and CETS 529.

URBDP 530 Land-Use/Transportation Models (3) A Review of theoretical basis of several existing models used to forecast urban growth patterns and their associated land-use, transportation, and energy requirements. Model validation studies in relation to empirical studies of urban growth and change. Environmental implications of alternative urban growth patterns. Joint with CETS 570.

URBDP 540 Seminar in Citizen Participation (3) W Modes of citizen participation in public decision making, advocacy planning, participant democracy, and community development are considered in terms of contemporary problems.

URBDP 546 Practicum (4, max. 8) AWSp Off-campus experience under academic supervision in situations useful to the education of planners, such as planning offices, public bureaucracies, projects related to the environment, cross-cultural matters, and decision making. Assistance in identifying appropriate projects. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

URBDP 550 Urban Planning: Financial Planning and Management (3) Sp Practical application of benefit-cost methodology to the decision-making process for urban development. In a "workshop" format, benefit-cost analysis procedures are applied to urban development projects or programs, including urban renewal as defined by legislation. Theory or methodology is utilized as necessary to determine objectives, to identify and to measure benefits and costs, and to specify decision criteria in terms of the public interest.

URBDP 551 Allocation Processes in Urban and Regional Planning (3) A General economic context of planning analysis and social decision making. Priorities and public budgets. Measurement of collective needs. Allocative processes applied to land use.

URBDP 552 Urban Development and the Real Estate Market (3) A Topical survey of urban development. Provides substantive information, methodology, theory, and base for additional courses and seminars in area. Includes urban economy and determinants of land use, capital investment in urban development, land tenure, urban functions and public sector, urban development policy and strategy. Prerequisite: permission of instructor.

URBDP 553 Urban Real Estate Finance and Investment (3) W Develops principles for evaluating opportunities to invest in urban real estate, discusses the question of determining the cost of capital for such investments, investigates some problems in the application of an appropriate investment criterion to specific types of opportunities, and explores some aspects of the urban renewal problem. Prerequisite: 552 or permission of instructor.

URBDP 554 Location Determinants of Urban Real Estate Investment (3) Sp Advanced workshop on empirical methods to conduct and evaluate locational studies. Prerequisite: permission of instructor.

URBDP 557 Economics of Land-Use Regulation (3) W Taxation, subsidy, and other means to further public purposes in land utilization and development. Open space, transfer of development rights, tax allocation financing. Resource use, distributive and market effects of controls. Prerequisite: 551 or 552 or permission of instructor.

URBDP 565 Comparative Urbanism (3) W Characteristics and problems of urbanization in the world; comparisons of origins and development; physical form, land utilization, and planning. Selected major cities. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

URBDP 570 Urban Design Process (3) W The study of concepts, methods, and processes basic to planning, design, and effectuation. Offered on credit/no

credit basis only. Prerequisite: specialization in urban design or permission of instructor.

URBDP 571 Research and Analytical Methods for Urban Design (3) W Studies of the various arrangements of urban forms that affect perceptual experiences. Urban design considerations of the location of structures, open space, movement channels, and methods of implementing public policy decisions affecting urban design. Prerequisite: specialization in urban design or permission of instructor.

URBDP 572 Case Studies in Urban Design and Development (3) W Wide range of urban design and development projects recently completed. Effective urban design implementation, including design process, decision making, administration, management. Tools and techniques such as design analysis, policy making, regulation, design review, taxation, financing. Prerequisites: 510; 580 and/or permission of instructor.

URBDP 580 Legal and Administrative Framework for Planning (3) A Political, legal, and administrative institutions closely related to the planning process. Issues of devolution of authority and public representation and participation. Legal basis for planning and associated regulation.

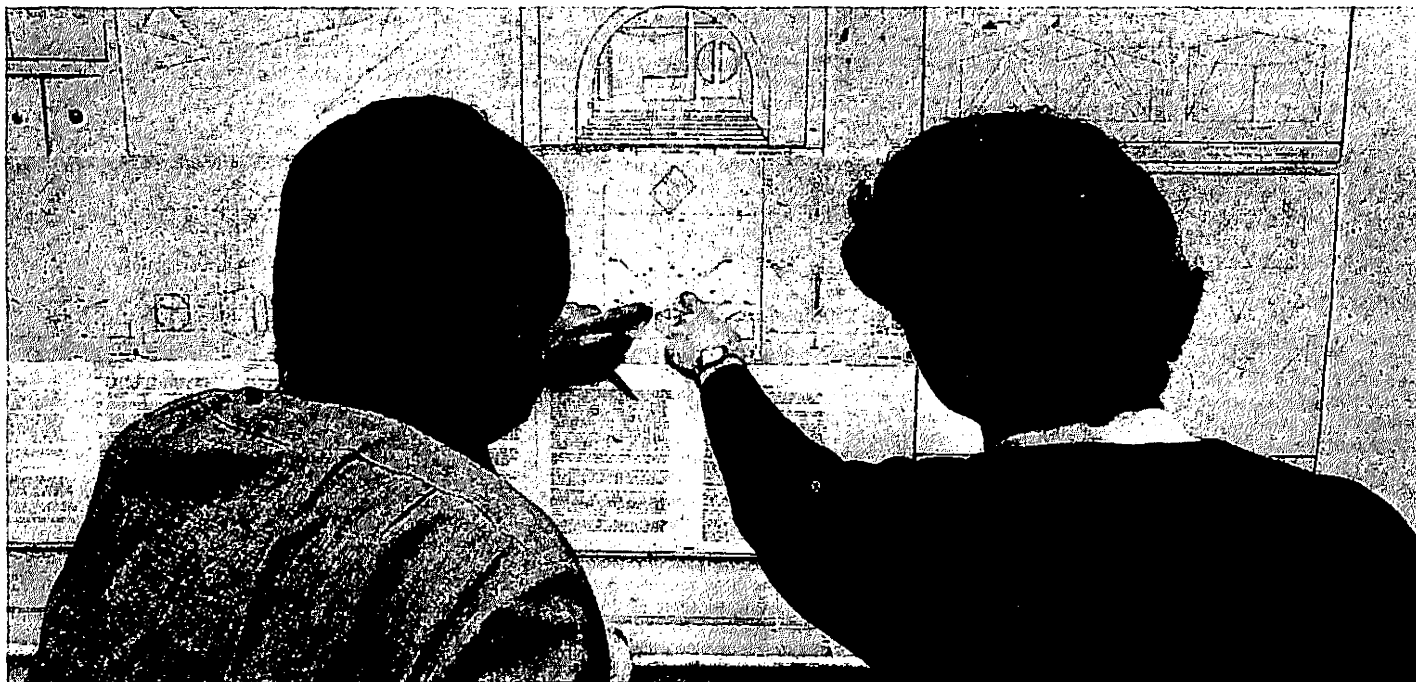
URBDP 591-592-593 Doctoral Seminar I, II, III (4-4-4) A,W,Sp Researchable issues and research methodology. Discussion and critique of selected pieces of recent research work. Presentation and critique of research proposed by members of the seminar. Prerequisite: master's degree or equivalent in a planning discipline.

URBDP 598 Special Topics (1-6, max. 15) AWSps Systematic study of specialized subject matter. Topics vary for each quarter, depending upon current interest and needs, and are announced in the preceding quarter. Prerequisite: permission of instructor.

URBDP 600 Independent Study or Research (*) AWSps

URBDP 700 Master's Thesis (*) AWSps

URBDP 800 Doctoral Dissertation (*) AWSps



College of Arts and Sciences

Dean

Joe G. Norman, Jr.
B110 Padelford

Associate Deans

Frederick L. Campbell—Undergraduate Education
Joe S. Creager—Earth Sciences; Research Facilities and Computing
Arthur Grossman—Arts
James D. Nason—Social Sciences
David Prins—Natural Sciences
Thomas M. Scheidel—Humanities

The departments and schools of the College of Arts and Sciences offer nearly one hundred curricula leading to the degrees of either Bachelor of Arts, Bachelor of Fine Arts, Bachelor of Music, or Bachelor of Science, as well as graduate study leading to master's and doctoral degrees.

Undergraduate Study

Graduation Requirements

To be awarded a baccalaureate degree, a student in the college must fulfill a proficiency requirement, a writing-course requirement, a distribution requirement, and a major requirement. All required courses must be taken for a numerical grade. In addition, the student must present at least 90 credits outside the major department and must meet minimum grade-point-average requirements as specified below. Detailed information on graduation requirements is provided in the Bachelor's Degree Planbook, available from the College of Arts and Sciences Advising Office, B10 Padelford.

Proficiency Requirement

To receive a degree from the College of Arts and Sciences, students entering any college or university Autumn Quarter 1985, or thereafter, are required to satisfy minimum proficiency standards in all three of the following areas: English composition, quantitative and symbolic reasoning, and foreign language. English proficiency may be satisfied by successful completion of college courses. The foreign-language and the quantitative and symbolic reasoning proficiencies may be satisfied by successful completion of college courses or proficiency examinations.

Writing Requirement

Students who first entered college Autumn Quarter 1983, or thereafter, must complete a minimum of 10 credits of courses that emphasize the development of writing skills in the context of an academic discipline. These courses are designated W in the quarterly Time Schedule and are shown with a W prefix on transcripts. Writing courses, if they apply, may also count toward distribution or major requirements. The writing requirement is in addition to the English composition proficiency requirement mentioned in the preceding paragraph.

Distribution Requirement

The distribution requirement is the means by which the college seeks to develop a student's breadth of knowledge and appreciation for subjects different in content and method from the one in which the student will ma-

ajor. The college has identified courses especially suited for meeting this requirement. These courses are currently divided into three large fields of knowledge: humanities, social sciences, and natural sciences. Each student must select, from the University Distribution List, at least 20 credits in courses from each of the three fields. As an alternative, students may take 15 credits from the distribution area under which the major falls and 25 credits in one of the other two groups. As another alternative, students may fulfill the distribution requirement by taking three sequences in the College Studies Program (see below).

Humanities courses have been subdivided into Part A (Language and Literature) and Part B (Fine Arts). Social sciences courses have been subdivided into Part A (Social Sciences) and Part B (History, Philosophy, Civilization). In humanities and in social sciences, students must complete at least 5 credits from Part A and at least 5 credits from Part B. Courses that apply toward the distribution requirement are shown on the University Distribution List.

The University Distribution List that appears in the Undergraduate Study section of this catalog applies to students who enter the University or any other college or university Autumn Quarter 1983 or later. Students who started college before Autumn Quarter 1983 (or who started community college before Autumn Quarter 1984 and who enter the University with an associate degree from a Washington community college) may choose to follow an earlier distribution list, available at B10 Padelford.

The University Distribution List may change. If a course changes distribution categories, students who took it before the change may use it for either the old category or the new, but students who take it after the change may use it only for the new category. (Courses are not likely to be removed from the University Distribution List altogether, unless they are being dropped from the curriculum.) It is recommended that students pick up an updated copy of the list once a year at B10 Padelford or at other advising offices on campus.

Linked Sets

Students using the University Distribution List shown on page 27 must include a linked set as part of their 20-credit natural science requirement. Students who begin college at the UW in Autumn Quarter 1985, or after (and students who begin college anywhere in autumn, 1985, or after, and who transfer to the UW in Autumn Quarter 1987, or after) must complete a second linked set in either the humanities, the social sciences, or a combination of humanities, social sciences, and/or natural sciences. Linked sets are listed in the *Bachelor's Degree Planbook*, available in B10 Padelford.

All courses composing the linked sets are also on the University Distribution List and may be counted for distribution as well as for the linked-set requirement. Courses in the major and courses used for proficiency requirements may not be used for distribution or for linked sets.

College Studies Program

As an alternative to choosing courses from the University Distribution List, students may fulfill the distribution requirement by selecting 45 credits from the College Studies Program list of course sequences developed specifically to give greater coherence to general education. One sequence of three interrelated courses must be taken from each of three groups: humanities, social sciences, and natural sciences. (Students may substitute one 15-credit set or two other sets from the College of Arts and Sciences natural sciences linked-set list for the College Studies Program natural science requirement.) To complete the distribution requirement, students must choose either 60 credits from the University Distribution List or 45 credits from the College Studies Program sequence list, not a combination of both. A list of College Studies Program sequences appears below. Updated lists may be found in the

Bachelor's Degree Planbook and the College Studies brochure, available in B10 Padelford and in the College Studies Program Office, A305 Padelford.

College Studies Program Sequences

Humanities/Fine Arts

Required: one sequence of 15 credits (or three courses from one set if more than three courses are listed)

Interpretation, Community, and Culture

C LIT 260 Interpretation as a Human Activity (5)

C LIT 360 Interpretation in Culture and Community (5)

C LIT 460 Interpretation in Humanistic Disciplines in the University (5)

Literature, Imagination, and Culture (three of the following)

ENGL 205 Method, Imagination, and Inquiry (5)

ENGL 306 Literature, Literary Study, and Society (5)

ENGL 307 Literature and the Age (5)

ENGL 346 Critical Practice (5)

ENGL 408 Literature and the Other Arts and Disciplines (5)

The Spectrum of Literature

C LIT 200 Introduction to Comparative Literature (5)

C LIT 370 The Scope of Literary History (5)

C LIT 400 Introduction to the Theory of Literature (5)

Argumentation in Society

SPCH 334 Essentials of Argument (5)

and two from among:

SPCH 424 Rhetorical Perspective in Revolutionary Documents (5)

SPCH 426 American Public Address (5)

SPCH 428 British Public Address (5)

SPCH 434 Argumentation Theory (5)

Art in Public Places

ART 275 A World History of Art in Public Places (5)

ART 276 Contemporary Directions, Art in Public Places (5)

ART 332 Intermediate Sculpture Composition (5, max. 15)

Social Sciences

Required: one sequence of 15 credits (or three courses from one set if more than three courses are listed)

Science in Civilization

HST 311 Science in Civilization: Antiquity to 1800 (5)

HST 312 Science in Civilization: Science in Modern Society (5)

and either HST 313 Science in Civilization: Physics and Astrophysics Since 1850 (5)

or MHE 424 Modern Biology in Historical Perspective (3) (change to 5 credits pending)

Western Civilization

HST 121 The Ancient World: Special Problems (5)

HST 122 The Medieval World: Special Problems (5)

HST 123 The Modern World: Special Problems (5)

How to Think About Moral Problems

One from the following:

PHIL 102 Contemporary Moral Problems (5)

PHIL 240 Introduction to Ethics (5)

Two from the following:

PHIL 241 Topics in Ethics (5)

PHIL 340 History of Ancient Ethics (5)

PHIL 342 History of Modern Ethics (5)

PHIL 344 History of Recent Ethics (5)

PHIL 345 Moral Issues of Life and Death (5)

American Ethnic Studies (subject to approval)

AES 362 American Race and Ethnic Relations (5)

AES 363 Foundations of Ethnic Studies (5)

AES 364 American Ethnicity in the Twenty-first Century (5)

Political Economy

POL S 270 Introduction to Political Economy (5)

POL S 370 Government and the American Economy (5)

POL S 475 Public Choice (5)

Evolution of Political Power

POL S 273 The Concept of Political Power (5)

ANTH 373 Stateless Societies: An Ethnographic Approach to Noncentralized Political Systems (5)

POL S 411 Theories of the State (5)

Human Biology and Behavior

PHY A 372 Evolutionary and Nonevolutionary Views of the Human Species (5)

WOMEN 453/ANTH 483 Women in Evolutionary Perspective (5)

ZOOL 409 Sociobiology (4)—
taken concurrently with

PHY A 499 Undergraduate Research (1)

Metacognition

PHIL 460 Philosophy of Science (5)

PSYCH 464 Metacognition (5)

and either PSYCH 462 Human Memory (5)

or PSYCH 466 Psychological Aspects of Judgment and Decision (5)

Natural Sciences

Required: one of the following

The Universe

ASTR 210 Distance and Time: Size and Age in the Universe (5)

ASTR 211 The Universe and Change (5)

ASTR 212 Life in the Universe (5)

The Physical World

PHYS 214 Light and Color (5)

PHYS 215 Order and Disorder (5)

PHYS 216 Time and Change (5)

Natural Science and the Environment

ENV S 203 Introduction to Physical Sciences and the Environment (5)

ENV S 204 Introduction to Biological Sciences and the Environment (5)

ENV S 207 Introduction to Global Environmental Issues (5)

One 15-credit set or two other linked sets from the College of Arts and Sciences natural science linked set list

Major Requirement

In fulfilling the requirements for a major, the student engages in thorough study of a discipline or subject, aimed at developing knowledge in depth. This part of the student's program is determined by the department, school, or faculty committee with which the major study is pursued. Measured in academic credits, the "major" required of each student consists of 50 or more prescribed credits in a department of the college or a closely related group of departments. Descriptions of major programs are printed below.

Credits Required Outside Major Department

So that the student will not be tempted to specialize prematurely, the college limits to 90 the number of credits from a single department that the student may elect to count in the 180 credits required for the baccalaureate degree. A department itself may require no

more than 70 credits from courses within the department, and no more than 90 credits from within the department and related fields combined, as constituting its major program for the baccalaureate degree. These limits may be exceeded only by the amount that a department elects to require credits in addition to the 180 minimum for graduation. Exceptions to these restrictions may be granted by the Dean under very unusual circumstances.

Grade-Point Average Required for Graduation

To be eligible to receive the baccalaureate degree, the student must achieve at least a 2.00 cumulative grade-point average in the major (some departments prescribe a higher minimum grade-point average for the major), as well as a 2.00 cumulative grade-point average for all work done in residence at the University.

Applying for Graduation

Students should apply for the baccalaureate degree no later than the first quarter of their final year. They may choose to graduate under the graduation requirements of the *General Catalog* published most recently before the date of entry into the college, provided that no more than ten years have elapsed since that date and provided that approval of the major department has been obtained. As an alternative, a student may choose to fulfill the graduation requirements as outlined in the catalog published most recently before the anticipated date of graduation. All responsibility for fulfilling graduation requirements rests with the student concerned.

Limits on Physical Education and ROTC Courses Allowed Toward Graduation

A student graduating from the College of Arts and Sciences may count a maximum of three 1-credit, 100-level physical education courses taken at the University of Washington, or their equivalents at other collegiate institutions, as elective credits toward graduation. At present, physical education courses are not offered at the University. Up to 18 credits in upper-division ROTC courses also may be counted as elective credits toward graduation, but no lower-division ROTC credits may be counted.

Certification for Teaching

Students following programs that lead to a baccalaureate degree in the College of Arts and Sciences may qualify for certification for public schools teaching in the state of Washington by including in their degree programs the courses required for certification as determined by the faculty of the College of Education.

Information on the requirements for certification and admission to the certification program is available in the College of Education section of this catalog and from an education adviser in 211 Miller.

Special Services and Programs for Undergraduates

Premajor and Preprofessional Advising

Director of Academic Counseling

Richard Simkins

Associate Director of Academic Counseling

Richard Newcomb

Academic Counselors

Kenneth Etzkorn
Louis Fox
Ann Trail Gaponoff
Nancy Hennes
Janet Kime
Beret Kischner
Lindsay Michimoto
Deborah Prince-Fenner

B10 Padelford

Students who do not make a definite choice of major when entering the University are designated premajor

students. An adviser in the Central Advising Office will assist them in designing a program of studies that will meet the general requirements of the college and provide them with information about possible major fields. The Central Advising Office also provides the following: assistance in exploring academic options; information about degree programs; preprofessional advising for such areas as medicine, dentistry, law; options for students on academic probation; preliminary career counseling; a wide range of information on registration, course offerings, degree requirements, and administrative procedures. Premajor students must make a selection of major by the time they have earned 105 credits. Transfer to a department major from premajor status sometimes requires completion of prerequisite courses, attainment of a minimum specified grade-point average, or selection by the department from among a group of prospective majors.

College Honors Program

Director

Stevan Harrell

Associate Director

Randolph Y. Hennes
B10 Padelford

This four-year program features special counseling, honors courses, honors sections of regular courses, faculty/student colloquia, and opportunities for independent study. It provides expanded opportunities for undergraduate education to those students who show exceptional intellectual promise. For additional information, see Honors—Arts and Sciences section.

Graduate Study

Students who intend to work toward advanced degrees must apply for admission to the Graduate School and must meet the general requirements outlined in the Graduate School section of this catalog, as well as the requirements established by the graduate faculty in the department or unit offering the degree program. Graduate students must satisfy the requirements for an advanced degree that are in force at the time the degree is to be awarded.

Afro-American Studies

See *American Ethnic Studies*.

American Ethnic Studies

B509 Padelford

Joseph W. Scott, Chairperson

The Department of American Ethnic Studies is a multi-cultural and multiracial research, teaching, and service unit dedicated to providing knowledge in the study of ethnicity and ethnic relations. Through the department's four programs—Afro-American, American Ethnic, Asian American, and Chicano Studies—students are provided with interdisciplinary, ethnic-specific, and comparative concepts, theories, and methods of inquiry, which shape the cultural, social, historical, economic, and political character of selected American ethnic communities.

Students may major in American Ethnic Studies (program subject to approval). In addition, the following culture-specific majors are offered: (1) Afro-American Studies and (2) General Studies with a concentration in Asian American Studies or Chicano Studies.

Undergraduate Programs

Afro-American Studies

B504 Padelford

Afro-American Studies is an interdisciplinary program that offers a variety of courses, often in cooperation with related traditional disciplines on campus, covering the numerous aspects of the Afro-American experience. The program is designed to provide students with a broad, in-depth understanding of the historical, linguistic, esthetic, social, political, and economic dimensions of Afro-American life and culture from a Black perspective. Special attention is given to theories of social change that have been offered by renowned thinkers in community development, the liberation of all oppressed peoples, and global humanitarianism.

Bachelor of Arts Degree

Major Requirements: 55 credits distributed as follows: 30 credits in core courses (AFRAM 105, 150, 201; 210 or 270; 330; ENGL 358 or MUSIC 319); 10 credits in one of three emphasis areas (history and cultural heritage, social/political analysis, arts and humanities)—course-option list available in B504 Padelford; 15 credits in advanced courses (AFRAM 430; 480; 440 or 490).

Faculty

Director

Johnnella E. Butler

Professors

Butler, Johnnella E., 1987, M.A.T., 1969, Johns Hopkins; Ed.D., 1979, Massachusetts; Afro-American literature, multicultural education.

Scott, Joseph W.,* 1985, (Sociology),† M.A., 1959, Ph.D., 1963, Indiana; political sociology, family sociology, race/ethnic relations.

Lecturer

Black, Albert W., Jr., 1972, M.A., 1968, Wayne State; Ph.D., 1976, California (Berkeley); sociology.

Course Descriptions

AFRAM 105 The Sociology of Black Americans (5) *Black* Evaluates the sociocultural context of the Black person's environment and consequences of interaction with that environment. Joint with SOC 105.

AFRAM 150 Afro-American History (5) Introductory survey of topics and problems in Afro-American history with some attention to Africa as well as to America. Basic introductory course for sequence of lecture courses and seminars in Afro-American history. Joint with HSTAA 150.

AFRAM 200 Proseminar in Afro-American Studies (5) *AWSp Black* Interdisciplinary survey of Afro-American Studies, presenting the unique Black perspective on the relevant disciplines in arts and sciences.

AFRAM 201 Introduction to Black Studies (5) History, culture, religion, institutions, politics, economics, arts, and psychology of peoples of African descent as developed from experience in both the old and new worlds. Multidisciplinary analysis of social life from a Black perspective as illustrated in selected historical and contemporary writings. Not open for credit to students who have taken 100. (Formerly 100.)

AFRAM 210 Resources in Afro-American Research I (3) Compilation of annotated subject bibliog-

raphy of Afro-American Studies topics, with emphasis on secondary sources, general reference sources, and social sciences. Not open for credit to students who have taken 230. (Formerly 230.)

AFRAM 211 Perspectives on African American Language (5) *AWSp Black* Aspects of the dialect spoken by the majority of Americans of African descent. History, linguistic description, and exploration of its artistic uses. Recommended: introduction to linguistics, Afro-American literature, and/or African literature. Not open for credit to students who have taken 210. (Formerly 210.)

AFRAM 212 Creative Expression for African-American Children (5) New and developing theories and practices of creative expression for African-American children. Students demonstrate techniques and practices learned. Not open for credit to students who have taken 280. (Formerly 280.)

AFRAM 220 Third World Images in Film (5) Historical and contemporary portrayals of Third World people in American and foreign full-length commercial and documentary film. Legitimation and maintenance functions of film; formation and elaboration of stereotypes; emergence of postcolonial film traditions in Latin America, Africa, and Asia. Sociology of film, images of the colonized and the colonizer, film as an emancipatory vehicle for social transformations.

AFRAM 250 The Afro-American and the U.S. Supreme Court (5) Laws passed by Congress, and the Constitution as interpreted by the Supreme Court, dealing with the conditions of Afro-Americans in the United States.

AFRAM 260 Black Male/Female and Family Relationships (5) *Scott* The Black family in the United States as a social institution. Effects of residence in a race-conscious society on interpersonal relationships between Black men and women. Exploration of proposals for strengthening the Black family in the United States. Joint with SOC 260.

AFRAM 303, 304, 305 Basic Krio (5,5,5) *A,W,Sp* Elementary structures of Krio with emphasis on the acquisition of basic conversational and reading skills. Prerequisites: 303 for 304; 304 for 305.

AFRAM 306, 307, 308 Basic Swahili (5,5,5) *A,W,Sp* Structure of spoken and written Swahili. Concentration on the acquisition of elemental conversational skill and an introduction to written texts of graded difficulty. Prerequisites: 306 for 307; 307 for 308.

AFRAM 320 Black Women in Drama (5) Character types of Black women as represented in plays by Black women. Some Black male playwrights are juxtaposed with Black female writers for comparative analysis. Playwrights include Georgia Douglas Johnson, Angelina Grimke, Alice Childress, Lorraine Hansberry, Ira Aldridge, LeRoi Jones. Prerequisites: 200, 212 or permission of instructor.

AFRAM 330 The Social Psychology of the Black Community (5) Internal dynamics of the African American community. Sociocultural factors influencing psychological development of African Americans; social origins, institutional formation, and impact of white racism; social stratification in, and the political economy of, the African American community; structural and psychological characteristics of domination; social determinants for social transformations.

AFRAM 350 The Black Esthetic (3) The Black esthetic as distinct from the mainstream of American culture. Problems and issues of being Black in America. Focuses on the various art forms (e.g., theatre, music, and literature) from historical, social, and political perspectives. Not open for credit to students who have taken 400. (Formerly 400.)

AFRAM 362 Race Relations (5) *Black* Interracial contacts and conflicts. Joint with SOC 362. Prerequisite: SOC 110.

AFRAM 370 Afro-American Political Thought (5) *Black* Political ideologies and philosophies of pivotal Afro-American historical figures and the conditions under which these ideologies are developed, rejected, and transformed. How ideologies relate to solution of Afro-American political problems. Prerequisites: SOC 362, PHIL 110, or permission of instructor.

AFRAM 401, 402, 403 Intermediate Swahili (3,3,3) *A,W,Sp* Readings from prose to traditional poetry. Emphasis on acquiring an ability to manipulate ideas in Swahili. Review of structure. Prerequisites: 308 or equivalent for 401; 401 for 402; 402 for 403.

AFRAM 406, 407, 408 Intermediate Krio (3,3,3) *A,W,Sp* Advanced structures of Krio with further emphasis placed upon conversational skills and reading. Prerequisites: 305 for 406; 406 for 407; 407 for 408.

AFRAM 410 Bantu Linguistics (3) Development of Bantu linguistics; emphasis on comparative Bantu phonology, morphology, and syntax. Prerequisite: permission of instructor.

AFRAM 430 Afrocentric Methods and Theories in Black Studies (5) *Black, Butler, Scott* Afrocentric approaches in the study of the Black experience, as exemplified in the writings of selected Black intellectuals and artists. Nature of cultural influences on epistemology. Prerequisite: junior or senior standing; recommended: background in Afro-American studies. Not open for credit to students who have taken 460. (Formerly 460.)

AFRAM 440 Community Practica (3-5, max. 15) Internship in various Seattle community service agencies (e.g., CAMP, Planned Parenthood). Students contribute their newly acquired skills and knowledge to the Afro-American community. Experience in working with professional community organizers. Not open for credit to students who have taken 301. Recommended: junior or senior standing. (Formerly 301.)

AFRAM 480 Contemporary Issues in Afro-American Studies (5) *Black, Butler, Scott* Five issues selected for their contemporary importance in Afro-American studies. Synthesis of different perspectives and approaches to the study of the Black experience. Prerequisites: senior standing and 201 or completion of Afro-American Studies core courses.

AFRAM 490 Research in the Black Community (1-5, max. 10) *AWSp Black, Butler, Scott* Identification and investigation of the problems and needs of the Black community. Methods and alternatives of approaching these problems and needs. Students designate their areas of interest and subsequently pursue research and problem solving. Prerequisite: permission of instructor.

AFRAM 492 Special Topics in Afro-American Studies (3-5, max. 15) Topics in which students and faculty have developed an interest as a result of work done in other classes or as a result of the need to investigate in greater depth Afro-American Studies issues. Topics vary. Prerequisite: 200 or permission of instructor.

American Ethnic Studies

B504 Padelford

Bachelor of Arts Degree

(Approval pending.)

Admission Requirement: Under review (see adviser).

Major Requirements (proposed): 80 credits distributed as follows: (1) 35 credits in core courses—AES 150, 151, 250, 251, 362, 401, 495 (see departmental adviser for substitutions; these courses subject to ap-

proval); (2) culture-specific courses (30 credits)—chosen from introductory offerings in Afro-American, American Indian, Asian American, Chicano, or American Ethnic Studies; (3) courses in a discipline outside the major (10 credits)—chosen in consultation with departmental adviser; (4) American Ethnic Studies writing course (5 credits)—chosen from among American Ethnic Studies writing courses other than AES 495; (5) minimum grade-point average of 3.00 in courses taken to satisfy (1) and (2), above.

Asian American Studies

B501 Padelford

Asian American Studies is an interdisciplinary program designed to study and transmit the experience of persons of Asian descent in America. Instruction is offered in three areas: (1) a general survey and contemporary issues class on the history and culture of Asian Americans; (2) courses focused on specific Asian American groups; (3) special topics courses, as well as courses listed jointly with other departments. A General Studies degree in Asian American Studies and an Asian American Studies major and minor degree in education are available.

Faculty

Director

Tetsuden Kashima

Associate Professor

Kashima, Tetsuden,* 1976, (Sociology), M.A., 1968, San Francisco State; Ph.D., 1975, California (San Diego); sociology.

Assistant Professors

Bacho, Peter, 1976, J.D., 1974, M.L., 1981, Washington; law.

Wong, Shawn H.,* 1984, (English), M.A., 1974, San Francisco State; creative writing, Chinese-American area studies.

Course Descriptions

AAS 205 Asian American Cultures (5) A *Bacho, Kashima, Wong* Asian American subcultures; evolution of Asian American cultures in the United States from 1850 to 1950—immigration patterns, evolution of subcultures, evacuation, interracial relations, assimilation, and signs of social disorganization. Not open to students who have taken GIS 305.

AAS 206 Contemporary Problems of Asian Americans (5) W *Bacho* Recent Asian American issues from 1950 to the present. Topics include ghetto communities, civil rights, identity problems and ethnicity, social organizations, political movements, and recent immigration.

AAS 220 Asian American Stereotypes in the Media (5) A *Wong* Asian stereotypes popularized by American literature, film, radio, and television and their effects on Asian American history, psychology, and community.

AAS 305 Asian American Cultures for Teachers (5) Specially designed for teachers who wish to learn more about the history, culture, and current concerns of Asians in the United States. Implications for elementary and secondary school are considered. Not open to students who have taken 205 or GIS 305. Prerequisite: permission of instructor.

AAS 350 Chinese American History and Culture (3) Sp *Wong* Experience of the Chinese in America from 1850 to the present. Transformation from an im-

migrant to Chinese American community: immigration patterns, anti-Chinese movements, ethnic socio-political and economic institutions, community issues, Chinese American culture. Prerequisite: 205 or equivalent or permission of instructor.

AAS 360 Filipino American History and Culture (3) Sp *Bacho* History and culture of the Filipino in America and the influence of an admixture of Filipino, Spanish, and American traditions on the Filipino immigrant and his or her descendants. Not open to students who have taken GIS 360. Prerequisite: 205 or equivalent or permission of instructor.

AAS 370 Japanese American History and Culture (5) Sp *Kashima* Historical roots and subsequent changes in the Japanese American group examined through an interdisciplinary approach. Topics include historical events, culture, values, social and community structures, institutions, occupations, and future orientations. Prerequisite: 205 or equivalent or permission of instructor.

AAS 380 Asian American Communities and Social Policies (5) WSp *Kashima* History, culture, social organization, leadership patterns and interethnic relations of Asian American (Chinese, Filipino, Japanese, and Korean) communities. Origins and impact of social policies relevant to Asian American communities. Not open for credit to students who have taken 300. Prerequisite: 205 or equivalent or permission of instructor. (Formerly 300.)

AAS 401 Asian American Literature to the 1940s (5) A *Wong* Asian American literature from nineteenth century immigrants to the 1940s. Emphasis on Chinese, Japanese, and Filipino writings detailing the experience and sensibility of first generation immigrants. Early twentieth century writing focus on the development not only of Asian American community, but also of second generation American-born Asian American writers. Not open for credit to students who have taken 400. (Formerly 400.)

AAS 402 Contemporary Asian American Literature (5) W Asian American literature from the 1940s to the present. Emphasis on the development of attitudes and identities in contemporary Asian American literature, the role of the writer in a minority culture, and the relationship of literature to self and society. Recommended: 401. Not open for credit to students who have taken 400. (Formerly 400.)

AAS 443 Undergraduate Field Experience (3-5, max. 15) AWSpS *Kashima* Faculty-supervised practicum experience in a variety of community settings and agencies dealing with Asian Americans. Prerequisites: 205 or 206, or equivalent, and permission of instructor.

AAS 490 Asian American Studies—Special Topics (3, max. 9) AWSpS Prerequisite: 205 or permission of instructor.

AAS 499 Undergraduate Independent Study (1-5, max. 10) AWSpS Prerequisites: 205 or equivalent and permission of instructor.

Chicano Studies

B525 Padelford

Chicano Studies offers an interdisciplinary curriculum that examines the historical and contemporary socioeconomic and political experience of people of Mexican descent in the United States. Emphasis is given to the student developing a broad understanding of the Chicano experience. In its approach, Chicano Studies strives to incorporate various disciplines, such as history, literature, political science, sociology, dance, and anthropology. The interdisciplinary nature of the curriculum prepares students for a wide range of advanced degrees or professional training in various fields.

Presently, a General Studies degree is available to students interested in following a program in this area. Ad-

ditional information is available from the Chicano Studies adviser, B521 Padelford, or a General Studies adviser, B10 Padelford.

Faculty

Director

Erasmus Gamboa

Associate Professor

Gil, Carlos B., (History),† 1974, M.A., 1963, Georgetown; Ph.D., 1975, California (Los Angeles).

Assistant Professors

Gamboa, Erasmo, 1978, M.A., 1973, Ph.D., 1984, Washington; history, Chicano experience, specialty—Pacific Northwest.

Olguin, Rick A., 1986, M.A., 1982, Ph.D., 1986, Stanford; political theory, American minority political behavior, social science methodology.

Salas, Elizabeth, 1987, M.A., 1977, Alabama State; Ph.D., 1987, California (Los Angeles); United States women's history, Chicana history.

Course Descriptions

CHSTU 201 Introduction to Chicano Studies (5) Gamboa Selected themes in Chicano experience; studies in Chicano politics and Chicano socioeconomic concerns. Not open to students who have taken GIS 302 or CHSTU 102. (Formerly 102.)

CHSTU 202 Intermediate Chicano Studies (3) AW Gamboa Follows 201. Further understanding of selected themes in Chicano experience; studies in Chicano politics and Chicano socioeconomic concerns.

CHSTU 207 Chicano Consumer: Past and Present (3) Coordinates Chicano economic history with contemporary economic problems of Chicanos, emphasizing social, psychological, and financial aspects that deprive the Chicanos of their economic freedom. Not open to students who have taken GIS 207 or 208.

CHSTU 211 Beginning Mexican Folk Dance (3) A Fundamental technique course to increase appreciation and awareness of Mexican people and their culture through acquaintance with folk customs, historical backgrounds, costumes, and music. Expressive interpretation characteristic of regional dance forms. Regions include Oaxaca, Michoacan, Norte, and Jalisco. Not open for credit to students who have taken GIS 110 or CHSTU 110. (Formerly 110.)

CHSTU 212 Beginning/Intermediate Mexican Dance (3) W Regional Mexican folk dancing: dance, costumes, music, and customs, concentrating on the regions of Oaxaca, Michoacan, and Jalisco. Not open for credit to students who have taken GIS 111 or CHSTU 210. (Formerly 210.)

CHSTU 254 History of Chicanos in Washington State (5) Sp Gamboa History, extent, and results of the Chicano presence from earliest Spanish explorations to the present; contemporary problems of Chicanos in a broader national context. Not open for credit to students who have taken GIS 201 or CHSTU 204. (Formerly 204.)

CHSTU 310 Intermediate Mexican Folk Dance (3) Sp Expands the knowledge of Mexican folklore through research, dance, and music, enables students to create folk dance through the development of their own choreography. Prerequisite: 211 or 212 or equivalent.

CHSTU 391 Independent Study (1-6, max. 10) AWSpS Gamboa, Olguin, Salas Students work individually or in teams. Prerequisite: permission of instructor.

CHSTU 405 Advanced Chicano Studies (3) S Gamboa Chicano culture as related to current values and health practices, Mexican labor and immigration in both historical and contemporary setting. Chicano politics 1848 to present. Recurrent problems of Chicanos in society; social movement for acceptance and for self-determination. Not open for credit to students who have taken 305. (Formerly 305.)

CHSTU 491 Special Topics in Chicano Studies (3-5, max. 10) A Gamboa, Olguin, Salas Interdisciplinary course concentrating on one or more aspects of the Chicano experience.

American Indian Studies

CS14 Padelford

The American Indian Studies Center, a division of the Department of Anthropology, offers courses focusing on American Indian cultures, perspectives, and problems, with the goal of enriching the liberal education of the general student. Courses are equally divided between the humanities and social sciences: Some survey Indian cultural developments in art, music, language, and literature and offer performance and studio experience; others explore the historical and contemporary interaction of Indians in American society and the application of social science theories to Indian societies and institutions. American Indians have been an integral part of the historical, cultural, and legal development of this country. These courses provide students with an opportunity to broaden their understanding of their own history, regardless of their ethnic origins.

A major emphasizing American Indian Studies is available through the Department of Anthropology. All AIS courses except AIS 102 may count toward that major. No more than 6 credits of any combination of AIS 253 and AIS 350 may be counted toward the major.

Faculty

Director

Marilyn G. Bentz

Professor

Witherspoon, Gary J., 1987, M.A., 1968, Arizona State; M.A., 1969, Ph.D., 1970, Chicago; anthropological studies in religion, language, art, and history; American Indians, Navajo.

Associate Professor

Lane, Barbara, 1975, (Affiliate), M.A., 1948, Michigan; Ph.D., 1953, Washington; anthropological and ethnographical studies, American Indians.

Assistant Professors

Bentz, Marilyn G., M.S.W., 1967, Illinois; Ph.D., 1984, Washington; anthropological studies in education, psychology, social work, and American Indians.

Lomawaima, Kimberly Tsianina, 1988, M.A., 1979, Ph.D., 1987, Stanford; anthropological studies in institutions of cultural contact; education, ethnohistory and oral history; native North America.

Vangen, Kathryn W. S., 1985, M.A., 1982, Ph.D., 1987, Washington; modern poetry, American and Native American literature, feminist theory.

Lecturer

Oliver, Marvin E., 1974, M.F.A., 1973, Washington; Northwest coast Indian art.

Course Descriptions

Courses for Undergraduates

AIS 102 Survey of American Indian Studies (5) ASp Origins, history, cultures, and contemporary life of American Indians; special focus on Pacific Northwest coast; taught by interdepartmental team.

AIS 110 American Indian Song and Dance Traditions (3) A Wapp Vocal technique, instrumental accompaniment, and song and dance traditions from different cultural areas of native North America.

AIS 151 Indian Art of Northwest Coast (3) Sp Oliver Studio course on Pacific Northwest coast Indian/Eskimo art. Traditional and contemporary forms; principles of form, style, and techniques; values that influence Indian/Eskimo art styles. Not open for credit to students who have taken ART 101.

AIS 170 Survey of North American Indian Art (5) Major Indian art traditions of North America. Precontact and early-contact-era traditions, and the evolution of Indian art forms in contemporary times. Design and techniques in Indian art.

AIS 240 American Indian Women in Society (5) Sp Bentz Indian women in the social structure; historical and contemporary roles; changes in male-female relationships; problems and opportunities of contemporary women; the feminist movement and Indian rights.

AIS 253 Wood Design (3, max. 9) AWSp Oliver Studio course in wood sculpture utilizing Pacific Northwest Indian hand tools. Properties of woods and their uses.

AIS 311 North American Indians: Pacific Northwest (5) Lane Traditional societies of the Pacific Northwest from southern Alaska to northern California; significant areal features, such as rank, totemic crests, guardian spirits, the potlatch, fishing, and foraging illustrated by comparisons and by selected ethnographic sketches. Continuity between past and present. Prerequisite: ANTH 100 or 202 or permission of instructor.

AIS 312 Northern American Indians: The Intermountain West (5) Traditional cultures of Columbia and Fraser Plateau region and Great Basin: Interior Salish, Sahaptin and Nez Perce, Paiute, and their neighbors. Regional features of language, ecology, social life, myth, religion. Contemporary issues of reservation life, government, ethnic conflict in historical perspective. Recommended: ANTH 100 or 202.

AIS 316 North American Indians: The Southeast to 1850 (5) Emphasis on prehistory, social organization, belief system, political alliances. European contact, effects of plantation slavery and slave trade on Indians, issues of ethnicity, and consequences of removal policies.

AIS 317 North American Indians: The Southwest (5) Witherspoon Overview of history and ethnography of the Southwest with emphasis on Apaches, Pueblos, and Pimans/Yumans. Social organization, religion, worldview, and expressive culture of such specific groups as Navajo, Hopi, Zuni, Tewa, and Papago. Prerequisite: 102 or ANTH 100 or 202.

AIS 330 United States-Indian Relations (5) Witherspoon Trends in interrelations of native Americans and European immigrants since 1500. Current problems in Indian-White relationships examined in historical context. Development of Indian policy and consequences of major legislative acts, including the Allotment Act, Indian Reorganization Act, termination and relocation. Implications for contemporary Indian education, religion, and health. Recommended: 102.

AIS 331 History of American Indian Education (5) Lomawaima Traditional and European-introduced methods of schooling, the federal role in Indian educa-

tion, and contemporary Indian education issues. Special attention to Indian concepts of learning; boarding school education; the role of the Bureau of Indian Affairs; current trends in bilingual and bicultural education for Indians.

AIS 335 Legal Problems of the American Indian (5) Legal status of the American Indian with emphasis on the reservation; heirship, land ownership and use; mineral, water, fishing, and hunting rights; and problems related to self-determination. Not open for credit to students who have taken GIS 317.

AIS 340 Indian Children and Families (3) Bentz Psychosocial development of the Indian child and family. Historical changes in family structure; value orientations; and social adaptations to a bicultural environment.

AIS 350 Two-Dimensional Art of the Northwest Coast Indians (3, max. 9) WSp Oliver Studio course emphasizing principles of structure and style of two-dimensional art on the Northwest Coast; analysis of traditional pieces (painted storage boxes and chests, house panels, ceremonial screens, etc.).

AIS 377 Contemporary American Indian Literature (5) Vangen Creative writings—novels, short stories, poems—of contemporary Indian authors; the traditions out of which these works evolved. Differences between Indian writers and writers of the dominant European/American mainstream. Joint with ENGL 377.

AIS 450 American Indian Song and Dance Tradition: Performance (3) Wapp Performance of various American Indian social dances, songs, and games. In-depth study of various American Indian vocal styles.

AIS 469 Special Studies in American Indians (3, max. 6) AWSps Delineation and analysis of a specific problem or related problems in American Indian Studies. Offered occasionally by visitors or resident faculty. May be repeated for credit by permission. Prerequisite: permission of instructor.

AIS 475 Special Topics in Indian Studies (1-5, max. 15) AWSps Current research and readings in American Indian Studies content areas.

AIS 499 Independent Study (1-5, max. 15) AWSps Readings and/or research under faculty supervision.

Anthropology

M32 Denny

Anthropology is the study of the physical, cultural, and social development; comparative biology; and variation in the customs and beliefs of human beings. The primary fields within the discipline include archaeology, physical anthropology, and sociocultural anthropology, with anthropological linguistics being included in the latter. Also offered is specialized degree training at the M.A. level in museology in cooperation with the Burke Museum. All of these fields are represented in the department's curriculum and in the faculty's research.

Undergraduate Program

Advisers

M03A Denny

Major Requirements: PHY A 201, ANTH 202, 203, ARCHY 205; one of the following: STAT 220, STAT 311, Q SCI 381, BIOST 472; 30 additional credits in anthropology selected from both upper- and lower-division courses, but excluding ANTH 100, AIS 102, and ARCHY 105, which may not be counted toward the major. No more than 6 credits from any

combination of AIS 253 and AIS 350 may be counted toward the major. At least 25 credits in the major must be with the grade of 3.0 or above. Courses in which 1.9 or less is received may not be counted toward the 55 credits required. Transfer students must complete a minimum of 15 upper-division credits in anthropology at this university. Students with a ten-year time gap since they took any required courses must retake those courses. Students who plan to undertake graduate work should elect one foreign language and ANTH 460.

Graduate Program

Eric A. Smith, Graduate Program Coordinator

The department recognizes three principal subfields of anthropology within its faculty, programs, and curriculum: archaeology, physical anthropology, and sociocultural anthropology (including anthropological linguistics). The department offers three distinct Ph.D. programs within the subdisciplines and a special M.A. program in museology. The M.A. degree may be earned within the Ph.D. programs as a thesis or non-thesis degree. Graduate students are admitted to, and specialize in, their chosen subfields from the beginning of their graduate studies.

Admission Requirements

Applicants are admitted to begin study only during an Autumn Quarter and are advised to have their credentials completed by the beginning of the prior February. A complete application file includes the Graduate School Application, two official transcripts, the Supplementary Information Form, three recommendations, and scores from the Graduate Record Examination (GRE). Students applying from outside of North America are not required to take the GRE for admission, but it is recommended that they take the GRE if possible. Foreign students (except for those from English-speaking countries) are required to take the TOEFL exam.

Program Requirements

For each of the respective graduate programs, completion of the core requirements and a reading knowledge of one foreign language are required. The M.A. degree may be earned with completion of a thesis or with a nonthesis program. The student elects the subfield and the particular problems or areas within it to be emphasized. Under the guidance of a supervisory committee selected from this subfield, the student shapes an individual program. The major areas emphasized in the faculty and curriculum are: North America, Africa, South Asia, China, Southeast Asia, and Oceania. The M.A. programs usually require two years of graduate study; the Ph.D. programs usually require at least three years beyond the master's level, including a year of independent field research and a year to organize field materials and write a doctoral dissertation.

Financial Aid

Fellowships are awarded to a few outstanding entering students. A variable, but limited, number of teaching and research assistantships and hourly positions are offered primarily to advanced students. Modest travel grants are available for summer fieldwork under faculty grants and department-supported fellowships. Some students may be qualified for a few National Resource Fellowships for Language Studies. The Ronald J. Olson Fellowship provides one year of support for entering students with interests in North America. Work study positions in the anthropology division of the Burke Museum are also available for eligible graduate students.

Correspondence and Information

Graduate Program Coordinator
M39 Denny, DH-05

Faculty

Chairperson

Charles F. Keyes

Professors

Chrisman, Noel J.,* 1973, ‡(Community Health Care Systems, Family Medicine), Ph.D., 1966, M.P.H., 1967, California (Berkeley); medical anthropology, urban anthropology, American culture, social support networks.

Dumont, Jean-Paul,* 1975, Ph.D., 1972, Pittsburgh; cultural and symbolic anthropology, South American lowlands, Philippine lowlands, France.

Dunnell, Robert C.,* 1967, (Quaternary Research Center), Ph.D., 1967, Yale; archaeological theory, field methods, eastern North America.

Eastman, Carol M.,* 1967, (Linguistics, Women Studies), Ph.D., 1967, Wisconsin; language and culture, anthropological linguistics, Bantu languages and literature (especially Swahili), Northwest languages (especially Haida).

Grayson, Donald K.,* 1975, M.A., 1969, Ph.D., 1973, Oregon; North American prehistory, paleoecology, vertebrate faunal analysis, history of archaeology.

Holm, Bill,* 1968, (Affiliate), (Art), M.F.A., 1951, Washington; Northwest coast, plains, and plateau art.

Hunn, Eugene S.,* 1972, M.A., 1969, Ph.D., 1973, California (Berkeley); cognitive anthropology, ethnobiology, cultural ecology and evolution, North American Indians.

Keyes, Charles F.,* 1965, Ph.D., 1965, Cornell; interpretive anthropology, religion and politicoeconomic change, ethnic group relations, sociology of Theravada Buddhism, mainland Southeast Asia.

Kirch, Patrick V.,* 1984, M.Phil., 1974, Ph.D., 1975, Yale; Director, Burke Memorial Washington State Museum; archaeology, environmental archaeology, cultural ecology, Pacific islands.

Krieger, Alex D., 1961, (Emeritus), M.A., 1939, Oregon; D.Sc., 1954, Universidad Nacional de Mexico; anthropology.

Nason, James D.,* 1970, M.A., 1967, Ph.D., 1970, Washington; sociocultural anthropology, museology, culture change, material culture, Micronesia, North America.

Newell, Laura L.,* 1972, (Orthodontics), M.A., 1957, Northwestern; Ph.D., 1967, Washington; primatology growth and development, human biology, evolutionary aspects of dermatoglyphics.

Neuman, Daniel M.,* 1978, ‡(Music), Ph.D., 1974, Illinois; ethnomusicology, South Asia, social organization, cultural anthropology.

Newman, Marshall T., 1966, (Emeritus), M.A., 1935, Chicago; Ph.D., 1941, Harvard; anthropology.

Nute, Peter E.,* 1972, (Medicine), Ph.D., 1969, Duke; genetics and evolution.

Osborne, Oliver H.,* 1969, ‡(Psychosocial Nursing), M.A., 1960, New York; Ph.D., 1968, Michigan State; cross-cultural health, mental health, nursing, social/cultural anthropology, Africa.

Ottanberg, Simon,* 1955, (Political Science), Ph.D., 1957, Northwestern; art, esthetics, politics, law, ethnicity.

Quimby, George I., 1937, (Emeritus), M.A., 1937, Washington; museology, culture history, North America, archaeology, historical archaeology.

Read, Kenneth E., 1958, (Emeritus), M.A. 1948, Sydney (Australia); Ph.D., 1948, London; social structure and organization, Oceania.

Schiffman, Harold F.,* 1967, ‡(Asian Languages and Literature, Linguistics), M.A., 1966, Ph.D., 1969, Chicago; Dravidian linguistics, Tamil sociolinguistics, language policy.

Swindler, Daris R.,* 1968, M.A., 1952, Ph.D., 1959, Pennsylvania; primate dentition, anatomy and growth development.

van den Berghe, Pierre,* 1965, ‡(Sociology), M.A., 1953, Stanford; Ph.D., 1960, Harvard; kinship, ethnic relations, human sociobiology, Africa, Latin America.

Watson, James B.,* 1955, (Emeritus), M.A., 1945, Ph.D., 1948, Chicago; social/cultural anthropology, economic anthropology, Oceania, New Guinea, exchange theory.

Winans, Edgar V.,* 1965, M.A., 1954, Ph.D., 1959, California (Los Angeles); politics, economics and law, Africa, the developing world.

Witherspoon, Gary,* 1987, M.A., 1968, Arizona State; M.A., 1969, Ph.D., 1970, Chicago; ethnology, anthropological linguistics, North America, Southwest.

Associate Professors

Atkins, John R.,* 1964, A.M., 1954, Pennsylvania; kinship, mathematical anthropology, culture and cognition.

Daniel, E. Valentine,* 1978, M.A., 1973, Ph.D., 1979, Chicago; South Asia, symbolic anthropology, semiotics, religion, philosophical anthropology, theory.

Eck, Gerald G.,* 1974, (Quaternary Research Center), M.A., 1974, Ph.D., 1977, California (Berkeley); physical anthropology, paleontology, primatology.

Greengo, Robert E.,* 1957, M.A., 1951, California (Berkeley); Ph.D., 1957, Harvard; archaeology, Northwest coast, Mesoamerica.

Harrell, C. Stevan,* 1974, (International Studies), ‡ M.A., 1971, Ph.D., 1974, Stanford; family systems, demography, social evolution, religion, China, Taiwan.

Horn, Beverly M.,* 1976, ‡(Community Health Care Systems), M.N., 1962, Ph.D., 1975, Washington; cross-cultural nursing, Native American Indian groups, adolescence.

Jacobs, Sue-Ellen,* 1974, ‡(Women Studies), M.A., 1966, Ph.D., 1970, Colorado; sociocultural and applied anthropology, anthropological studies of women, ethnohistory, North America.

Miller, Marc L.,* 1979, ‡(Marine Studies), M.A., 1972, California (San Diego); Ph.D., 1974, California (Irvine); work and occupations, natural resource management, tourism and leisure, maritime anthropology.

Muecke, Marjorie A.,* 1979, ‡(Community Health Care Systems), M.A., 1968, New York; M.A., 1972, Ph.D., 1976, Washington; community health nursing, refugee health, fertility and health, crosscultural healing.

Smith, Eric A.,* 1980, M.A., 1976, Ph.D., 1980, Cornell; ecology, evolutionary theory, hunter-gatherers, demography, Native Americans, Canadian Inuit.

Spain, David H.,* 1968, (Psychiatry and Behavioral Sciences, Social Work), M.A., 1962, Ohio State; Ph.D., 1969, Northwestern; psychocultural anthropology, African studies, research methods.

Stein, Julie K.,* 1980, (Quaternary Research Center), M.A., 1976, Ph.D., 1980, Minnesota; New World archaeology, Northwest coast archaeology, geoarchaeology, shell middens.

Wenke, Robert J.,* 1975, M.A., 1972, Ph.D., 1975, Michigan; archaeology of Egypt, the Middle East, and quantitative methods.

Assistant Professors

Bentz, Marilyn, 1979, M.S.W., 1967, Illinois; Ph.D., 1984, Washington; American Indians, psychological anthropology, applied anthropology, educational anthropology, social change.

Kahn, Miriam,* 1986, M.A., 1974, Ph.D., 1980, Bryn Mawr; museology, ecology, agricultural development, food symbolism, gender relations, Melanesia and Oceania.

Leonetti, Donna L.,* 1976, (Research), M.A., 1967, Ph.D., 1976, Washington; biological and sociocultural interactions in population adaptation, social epidemiology, Japanese Americans.

Lomawaima, Kimberly Tsianina, 1988, M.A., 1979, Ph.D., 1987, Stanford; institutions of cultural contact, educational anthropology, ethnohistory and oral history, native North America.

Rhodes, Lorna A.,* 1984, (Health Services), M.A., 1971, Ph.D., 1973, Cornell; medical anthropology, symbolic anthropology, South Asia, religion, psychiatry.

Ryesky, Diana,* 1978, (Affiliate), M.A., 1969, Wisconsin; Ph.D., 1977, New School for Social Research (New York); primitive art, medical anthropology, educational anthropology, social change.

Wyatt, Victoria,* 1986, ‡(Art), M.A., 1978, M.Phil., 1980, Ph.D., 1985, Yale; art and history of the natives of the Pacific Northwest coast and Alaska.

Course Descriptions

Courses for Undergraduates

General

ANTH 100 Introduction to Anthropology (5) AWSp Introduction to the subfields of archaeology, physical anthropology, and sociocultural anthropology through the examination of selected problems in human physical, cultural, and social evolution. Not recommended for students who have had other courses in anthropology, archaeology, or physical anthropology. May not be counted toward the 55 credits required for the major in anthropology.

Sociocultural Anthropology

ANTH 202 Principles of Sociocultural Anthropology (5) Comparison of lifeways of various non-Western and Western peoples. Introduction to basic theories and methods used in the field.

ANTH 203 Introduction to Linguistic Anthropology (5) A Eastman Linguistic approaches, methods, and theories used within anthropology. Descriptive and structural linguistics, comparative method, language change, ethnohistory, language and culture, sociolinguistics, language and culture classification, animal communication, study of social dialects (e.g., language and sex, class, geographical area).

ANTH 213 Peoples of Africa (5) Ottenberg, Spain, Winans Survey of the many cultures of pre- and post-colonial sub-Saharan Africa. Appreciation of the adaptability, strength, and creativity of African peoples.

ANTH 216 Oceania (3) Contemporary and traditional life in the Pacific Basin.

ANTH 230 Comparative Tribal Religion (5) World's "folk" or "little traditions" of religious belief and practice. Cosmologies, eschatologies, notions of causality and of human nature. "Little traditions" as examples of man's imaginative attempts to create a relatively closed, knowable, and more-or-less manageable cosmos.

ANTH 235 Southeast Asian Civilization: Buddhist and Vietnamese (5) Keyes Civilizations of Theravada Buddhist societies in Burma, Thailand, Cambodia, and Laos, and Vietnamese societies of Southeast Asia. Culture of tribal peoples who live on peripheries of these societies. Cultural transformations consequent upon the war in Indochina and resettlement of Indochinese refugees in United States. Joint with SISEA 235.

ANTH 301 Human Nature and Culture (3) Comparison of various anthropological perspectives on the sources of variation in customs, values, and beliefs of human groups, including non-Western peoples and contemporary Americans.

ANTH 302 Plants, Animals, and People (3) Hunn Emphasis on the knowledge of, and attitudes toward, plants and animals of non-Western peoples. Role of resource species as food and medicine and in tool manufacture, myth, and ritual. Hunters and gatherers, fishermen, pastoralists, and agriculturalists studied in comparison with contemporary Western societies.

ANTH 305 Anthropology of the Body (5) Atkins Biosociocultural approach to the human body as universal object—and agency—for human minds. How cross-cultural contrasts in ways of construing the body affect self-regard and social interaction. Body shapes, sizes, colors, exordia, signals, symbolism, esthetics, metaphysics, rituals, lore, and politics.

ANTH 310 Native North American Societies (5) W Smith Traditional cultures of America north of Mexico, emphasizing diversity of North American Indian and Eskimo societies. Origins of Native Americans' culture areas and language groupings; subsistence systems; levels of social organization; European conquest and colonialism; and description of representative cultures from the ten culture areas. Recommended: 100 or 202.

ANTH 314 Societies and Cultures of Insular Southeast Asia (5) Cultural, political, economic traditions of Insular Southeast Asia, Indonesia, Malaysia, Philippines. Early Indianized states; growing influences of Islam; Western European conquests; developed colonial societies, their legacies; modern nationalism, problems faced by new independent states; important cultural continuities. Joint with SISEA 314. Prerequisite: one 200-level course in either anthropology or International Studies.

ANTH 316 South Asia (3) Daniel Major cultural features of the Indian and Pakistan subcontinent.

ANTH 317 Southeast Asia (3) Dumont, Keyes Cultures of Southeast Asian societies: Burma, Thailand, Laos, Cambodia, Vietnam, Malaysia, Indonesia, and the Philippines. Emphasis on ethnographic cases. Prerequisite: permission of instructor.

ANTH 318 Peoples and Cultures of the Islamic Middle East (3) Survey of cultures and peoples of Islamic Middle East and North Africa. First half of the course emphasizes the integration of peasant, urban, and nomadic societies in the traditional culture and economy; the second half concentrates on the transformation of the traditional life styles through the process of westernization and modernization.

ANTH 321 Introduction to the Anthropological Study of Religion (3) Comparative study of religion as approached by anthropologists. Primarily for nonanthropology majors. RELIG 201 or 202 recommended.

ANTH 333 Art of the Northwest Coast Indian (3) A Emphasis on the structure and style of two-dimensional art of the northern tribes. Joint with ART H 333.

ANTH 334 Art of the Northwest Coast Indian (3) W Three-dimensional art of the Northwest coast cultural area with emphasis on esthetic principles, techniques, and cultural functions. Joint with ART H 334.

ANTH 335 Art of the Northwest Coast Indian (3) Sp Northwest coast Indian art as related to drama and dance with special attention to the Kwakiutl Indians. Joint with ART H 335.

ANTH 350 Ecological Anthropology: Civilized and Primitive (3) Spain Evolution of culture and society with emphasis on ecology. Development of urban life in light of common and distinctive character of cities, peasantries, and tribal groups or bands. Process of urbanization, disappearance of truly primitive peoples, emergence of peasant, rise of a world system. Selected case studies, past and present.

ANTH 352 Buddhism and Society: The Theravada Buddhist Tradition in South and Southeast Asia (5) Keyes Introduction to the religious tradition of Theravada Buddhism (as practiced in Sri Lanka, Burma,

Thailand, Laos, and Cambodia) and examination of the variations in ethical orientations developed through Theravada Buddhist ideas. Joint with RELIG 350. Recommended: RELIG 202 or knowledge of one Eastern religious tradition.

ANTH 353 Anthropological Studies of Women (5) Jacobs Cross-cultural and comparative survey of the varieties of women's cultural experiences, statuses, and roles in cultural context and the anthropological theories used to account for them. Topics include biological factors, studies of primates, woman the gatherer, work in preindustrial and industrial societies, women in folklore and music, patriarchy and matrilineal kinship, childbirth, and women's roles in economic development. Joint with WOMEN 353. Prerequisites: 202 and WOMEN 200, or permission of instructor.

ANTH 354 The Comparative Study of Societies (3) van den Berghe Compares entire societies at various levels of technological complexity to explore problems of their development and structural organization. Examines both historical and contemporary, and Western and non-Western societies. Joint with SOC 354. Prerequisite: 202 or SOC 110.

ANTH 355 Aging in Cross-Cultural Perspective (3) Survey of strategies for dealing with the fact of aging in various sociocultural systems. Relates the varieties of cultural solutions to the theories on aging, drawn from psychology and medicine, with emphasis on non-Western societies. Prerequisite: 202 or permission of instructor.

ANTH 356 Visual Anthropology (3) The place of photography and films in ethnography; their use in the documentation and interpretation of cultural and social systems.

ANTH 359 Linguistic Ethnography (5) Eastman Language use in cultural contexts. How language reflects world view. Language use in culturally significant settings. Analyzes sets of culturally specific terms in semantic domains. Includes projects demonstrating application of theory and method to data addressing specific problems. Workshop format.

ANTH 360 Ecological Anthropology: Introduction to Cultural Ecology (5) Survey of anthropological research on interaction between human societies and their environments. Logic of different subsistence systems; intensification and transformation of subsistence strategies; population regulation; ecological aspects of human nutrition, disease, spatial organization, ethnicity, social stratification, conflict, and cooperation; historical roots of current ecological crisis. Prerequisite: permission of instructor.

ANTH 371 Political Anthropology (3) Ottenberg, Winans Theories of the development of political forms and of the social structural analysis of political organization. Authority, power, and concepts of politics and administration. Prerequisite: 202.

ANTH 372 Anthropology of Law (3) Ottenberg, Winans Major theories and studies in legal anthropology. Dispute settlement, juridical processes, and concepts of law and legal activities. Prerequisite: 202.

ANTH 373 Stateless Societies: An Ethnographic Approach to Noncentralized Political Systems (5) W Winans Comparative examination of modes of governance in noncentralized societies. Forms of decision making, competition for supports, resolution of conflicts, and boundary maintenance with adjacent groups. Cases discussed in the context of alternative theories of the development of politics. Prerequisites: 202 and POL S 273.

ANTH 401 West African Societies (3) Ottenberg, Spain Social and cultural features of coastal and interior West African societies, including the Western Sudan. Detailed study of selected societies. Prerequisite: 202 or permission of instructor.

ANTH 402 Societies of Eastern and Southern Africa (5) *Winans* Historical background and contemporary life of cultural groups in eastern and southern Africa with special study of selected cases of political and economic organization and cultural change. Prerequisite: 202 or permission of instructor.

ANTH 403 Traditional Chinese Society (5) *Harrell* Late traditional (Ming-Qing) China as a social system. Systematic analysis of temporal and spatial variation in family, kinship, local organization, social class, government, and antigovernment activity. Joint with SISEA 443. Prerequisite: 202, HSTAS 454, graduate standing, or permission of instructor.

ANTH 404 South America (5) Survey of anthropological research among the traditional peoples of South America. Historical background and contemporary life of cultural groups of the Amazonian Basin. Transformation of traditional life-styles through the process of European conquest and the aftermath of colonialism. Detailed study of selected societies. Prerequisite: 100 or 202. (Formerly 322.)

ANTH 405 Peoples of the Soviet Union (5) *W* Traditional culture and social organization of Russians and some other USSR peoples, including larger nationalities (e.g., Ukrainians, Estonians) and some smaller ethnic groups in Siberia. Role of traditional culture in shaping contemporary lifestyles in multiethnic, diversified setting. Joint with SISRE 405. Prerequisite: 202 or permission of instructor.

ANTH 408 New Guinea Societies (5) Peoples and cultures of coastal and interior New Guinea and adjacent islands. Deals intensively with selected general problems of ethnographic method and ethnological and sociological interpretation. Character of small autonomous societies in Melanesia: ecology, economics, gender, systems of exchange, social organization, magic and ritual, warfare. Prerequisite: 202 or permission of instructor.

ANTH 409 Micronesian Societies (3) Comparative social anthropology of the social systems of high islands and coral atolls of Micronesia. Intensive treatment of the kinship, religion, ecology, and politics in both traditional and contemporary periods. Prerequisites: 202, and either 216 or permission of instructor.

ANTH 410 Polynesian Societies (3) Comparative social anthropology of the high and low islands of Polynesia, including the Polynesian outliers in Melanesia and Micronesia. Covers history, ecology, economics, political organization, and ritual systems. Special topics include colonialism, land tenure in relation to kinship, and child adoption. Prerequisites: 202, and either 216 or permission of instructor.

ANTH 411 Australian Aboriginal Societies (3) Examination of archaeological and linguistic evidence of distribution of, and relationships among, aboriginal groups before White contact. Ethnographic comparisons of local organization and land tenure, kinship, law, and religion. Past and present use of aboriginal data in social science theory. Prerequisites: 202, and either 216 or permission of instructor.

ANTH 412 South Asian Social Structure (5) Caste dynamics, political control, economic organization, and religion in Hindu-village India. Prerequisites: 202 or permission of instructor.

ANTH 415 Applied Ethnography (3) *Sp* Examines the social context of applied cultural anthropology and prepares students for nontraditional uses of anthropological theory, knowledge, and training. Rationale for applied ethnographic research, professional training, the research proposal/contract, social change, applied anthropology, the research product.

ANTH 418 Indian Heritage of Central America (5) *Hunn* Indian civilization of Mexico and Guatemala, their origins and ecological foundations. Contemporary communities of Mexico and Guatemala, focusing on

creative adaptation of pre-Columbian traditions to modern national realities. Prerequisite: 202 or permission of instructor.

ANTH 419 Peoples and Cultures of the Iranian Plateau (3) Survey of the cultural features of the Iranian Plateau with particular attention to modern problems of cultural change. Prerequisite: permission of instructor.

ANTH 421 Belief, Ritual, and the Structure of Religion (5) Systematic survey of concepts, models, and theories that characterize the anthropological study of religion. Consideration of the human universal basis of religion and of diverse ways in which religions are constructed and related to social experience. Prerequisites: 202 or 321, or RELIG 201 and 202.

ANTH 422 Religious Systems (5) Intensive examination of selected type of religious system with reference to the anthropological approach to study of religious phenomena. Type of system chosen for study varies. Prerequisite: 421 or RELIG 380 or permission of instructor.

ANTH 424 Hunter-Gatherer Societies (4) Comparative examination of human foraging societies, emphasizing ethnographic cases and socioecological analysis. Foraging and human evolution; rationality of foraging societies; population and reproductive strategies; variability in social organization and land use; power relations between the sexes; ritual and belief; contemporary status of hunter-gatherer populations. Prerequisite: 202 or permission of instructor.

ANTH 425 Ethnicity and Nationality in the USSR (5) *Sp* *Platkin* Creation of the Soviet Union: Leninist and Stalinist approaches to the "national question." Contemporary processes of ethnic assimilation and dissimilation. Formation of national elites, rise of various forms of nationalism, position of religion in national cultures. Specific cases include Russian nationalism, Islam in Central Asia. Joint with SISRE 425.

ANTH 426 Peasant Culture and Society (5) Place of peasants in state, civilization, and global economy, especially as seen from peasants' perspective. Consideration of cases drawn from anthropological studies. Prerequisite: 202 or permission of instructor.

ANTH 427 Anthropology in Urban Settings (3) *Sp* *Chrisman* Cross-cultural examination of theoretical issues in anthropology as studied in urban places. Focuses on ethnic identity and the formation of urban ethnic groups; migration and its rural and urban consequences; family and kinship organization as an adaptation to urban complexity; the nature of urban voluntary associations; law and politics; and the developments in anthropological method. Prerequisite: 202 or permission of instructor.

ANTH 428 Anthropological Perspectives on Ethnicity (3) *Keyes, Ottenberg* Anthropological approaches to ethnicity and ethnic group relations, with reference to other models including race, caste, class, regional groupings, nations, religion, and stratification. Data drawn from precolonial, colonial, and postcolonial periods. Prerequisite: 202 or permission of instructor.

ANTH 429 Expressive Culture (5) *Ottenberg* Anthropological view of one expressive aspect of culture: plastic-graphic arts, myth and folktale, music, dance, humor and tragedy, or play and games. Prerequisite: 202 or permission of instructor.

ANTH 430 The Anthropology of Music (3) *Ellingson, Waterman* Analysis of aspects of anthropological thought influential in ethnomusicology. Critical evaluation of dominant theoretical schools and modes of explanation (e.g., evolutionist, diffusionist, historical particularist, structuralist, functionalist, symbolist, semiotic) through detailed examination of seminal texts. Joint with MUSIC 480. (Offered alternate years.)

ANTH 431 Oral Traditions (3) *Dumont, Smith* Oral traditions and verbal expression, examined anthropologically and in relation to student interests. Criti-

cal examination of relevant theories and methods of analysis. Prerequisite: 100 or 202.

ANTH 432 Sociolinguistics (3) *Sp* *Eastman, Schiffman, Williams* Social variation in phonology, morphology, syntax, lexicon of languages and dialects. Nonstandard language, diglossia, pidgins and creoles, gender differences, bi- and multilingualism, the ethnography of speaking, pragmatics, and language attitudes. Joint with LING 432. Prerequisite: LING 400; recommended: concurrent registration in LING 451 or permission of instructor.

ANTH 433 Culture and Homosexuality: U.S.A. (3) Descriptive and analytical treatment of homosexuality and culture. Cultural bases for the stigma of homosexuality; heterosexual lore of the "masculine" and "feminine"; cultural definitions of intra- and inter-sexual roles and their relationship to the homosexual stigma. Homosexuality and cultural alienation. Homosexual modes of communicating and expressing the stigmatized preference; institutionalized settings. Symbolism of homosexual ritualized behaviors. Prerequisite: 202 or permission of instructor.

ANTH 434 Comparative Morals and Value Systems (3) Moral basis of human society and comparison of value systems based on anthropological studies. Prerequisite: 202 or permission of instructor.

ANTH 435 Economic Anthropology (5) Chief features of nonmonetary and simple monetary economics. Impact of central or metropolitan market economy and industrial technology as peripheral systems, especially of small-scale and limited monetary circulation. Development and application in anthropology of economic concepts, including Marxian. Prerequisites: 202 or permission of instructor.

ANTH 436 Comparative Family Organization (5) *Harrell* Function and structure of family developmental processes in band, tribal, peasant, and modern societies. Illustrates inter- and intrasocietal variation and provides data for construction of formal models of process and variation in family systems. Prerequisite: 202.

ANTH 437 Political Anthropology and Social Change (5) *Ottenberg, Winans* Anthropological studies of local-level politics in colonial, modernizing, and encapsulated societies. Processual approaches to the study of political change. Prerequisites: 202, 371, or permission of instructor.

ANTH 438 The Analysis of Kinship Systems (5) Data, theories, and analytical technique used in the study of kinship systems, including our own, from around the world. Prerequisite: 202 or permission of instructor.

ANTH 439 Law in Changing Societies (5) Anthropological viewpoints on legal aspects of colonial, modernizing, and encapsulated societies. Problems of plural legal systems and of conflicts in judicial systems. Prerequisites: 202, 372, or permission of instructor.

ANTH 440 Child-Rearing, Culture, and Health (3) Cross-cultural study of the child-rearing practices, cultural norms, and health behavior of children and adolescents in different societies. Comparative approaches, diverse theoretical postures, and empirical research findings are used. Joint with CHCS 495. Recommended: courses in child development or introductory anthropology.

ANTH 441 Psychological Anthropology (5) *Spain* Assessment of mutual relevance of cultural and psychological variables in anthropology. Historical development of principal topics (e.g., cognition, national character, enculturation, personality and social change, cross-cultural psychiatry, sex and temperament, deviance, and psychoanalytic studies of culture). Prerequisite: 202 or introductory psychology or personality theory or permission of instructor.

ANTH 442 Anthropological Aspects of Communication (5) *Daniel* Introduction to communicational aspects of culture. Prerequisite: 202.

ANTH 443 Anthropological Rhetoric (5) Ethnographic writing as literature; the understanding of cultures different from one's own by means of textual analysis and critique from Herodotus through Geertz. Methodology of anthropological persuasion. Prerequisite: upper-division standing or permission of instructor.

ANTH 444 Contemporary Chinese Society (5) *Harrell* Analysis of society in the People's Republic of China as a product of traditional Chinese society and the changes wrought upon it by the impact of the West and by the revolutionary policies and practices of the Chinese Communist Party. Joint with SISEA 444. Prerequisite: 403 or SISEA 443 or another acceptable course on Chinese society, or permission of instructor.

ANTH 445 Quantitative Methods in Anthropology (5) Basic statistical techniques useful for anthropologists. Elementary computer processing of anthropological data. Intended for students of anthropology. Prerequisites: 202, ARCHY 205 or PHY A 201 and STAT 301 or 311 or permission of instructor.

ANTH 446 Structural Anthropology (3) *Dumont* Contributions of Levi-Strauss and others to anthropology, with concentration on the holistic analysis of culture through myth, ritual, society, and cosmology. Prerequisite: 202 or permission of instructor.

ANTH 447 Religion in China (5) *Sp Harrell* Place of religion in Chinese society, examining the doctrines, practices, and social consequences of the eclectic folk religion, the elite Confucian, Taoist, and Buddhist traditions, syncretistic sects, and imported Christianity. Joint with SISEA 445. Prerequisite: one course in Chinese society, politics, or history, or permission of instructor.

ANTH 451, 452, 453 Phonology I, II, III (4,4,4) *A,W,Sp Brame, Contreras, Kalsse* Speech sounds, mechanism of their production, and structuring of sounds in languages; generative view of phonology. Joint with LING 451, 452, 453. Prerequisite: LING 200 or 400, either of which may be taken concurrently, or permission of instructor.

ANTH 454 Women, Words, Music, and Change (5) *Sp Jacobs* Comparative analysis of use of myths, tales, music, and other forms of expressive culture to account for, reinforce, and change women's status and roles; cross-cultural analysis of planned change and development. Joint with WOMEN 454. Prerequisite: 353 or permission of instructor.

ANTH 455 Areal Linguistics (3, max. 6) *Eastman* Issues involved in classification of languages. Systems of classification based on structure, word order, areal features. Ways in which languages may be classified for different purposes. Borrowing vocabulary specialization, lexical change, language death and revival. Joint with LING 455.

ANTH 458 Cross-Cultural Perspectives on Textiles and Costumes (3) *Fyiesky* Technological, economic, social, ideological, esthetic, and communicative aspects of textiles and costume of non-Western societies, analyzed from perspectives derived from anthropology and other social sciences. Modifications in the design and use of textile products due to the impact of industrial society. Prerequisites: 10 credits in anthropology or sociology.

ANTH 460 History of Anthropology (5) *Keyes, Ottenberg* Sources and development of leading concepts, issues, and approaches in anthropology. Findings of anthropology in relation to scientific and humanistic implications and to practical application. Main contributors to field; their work and influence. Past, present, and future perspectives, including anthropology of modern life. Prerequisites: 202 and 15 additional credits in anthropology.

ANTH 461, 462, 463 Syntax I, II, III (4,4,4) *Newmeyer* Study of the structural properties of language; introduction to generative transformational syntax.

Joint with LING 461, 462, 463. Prerequisite: LING 200 or 400, which may be taken concurrently, or permission of instructor.

ANTH 464 Language Policy and Cultural Identity (3) *Eastman, Schiffman* Decision making regarding language in sociopolitical contexts. Language and ethnicity, educational policy, and use of language in developing nations. Plans to modernize, purify, standardize, reform, and revive language. Language loyalty and motives for second-language acquisition. Joint with LING 433. Prerequisite: LING 200 or 400.

ANTH 469 Special Studies in Anthropology (3-9, max. 9) Delineation and analysis of a specific problem or related problems in anthropology. Offered occasionally by visitors or resident faculty. May be repeated for credit by permission. Prerequisite: 202 or permission of instructor.

ANTH 475 Comparative Systems of Healing (5) *S* Medical anthropology. Ways in which and extent to which "health" and "sickness" are culturally constituted. Epistemological, as well as pragmatic, limitations of the organism-centered, cartesian, biomedical approach to sickness, medicine, and health. Joint with HSERV 475.

ANTH 480 Introduction to Museology (3) Museum history, philosophy, and basic operations, including organization, income, collection management, conservation, exhibition, security, education, research, and ethics. Prerequisite: upper-division standing or permission of instructor.

ANTH 481 Museum Collection Management: Ethnology (3) Lecture and work experience in museum collection management in the ethnology collections of the Burke Memorial Washington State Museum, including identification, cataloging, fumigation, storage, cleaning, inventory, and specimen preparation for exhibition of archival and nonarchival museum specimens from North America, the Pacific, and Pacific Rim areas. Prerequisite: 480 or permission of instructor.

ANTH 482 Museum Conservation (5) Lecture and laboratory work in the recognition and treatment of museum conservation problems for specimens of wood, fiber, stone, metal, and bone. Application of basic principles to specific conservation and restoration problems faced by curatorial personnel. Prerequisites: 480, 481 or permission of instructor.

ANTH 483 Women in Evolutionary Perspective (5) *W* Critical appraisal of major theories accounting for evolution of sex and gender roles and status differences; cross-cultural testing for sociobiological, biocultural, cultural materialist, structural, and symbolic explanations for "female power and male dominance." Joint with WOMEN 453. Prerequisite: 353 or permission of instructor.

ANTH 486 Human Family Systems: Biological and Social Aspects (3) *van den Berghe* Biological bases for human mating and reproduction, and an examination of the range of cross-cultural variability in human systems of kinship and marriage; comparisons among a wide range of human and nonhuman species, and between Western and non-Western human societies; interplay of biological, ecological, and sociocultural factors in determining the structure and function of human family systems. Joint with SOC 486. Prerequisite: 100 or PHY A 201 or SOC 110.

ANTH 488 Advanced Topics in Museology (3) Selected current topics in museology. Prerequisite: 480 or permission of instructor.

ANTH 489 Anthropology Practicum (3-9, max. 15) *AWSpS* Faculty-supervised off-campus internships in organizations utilizing anthropological skills in nonacademic settings. Establishing educationally valuable individual projects for internships with faculty sponsor. Organizations include museums, social service and other governmental agencies, and private nonprofit service agencies. Prerequisites: major in anthropology and permission of instructor.

ANTH 490 Problems in Social Structure (3, max. 6) Selected current problems in the study of social structure. Prerequisites: 202, 20 additional credits in anthropology, and permission of instructor.

ANTH 492 Anthropology of Refugees (3) *W Muecke* The refugee phenomenon, its emergence in the postcolonial world, and the structure of the life history of refugees. Ethnic change, involuntary deculturation, and acculturation as they occur in refugee life histories. Joint with CHCS 492. Prerequisite: 202 or permission of instructor.

ANTH 493 Advanced Topics in Expressive Culture (3, max. 6) Analysis and testing of special domains of esthetic expression, such as graphic arts, oral literature, dance, and humor among non-Western peoples. Prerequisites: 202, 429, or permission of instructor.

ANTH 494 Problems in the Anthropology of Law and Politics (3, max. 6) *Ottenberg, Winans* Seminar in the interrelationships of law and politics. Political aspects of procedural and substantive law. Law as a basis of political power and authority. The intertwining of political and legal processes. Prerequisites: 371 or 439 and 372 or 437, or permission of instructor.

ANTH 495 Advanced Problems in Ethnology (3, max. 6) Current problems in ethnology. Seminar format. Prerequisites: 25 credits in anthropology and permission of instructor.

ANTH 496 Problems in Psychological Anthropology (3, max. 6) Problem areas and new approaches to the study of culture and personality. Prerequisite: 441 or permission of instructor.

ANTH 499 Undergraduate Research (*, max. 12; max. 18 for honors students only) Prerequisite: permission of instructor.

Archaeology

ARCHY 105 World Prehistory (5) *W Stein, Wenke* Prehistoric human ancestors from three million years ago: their spread from Africa and Asia into the Americas, survival during ice ages, development of civilizations. Well-known archaeological finds (e.g., Olduvai Gorge; Neanderthals; Jericho; Egyptian pyramids; Mexican temples; Mesa Verde; Ozette, Washington). May not be counted toward the 55 credits required for the major in anthropology.

ARCHY 205 Principles of Archaeology (5) *AWSpS* Techniques, methods, and goals of archaeological research. Excavation and dating of archaeological materials. General problems encountered in explaining archaeological phenomena.

ARCHY 270 Field Course in Archaeology (12) *S* Introduction to field acquisition of archaeological data through survey and excavation. On-going field projects; recovery and recording techniques. Prerequisite: permission of department.

ARCHY 303 Old World Prehistory (3) Old World prehistory from beginnings of human culture to rise of civilizations. First tools made by humans, spread of humans out of Africa, origins of agriculture, rise of state society. Africa, Near East, Egypt, China, India, Europe.

ARCHY 304 New World Archaeology (3) History of earliest Americans, beginning with crossing of land bridge between Asia and North America and eventual spread over the Americas. Highlights prehistory and best examples of western hemisphere's civilizations. Mexico, Yucatan, Peru, southwestern and eastern United States, Washington.

ARCHY 320 Prehistory of the Northwest Coast (5) Origin, development, and variation of Pacific Northwest cultures from early migrations to nineteenth century. Adaptation to maritime and interior environments; artifacts and art.

ARCHY 371 Analysis of Archaeological Data (5) A Stein Analyzing archaeological data by measuring and describing such artifacts as stone tools and ceramics. Analysis of such environmental data as bones, plant remains, and sediments. Prerequisite: 205, or permission of instructor.

ARCHY 468 Issues in Cultural Resource Management (1) Sp Dunnell, Grayson, Nason Review of federal and state cultural resource management policies and the effects of these policies on the conduct of projects that may impact cultural resources on public lands. Survey of related issues in museum management. Prerequisite: 205, ANTH 202, or permission of instructor.

ARCHY 469 Special Studies in Archaeology (3, max. 6) Consideration in detail of specific archaeological topics, either methodological or substantive in content, of current interest. Offered occasionally by resident, new, or visiting faculty. For advanced undergraduates and graduate students. Prerequisites: 205 and permission of instructor.

ARCHY 473 Prehistoric Cultures of Mexico (3) Development of ancient Mexican civilization from early hunter-gatherers to the Aztecs. Origins of agriculture; mysterious Olmec; development of complex societies in the Valley of Mexico, Oaxaca, and Gulf Coast. Prerequisite: 205 or permission of instructor.

ARCHY 474 Prehistoric Cultures of South America (3) Sp Stein Archaeological history of South American continent. Andean region: earliest evidence of humans, origin of agriculture, development of civilization. Amazon, Brazilian coast, Colombian-Ecuadorian coasts. Prerequisite: 304, or permission of instructor.

ARCHY 475 The Mayan Civilization (3) Evolution of Mayan civilization in tropical lowlands of Yucatan and Guatemala, and Guatemalan Highlands. Olmec heritage; rise of complex societies; sudden collapse of ceremonial centers and ceramics. Prerequisite: 304 or 205 or permission of instructor.

ARCHY 478 Prehistoric Cultures of North America: Western North America (5) W Grayson Ecological account of prehistoric cultural developments in North America west of the Rocky Mountains. Cultural and environmental change from appearance of people in New World to collapse of indigenous cultural systems. Prerequisite: 304 or permission of instructor.

ARCHY 479 Prehistoric Cultures of North America: Eastern North America (5) Sp Dunnell Ecological and evolutionary account of prehistoric cultural developments in North America east of the Rocky Mountains. Cultural and environmental change from appearance of people in New World to collapse of indigenous cultural systems. Prerequisite: 304 or permission of instructor.

ARCHY 480 Advanced Archaeological Analysis: Tools (6) W Dunnell, Wenke Combination of lecture and practical laboratory instruction in the presentation of archaeological data for analysis, emphasizing stylistic and functional analyses of lithic, ceramic, and other artifacts, attribute recognition, and standard techniques for data manipulation. Theoretical bases for techniques and their uses and limitations in cultural, historical, and processual accounts. Prerequisite: 371 or permission of instructor.

ARCHY 481 Advanced Archaeological Analysis: Biological Remains (6) A Grayson Seminar on techniques and methods employed in analysis of floral and faunal remains from wide range of late Pleistocene and Holocene settings, including archaeological sites, coupled with laboratory focusing on identification of faunal remains from these settings. Prerequisite: 371 or permission of instructor.

ARCHY 482 Advanced Archaeological Analysis: Geoarchaeology (6) Sp Stein Identification, analysis, and interpretation of sediments and soils associ-

ated with archaeological remains. Laboratories deal with sediment description and chemical analysis; field trips and student projects focus on archaeological applications of these subjects. Prerequisite: 371 or permission of instructor.

ARCHY 489 Laboratory in Artifact Identification: Eastern North America (1) Dunnell Identification of prehistoric artifacts from eastern North America, based on experience with actual specimens. Time- and area-sensitive classes, projectile points, pottery, and groundstone tools emphasized. Prerequisite: 479, which may be taken concurrently.

ARCHY 491 Museum Collection Management: Archaeology (3) W Lecture and work experience in museum collection management in the archaeology collections of the Washington State Burke Memorial Museum, including identification, cataloging, storage, cleaning, inventory, and exhibit preparation. Involves both archival and nonarchival specimens from North America, Oceania, South America, and Europe. Prerequisite: 480 or permission of instructor.

ARCHY 495-496 Quantitative Archaeological Analytic Techniques (3-3) A Wenke Introduction to quantitative approaches to archaeological problems; data screening, numeric methods of classification and identification, graphical and computer-based seriation techniques, and the analysis of spatial patterning in artifact distributions. Prerequisites: 205, an introductory descriptive statistics course, and permission of instructor.

ARCHY 497 Archaeological Method and Theory I: Formal Theory (5) A Dunnell Examination of theoretical constructs in the analysis of archaeological data. Terminology, typologies, and interregional comparisons. Prerequisites: 205, 20 additional credits in anthropology, and permission of instructor.

ARCHY 498 Archaeological Method and Theory II: Explanatory Theory (5) W Dunnell Conceptual frameworks employed by archaeologists in obtaining explanation in the three major areas of culture history, cultural reconstruction, and explanatory prehistory, considering the nature of explanation as conceived in these areas, the basic assumptions employed in achieving these aims, and an introduction to the methods employed. Prerequisites: 205, 497.

ARCHY 499 Undergraduate Research (*, max. 12; max. 18 for honors students only) Prerequisite: permission of instructor.

Physical Anthropology

PHY A 201 Principles of Physical Anthropology (5) AWSps Evolution and adaptation of the human species. Evidence from fossil record and living populations of monkeys, apes, and humans. Interrelationships between human physical and cultural variation and environment; role of natural selection in shaping our evolutionary past, present, and future.

PHY A 370 Introduction to Primates (5) Eck, Newell, Swindler Origins, major evolutionary trends, and modern taxonomic relationships of the nonhuman primates. Their distribution and habitat in relation to behavioral and morphological adaptations and their status as endangered species. Prerequisite: 201.

PHY A 371 Evolutionary Perspectives on the Human Condition (4) Newell The human species—past, present, and future. Biological uniqueness of the human species; its role in biological and cultural extinctions. Conceptions and misconceptions of species behavior. Evidence for ongoing human evolution evaluated in relation to present population redistribution and reorganization.

PHY A 372 Evolutionary and Nonevolutionary Views of the Human Species (5) Views of human biology and behavior as they have changed since Darwin published his theory of evolution. Challenges to Darwinism, "myths" of human origins and biological

determinism as exemplified in the eugenics movement, racism, and studies of human physiognomy. Recommended: 201.

PHY A 375 Biology of Human Race (3) Sp Worldwide distribution of variation in human biology: shape, size, skin color, body composition, human performance. Natural selection, historical factors, random biological events. History of attempts to classify people into racial groups and problems associated with such efforts. Prerequisite: 201 or permission of instructor.

PHY A 382 Human Population Biology (3) A Nute Human population biology with reference to capacity for growth in population size. Interaction of human biology, population structure, and culture in promoting such growth. Effects of economic, demographic, medical, and ecological factors.

PHY A 387 Ecological Anthropology: Ecological and Biological Adaptation in Human Populations (5) A Biological adaptability derived from our history as hunter/gatherers. Biological consequences of our past examined by studying how living populations respond to environmental stress. Relationships between biological and behavioral responses. Application of theoretical models derived from evolutionary and ecological approaches. Prerequisite: 201 or permission of instructor.

PHY A 388 Human Fossils and Evolution (5) W Eck Evolution of human anatomy and behavior. Human fossils: their geological context, age, ecological setting. Use of this information to reconstruct early human history. Changes in anatomical and behavioral characteristics as adaptations to environment. Prerequisite: 201, or BIOL 210, 211, 212.

PHY A 390 Ecological Impact of Cities on People (3) Effects of urban stresses upon the biobehavioral characteristics of city people in both developed and underdeveloped countries: pollution, poor nutrition, disease, social breakdown, maladaptive lifestyles, anonymity, and overstimulation. The multifactorial nature of these stresses is emphasized, as well as the mechanisms behind the responses to them. Prerequisite: 201.

PHY A 469 Special Topics in Physical Anthropology (3, max. 6) Eck, Newell, Nute, Swindler Delineation and analysis of a specific problem or a more general area in physical anthropology. Offered occasionally by visitors or resident faculty. Prerequisite: permission of instructor.

PHY A 473 Biological Adaptability of Human Populations (5) W Mechanisms enabling humans to maintain homeostasis in extreme environments: high altitude, heat, cold, nutritional deficiency, radiation. Adaptive process operating at levels of physiology, metabolism, and population, including the strategies of fertility and birth spacing. Prerequisites: 201 and physiology, or permission of instructor.

PHY A 476 Sociocultural Ecology and Health (3) Sociocultural ecology of health/disease, focusing on humans as bioculturally integrated beings and on populations as biocultural units of adaptation. Examples of research on disease (infectious, chronic) and patterns of morbidity and mortality (infant, maternal, old age) with particular attention to situations of sociocultural changes. (Last quarter offered: Winter Quarter 1991.)

PHY A 478 Dental Anthropology (5) Swindler Intensive survey of the dentitions of primates from tree shrews to man. Emphasis placed on the range of metric and morphologic variability existing in the teeth of these animals, both in fossil and living groups. Environmental and genetic factors are considered within this ontogenetic and phylogenetic framework. Prerequisite: 201.

PHY A 480-481 Primate Anatomy: Structure and Function (5-5) W, Sp Swindler Anatomy of various primates studied in detail with special reference to

structural and functional relationships. The evolution and present ecology of primates as they relate to the total anatomical picture. The laboratory consists of dissection of a specified primate and a study of the dentition and osteology. Prerequisite: 201 or permission of instructor.

PHY A 482 Human Population Genetics (5) Sp Nute Micro-evolutionary changes in human populations. Effects of mutation, selection, inbreeding, gene flow, and genetic drift as causes of evolutionary change. Mathematics beyond high school not required. Prerequisite: 201 or permission of instructor.

PHY A 484 Human Life Cycle (5) Sp Newell Human growth and physical/social development: fetal life to old age. Cultural, ecological, and evolutionary aspects of the life cycle—population differences in age and sex related to morbidity and mortality. Prerequisite: 201 or permission of instructor.

PHY A 485 Research in Growth and Development (2, max. 8) Newell Discussion and research on topic relating to primate growth and development, using either published materials or data from on-going studies at this university. Prerequisites: 484, which may be taken concurrently, and permission of instructor.

PHY A 486 Primate Socioecology (3) Focus on the variety of social systems exhibited by nonhuman primates and adaptive significance of these societies; social systems in terms of the present ecology and evolutionary past of the species; the function of communicatory gestures and vocalizations, tradition, kinship, and social roles in maintaining and structuring groups over generations; the relationship among mating systems, foraging strategies, ranging patterns, and ecological separation/resource partitioning and their contribution to species-typical social organization. Prerequisite: 201.

PHY A 487 Human and Comparative Osteology (3) Swindler Introduction to the vertebrate skeleton. The skeleton is described in detail, and various methods of determining age and sex are presented, as well as osteometry and modern statistical methods for handling such data. Prerequisite: permission of instructor.

PHY A 488 Primate Evolution (5) Eck Major trends in nonhominid primate evolution through the Cenozoic. Discussion of the specimens, geological context, and age of the fossil taxa and their relationship to modern taxa. Practical experience in analyzing fossil material. Prerequisite: 201 or permission of instructor.

PHY A 489 Early Evolution of the Hominidae (5) A Eck Data and interpretations basic to the Pliocene and early Pleistocene evolution of the family Hominidae. Presentation of the geological contexts, ages, faunal associations, and fossil and cultural remains of the hominid lineages. Practical experience with the hominid fossil material, and explanation of the morphological and contextual similarities and differences. Prerequisite: 201 or permission of instructor.

PHY A 490 Later Evolution of the Hominidae (3) W Eck Data and interpretations basic to the middle and late Pleistocene evolution of the family Hominidae. Presentation of the geological contexts, ages, faunal associations, fossil and cultural remains of the hominid lineages. Practical experience with the hominid fossil material and explanation of the morphological and contextual similarities and differences. Prerequisite: 201 or permission of instructor.

PHY A 499 Undergraduate Research (*, max. 12; max. 18 for honors students only) AWSps Prerequisite: permission of instructor.

Courses for Graduates Only

General

ANTH 600 Independent Study or Research (*, AWSp)

ANTH 700 Master's Thesis (*) Offered on credit/no credit basis only.

ANTH 800 Doctoral Dissertation (*) Offered on credit/no credit basis only.

Sociocultural Anthropology

ANTH 500. Preceptorial Reading (6) For beginning graduate students who have not had adequate training in the problems, principles, and methods involved in the analysis and comparison of social and cultural systems. Not open to graduate students in the sociocultural anthropology program.

ANTH 503 Preceptorial Reading in Linguistic Anthropology (6) For beginning graduate students who have not had prior training in the problems, principles, and methods involved in linguistic anthropology. See also course description for 203. Not open to graduate students in the linguistics program.

ANTH 507-508-509 Methods of Sociocultural Research (5-5-5) Core-course sequence intended for first-year graduate students in sociocultural anthropology. Survey of major issues, alternative strategies, and selected special topics in the design of anthropological research and the collection, processing, and analysis of anthropological data. Prerequisite: graduate standing in anthropology or permission of instructor.

ANTH 510 Seminar on North American Indians (3) Advanced comparative treatment of selected aspects of the Indian cultures and societies of North America.

ANTH 514 Regional Seminar (3, max. 12) Comparative treatment of selected aspects of cultures and societies of a particular region or area.

ANTH 517 Seminar on South Asia (3) Advanced analysis of selected problems in South Asian ethnology and social structure. Prerequisite: 412.

ANTH 520 Ecology, Evolution, and Anthropological Theory (3-5) Smith Critical examination of models and theories from evolutionary ecology, sociobiology, and ecological anthropology. Potential and actual utility of such models in explaining aspects of human social behavior, cultural evolution, and cross-cultural variation in strategies of production and reproduction.

ANTH 521 Seminar on the Anthropological Study of Religion (3, max. 9) Advanced seminar in the anthropological study of religion designed for students who have a background in the theory and applications of theory developed in the anthropological study of religion. Seminar topics vary each quarter. Prerequisites: 422 and graduate standing; permission of instructor for graduate students in Comparative Religion.

ANTH 522 Seminar on South American Indians (3) Sp Dumont Advanced comparative treatment of selected aspects of the Indian cultures and societies of South America.

ANTH 525 Seminar in Culture Processes (3, max. 6) The concept of process and its application to the study of culture.

ANTH 527 Acculturation and Ethnicity (3) Systematic analysis of psychological, social, and cultural implications of the contact of peoples.

ANTH 529 Seminar in Expressive Culture (3) Detailed study of selected topics in expressive culture from an anthropological point of view. Prerequisite: 429 or permission of instructor.

ANTH 530 Dialectology (3) Principles of dialect deviation as related to linguistic structure and usage. Joint with LING 530. Prerequisite: 452 or permission of instructor.

ANTH 534 Cultural Influences Upon Parenting (3) Sp Kotchek Data from several cultures to compare cross-cultural similarities and differences in definitions

of ideal parenting; socializations into a parent role; social support for, and controls upon, parenting. Analyses of additional effects of changes in ideology, technology, and demography upon cultural parenting roles. Joint with PCN 534. Prerequisite: permission of instructor.

ANTH 538 Seminar in Visual Anthropology (3) A Dumont Significance of anthropological cinema and photography placed in historical perspective. Screening of films to determine the role of the anthropologist as filmmaker, as well as the role of the filmmaker as anthropologist.

ANTH 537 Political Anthropology and Law (3, max. 6) Seminar on special topics in politics and law and their interrelationships. Prerequisites: 437, 439, or permission of instructor.

ANTH 541 Seminar in Psychological Aspects of Culture (3, max. 9) Selected problems in the relation of culture and personality types. Prerequisite: 441 or permission of instructor.

ANTH 542 Seminar in Cognitive Anthropology (3) Hunn Examines the intellectual history of cognitive anthropology; assesses its major findings in kinship, folk biology, color classification, and decision and planning theory. Replicates key studies, using cognitive anthropological methods. Evaluates influences from linguistics, psychology, and artificial intelligence research. Practical applications and future prospects. (Formerly 497.)

ANTH 553 Analysis of Linguistic Structures (3, max. 6) Syntactic, semantic, or phonological analysis. Languages to be analyzed vary. Joint with LING 553. Prerequisite: permission of instructor.

ANTH 554 Field Techniques in Ethnography (5) Techniques of collecting, ordering, and utilizing ethnographic data in the field. Problems of rapport, elicitation, observation, interpretation, and ethics.

ANTH 555 Techniques of Network Analysis (5) Atkins Theory and technique in analysis of social networks and other relational structures as formal nets or digraphs, with applications to anthropological problems. Key concepts and experience in using APL to analyze relational matrices. No prior background in computers or advanced mathematics assumed.

ANTH 556 The Evolution of the Family (3) Sp van den Bergh Geological evolution of species-specific behaviors; forms of sociality linked to human mating, reproduction, parenting. Cultural evolution of human systems of kinship, marriage as fitness-maximizing adaptations to wide range of habitats. Joint with SOC 556. Prerequisite: upper-division course in evolutionary theory, population genetics, behavioral ecology, primatology, or animal behavior.

ANTH 558 Types and Techniques of Transcription (3) Analysis of aims and problems in the written symbolization of structured data. Emphasis on field transcription of human movement, music, and language. Prerequisite: 202 or permission of instructor.

ANTH 559 Seminar in Language and Culture (3, max. 9) Theoretical and methodological problems in language and culture.

ANTH 561 Seminar in Methods and Theories (3, max. 9)

ANTH 562 Clinically Applied Anthropology (3) Sp Chrisman Anthropology as it relates to interdisciplinary delivery of health care. Cultural variation in illness beliefs and behavior, types of healing practice, illness prevention, and social support networks. Joint with CHCS 562. Prerequisites: graduate standing and permission of instructor.

ANTH 564 Formal Methods of Analysis for Social Anthropology (3) Seminar on selected nonstatistical mathematical methods and models of relevance to various problems in social anthropology.

ANTH 565-566-567 History and Theory of Sociocultural Anthropology (5-5-5) Core course sequence for the beginning graduate student in sociocultural anthropology in which the development of theory is analyzed and emphasis is placed on the relation between theory and a growing body of ethnographic data. Prerequisites: graduate standing in anthropology or permission of instructor; 565 for 566; 566 for 567.

ANTH 571 Communicational Anthropology (3-9) Introduction to communicational aspects of culture. Prerequisite: permission of instructor.

ANTH 575 Cultural Construction of Illness: Seminar in Medical Anthropology (5) Sp Historical and comparative examination of depression, neurasthenia, somatization, hypochondriasis, and hysteria. Anthropology of psychosomatics and psychiatry, including cultural analysis of selected biomedical, indigenous folk medical, and popular common-sense conceptualizations of illness.

ANTH 590 Seminar in Museum Theory (3) Fundamental theoretical issues involved in current museum administrative and operations work, including administrative structure, organizational conflicts, museum-community relations, and museum educational programming. Prerequisite: permission of instructor.

ANTH 591 Seminar in Museum Operations (3) Designing hypothetical museums and creating a first year of operations. Design elements include architectural plan, staffing plan, initial and recurring budgets, security system, records system, educational plan, and policy making. Prerequisite: 590 or permission of instructor.

ANTH 592 Seminar in Museum Specimen Documentation (3) Seminar discussion of museum specimen documentation research approaches, including technological and raw material analyses, contextual studies, and esthetic studies. Documentation of a collection and reference work. Prerequisites: 590, 591, or permission of instructor.

Archaeology

ARCHY 501 Preceptorial Reading (6) For beginning graduate students who have not had adequate training in the problems, principles, and methods involved in the reconstruction of prehistory. Not open to graduate students in the archaeology program.

ARCHY 580 Seminar in Archaeological Methods (5, max. 20) Basis, limitations, and applications of a particular archaeological analytical method, or closely related set of methods. Prerequisite: permission of instructor.

ARCHY 570 Seminar in Archaeological Theory (3, max. 12) Detailed consideration of a particular archaeological theory or closely related set of theories, including their methodological and epistemological bases. Prerequisites: 497, 498.

ARCHY 571 Field Course in Archaeology (5) S Introduction to field acquisition of archaeological data through survey and excavation. Ongoing field projects; instructional emphasis on recovery and recording techniques and on management of field projects. Prerequisite: permission of department.

ARCHY 572 Seminar in North American Archaeology (3, max. 6) Selected problems in the archaeology of America north of Mexico. Prerequisite: permission of instructor.

ARCHY 573 Seminar in Middle American Archaeology (3, max. 6) Selected problems in the archaeology of Middle America. Prerequisite: 473 or 475 or permission of instructor.

ARCHY 574 Seminar in South American Archaeology (3, max. 6) Selected problems in the archaeology of South America and southern Central America. Prerequisite: 474 or permission of instructor.

ARCHY 575 Archaeological Field Research Design (6) Sp Durnell Nature of the archaeological record, and methods and techniques of field research, to illustrate range of data sources and modern techniques of general applicability. Practical experience in mapping, map interpretation, sampling design, remote sensing, photogrammetry, and research proposal writing. Prerequisite: permission of instructor.

ARCHY 591 Advanced Field Course in Archaeology (6-9) For students with previous field experience and graduate work in archaeology. Emphasis on decision making in field and project management. Prerequisites: 497, 498, 571, 575, or permission of instructor.

ARCHY 600 Independent Study or Research (*) Prerequisite: permission of instructor.

ARCHY 601 Internship (3-9, max. 9)

Physical Anthropology

PHY A 502 Preceptorial Reading (6) For beginning graduate students who have not had adequate training in the study of primate principles, and methods involved in the study of evolution, human genetics, and the evolution of modern populations. Not open to graduate students in the physical anthropology program.

PHY A 570 Principles of Primate Taxonomy (3) Problems in primate classification involving consideration of living and fossil forms and the extent to which application of taxonomic principles can aid in both the definition and solution of these problems. Prerequisite: 488 or 489 or permission of instructor.

PHY A 583 Topics in Growth and Development (3, max. 9) Newell Seminar on various topics of human or nonhuman primate growth and physical/behavioral development. Subject matter varies by quarter. Prerequisite: 484 or permission of instructor.

PHY A 584 Topics in Ecology and Adaptation (3, max. 9) Seminar dealing with various aspects of ecology and adaptation. Topics vary each quarter. Prerequisite: permission of instructor.

PHY A 588 Topics in Primate Evolution (3) Eck Emphasis on fossil taxa and their importance in understanding the morphologies and distributions of members of modern taxa. Prerequisites: 488 and permission of instructor.

PHY A 589 Topics in Hominid Evolution (3) A Eck Emphasis on the fossil taxa and their importance in understanding the evolutionary history of the modern genus. Prerequisites: 489 and permission of instructor.

PHY A 590 Current Issues in Human and Non-Human Primate Evolution (2, max. 18) Biweekly presentation by participants and guest lecturers of current literature and ongoing research in topics pertaining to human and nonhuman primate evolution, biology, anatomy, genetics variation, and behavior. Prerequisite: graduate standing in physical anthropology or permission of instructor.

PHY A 600 Independent Study or Research (*) AWSpS Prerequisite: permission of instructor.

cal sciences option for the Bachelor of Science degree in the Department of Mathematics and to elect the applied mathematics concentration. They are encouraged to consult the Chairperson of Applied Mathematics for counseling.

Graduate Program

The Department of Applied Mathematics offers graduate programs of study leading to the degrees of Master of Science and Doctor of Philosophy. These programs involve (1) broad training in those mathematical methods and techniques that have been found useful in applications, (2) in-depth study in at least one field of application, and (3) opportunities to explore various specialized aspects of applied mathematics.

Master of Science, Doctor of Philosophy Degrees

Admission Requirements: Prospective students for the Master of Science program should hold an undergraduate degree either in mathematics with a strong background in applications or in physical, engineering, biological, or social science with a strong background in applications-oriented mathematics. Students who wish to apply to the doctoral program need to show evidence of completion of course work equivalent to that described for the master's degree, with at least a 3.40 grade-point average. In addition, admission to the doctoral program is contingent upon passing a qualifying examination and indication of the ability or potential to perform independent research.

It is strongly recommended that the Graduate Record Examination be taken and the results be sent to Graduate Admissions. Three letters of recommendation are required in support of each application; they should be sent directly to the department. After receiving notification of admission to the Graduate School and a registration appointment, the student should contact the department. (On the Application for Graduate School Admission form, the student should be sure to indicate the desire to enter the Department of Applied Mathematics, rather than Mathematics.)

Master of Science Degree

The M.S. degree program is designed to provide the student with a working knowledge of several basic areas of applied mathematics, together with exposure to at least one specific area of application. The applied mathematics areas include complex variables, ordinary and partial differential equations, applied linear algebra, numerical analysis, optimization, and applied probability and statistics. In addition, M.S. students must take the department course offering in mathematical modeling and must acquire some experience in high-speed computation before receiving a degree. The specific area of application is chosen by the student from a broad range of outside fields, including engineering; the physical, biological, and social sciences; and certain areas of the medical sciences. After fulfilling the basic course requirements, the student can obtain the M.S. degree by additional course work to complete the required 40 credits for the degree. Students may elect to do an M.S. thesis in lieu of a maximum of 6 additional course credits. Detailed requirements for the M.S. degree are listed in the Applied Mathematics graduate program guidelines.

Doctor of Philosophy Degree

The Doctor of Philosophy degree in applied mathematics is primarily a research degree, not conferred as a result of course work alone. The granting of the degree is based on general proficiency and attainment in applied mathematics, together with a demonstrated ability to carry out an independent investigation, which is described in a doctoral dissertation. Proficiency and attainment in applied mathematics is demonstrated by passing the General Examination, which tests the student's ability to probe a new area of research and to exercise critical judgment on a technical issue of cur-

Applied Mathematics

408 Guggenheim

The Department of Applied Mathematics is concerned with mathematical modeling and analysis of problems from the physical, biological, and social sciences and from engineering. The department offers upper-level undergraduate and graduate courses for all interested students in the University, as well as degree programs for graduate students in applied mathematics. Students interested in an undergraduate curriculum in applied mathematics are advised to enter the mathemat-

rent importance in the chosen field of research. The doctoral dissertation must exhibit original mathematical contributions in a significant area of application. The Final Examination and defense of the dissertation is a research seminar presentation open to the public. The detailed requirements for the doctoral degree are listed in the Applied Mathematics graduate program guidelines.

Financial Aid

Both research and teaching assistantships are available to full-time students who qualify. In addition, fellowship funds for the study of applied mathematics are available and awarded on a competitive basis.

Research Facilities

Students in applied mathematics have access to extensive library facilities and an array of high-speed computing equipment, including the CYBER 170, VAX 11/780, and several microcomputers.

Correspondence and Information

Graduate Program Coordinator
408 Guggenheim, FS-20

Faculty

Chairperson

Frederic Y. M. Wan

Professors

Baker, Marshall,* 1962, ‡(Physics), Ph.D., 1958, Harvard; theoretical physics.

Criminale, William O.,* 1968, (Oceanography, Geophysics), † Ph.D., 1960, Johns Hopkins; fluid dynamics, mathematical physics, nonlinear mechanics, stability theory.

Faaland, Bruce H.,* 1971, ‡(Management Science), M.S., 1968, Ph.D., 1971, Stanford; integer and combinatorial programming.

Fisher, Lloyd D., Jr.,* 1966, ‡(Biostatistics), M.A., 1965, Ph.D., 1966, Dartmouth; cardiovascular data analysis, clinical trials, multivariate statistics, longitudinal data analysis.

Ishimaru, Akira,* 1956, ‡(Electrical Engineering), Ph.D., 1958, Washington; wave propagation and scattering.

Kevoorkian, Jirair,* 1964, (Aeronautics and Astronautics), † M.S., 1956, Georgia Institute of Technology; Ph.D., 1961, California Institute of Technology; partial differential equations, perturbation theory.

Murray, James D., 1988, ‡(Zoology), Ph.D., 1956, St. Andrews (England); M.A., 1961, D.Sc., 1968, Oxford (England); reaction-diffusion phenomena, bifurcation, mathematical biology, epidemic theory, mathematical ecology.

Pearson, Carl E.,* 1965, (Aeronautics and Astronautics), † Ph.D., 1949, Brown; fluid dynamics, numerical analysis, optimization.

Riley, James J.,* 1983, ‡(Mechanical Engineering), Ph.D., 1971, Johns Hopkins; fluid mechanics, especially transition and turbulence, geophysical fluid mechanics.

Rockafellar, R. Tyrrell,* 1966, (Mathematics), † M.S., 1959, Marquette; M.S., 1960, Ph.D., 1963, Harvard; optimization, control theory, network programming.

Vagners, Juris,* 1967, (Aeronautics and Astronautics), † M.S., 1963, Ph.D., 1967, Stanford; optimal control and estimation theory.

Wan, Frederic Y. M.,* 1983, (Mathematics), † S.M., 1963, Ph.D., 1965, Massachusetts Institute of Technology; mathematical modeling, asymptotic and variational methods in elasticity, biomechanics and resource economics.

Associate Professors

Adams, Loyce M.,* 1985, (Computer Science), M.S., 1978, Ph.D., 1983, Virginia; numerical algorithms for parallel computers.

LeVeque, Randall J.,* 1985, (Mathematics), † Ph.D., 1982, Stanford; numerical analysis and solution of nonlinear partial differential equations.

Assistant Professors

Bretherton, Christopher S.,* 1984, (Atmospheric Sciences), Ph.D., 1984, Massachusetts Institute of Technology; complex behavior in geophysical systems, especially moist atmospheric convection.

Storti, Duane W.,* 1983, ‡(Mechanical Engineering), M.S., 1981, Ph.D., 1983, Cornell; nonlinear dynamics and vibrations, perturbation theory.

Course Descriptions

Courses for Undergraduates and Graduates

AMATH 341 Computer Applications of Numerical Methods (3) AWSp Development and application of numerical methods and algorithms to solve problems in engineering. Simultaneous equations, curve fitting, root-finding algorithms, Taylor series analysis, numerical integration, ordinary differential equations. Joint with ENGR 341. Prerequisites: ENGR 141 or equivalent and MATH 238, which may be taken concurrently.

AMATH 351, 352 Quantitative Methods I, II (3,3) A,W Applications of mathematical techniques and basic principles of the natural sciences to problems in engineering and oceanography. 351: ordinary differential equations. 352: approximate methods; Fourier series; partial differential equations; boundary-value problems. Joint with OCEAN 351, 352 and MATH 351, 352. Prerequisites: one year of physics and MATH 126 for 351; 351 or MATH 238 for 352.

AMATH 381, 382, 383 Introduction to Mathematical Modeling (3,3,3) A,W,Sp Simple discrete and continuous models of diverse natural and social phenomena with particular reference to the unity of the tools of mathematical analysis useful in their study. 381: discrete methods; 382: continuous methods; 383: a mixture. Mathematical topics and phenomena. Joint with MATH 381, 382, 383. Prerequisites: MATH 126 and either MATH 205 or MATH 302 for 381 and 382; either AMATH 351 or MATH 238, and MATH 327 for 383.

AMATH 401 Methods in Applied Mathematics I (4) ASp Acquisition of technique and experience in application of areas of mathematics encountered in science and engineering; illustrated by case studies from many fields. Applications of vector differential calculus; line and surface integrals, integral theorems; complex variables; Taylor and Laurent series, contour integration. Joint with ENGR 401. Prerequisites: MATH 205; MATH 327 or A 370, and AMATH 351 or MATH 238 or permission of instructor.

AMATH 402 Methods in Applied Mathematics II (4) AW See 401. Applications of ordinary differential equations; phase plane, stability; systems of differential equations; power series solutions, Laplace transforms. Joint with ENGR 402. Prerequisites: MATH 205; MATH 327 or A 370; and AMATH 351 or MATH 238 or permission of instructor.

AMATH 403 Methods in Applied Mathematics III (4) WSp See 401. Application of partial differential equations; special functions, Fourier series, Fourier transforms. Joint with ENGR 403. Prerequisite: 402 or permission of instructor.

Courses for Graduates Only

AMATH 500 Special Studies in Applied Mathematics (*, max. 12) AWSps Lectures and discussions of topics of current interest in applied mathematics.

ics. May not be offered every quarter; content may vary from one offering to another. Prerequisite: permission of instructor.

AMATH 501 Seminar in Applied Mathematics (1, max. 6) AWSp Special topics and selected problems of current interest in applied mathematics. Offered on credit/no credit basis only.

AMATH 502 Applied Mathematics Clinic (1-2) AWSp The clinic provides consulting service for problems from different academic units requiring assistance in formulation, analysis, and interpretation of mathematical models. Students learn to delineate sources of difficulties, identify or devise a method of solution, and effectively communicate it to clients. Prerequisites: 568, 569, and 584.

AMATH 508 Applied Probability and Statistical Inference (4) Sp Overview of probability models, random variables, independence and conditional probability, Markov chains, stationary time series, statistical inference, estimation and testing. Joint with STAT 508. Prerequisite: some advanced calculus and linear algebra.

AMATH 507, 508 Calculus of Variations I, II (3,3) A,W Necessary and sufficient conditions for a weak and strong extremum. Legendre transformation, Hamiltonian systems. Constraints and Lagrange multipliers. Space-time problems with examples from elasticity, electromagnetics, and fluid mechanics. Sturm-Liouville problems. Approximate methods. Joint with MATH 507, 508. Prerequisites: 351 or MATH 238; MATH 327, 328, 329 for 507; 507 for 508; recommended: 402, 403, or MATH 428, 429.

AMATH 509 Theory of Optimal Control (3) Sp Trajectories obtained from ordinary differential equations with control variables. Controllability, optimality, the maximum principle. Relaxation and the existence of solutions. Techniques for nonsmooth analysis. Joint with MATH 509. Prerequisites: real analysis on the level of MATH 426; background in optimization corresponding to 507 or 515. (Offered even-numbered years.)

AMATH 514 Networks and Combinatorial Optimization (3) A Networks and directed graphs. Paths and trees. Feasible and optimal flows and potentials. Transportation problems, matching and assignment problems. Algorithms and applications. Joint with MATH 514. Prerequisites: MATH 302 and 327 or equivalents.

AMATH 515 Fundamentals of Optimization (3) W Maximization and minimization of functions of finitely many variables subject to constraints. Basic problem types and examples of applications; linear, convex, smooth, and nonsmooth programming. Optimality conditions. Saddlepoints and dual problems. Penalties, decomposition. Overview of computational approaches. Joint with MATH 515. Prerequisites: MATH 303, 327, or equivalents.

AMATH 516 Numerical Optimization (3) Sp Methods of solving optimization problems in finitely many variables, with or without constraints. Steepest descent, quasi-Newton methods. Quadratic programming and complementarity. Exact penalty methods, multiplier methods. Sequential quadratic programming. Cutting planes and nonsmooth optimization. Joint with MATH 516. Prerequisite: 515.

AMATH 517 Optimization Under Uncertainty (3) A Sequential optimization problems involving random variables. Dynamic programming, stochastic programming. Control of uncertain dynamic systems in finite, discrete time. Risk, feedback, adaptivity. Problems with imperfect state information. Applications to optimal stopping, inventory control, resource management. Joint with MATH 517. Prerequisites: 506 (or an introduction to basic concepts of probability such as STAT 390 or 394, 395), MATH 302 and 327.

AMATH 518 Topics in Applied Optimization (3) Sp Problems and techniques in special areas of optimization, such as engineering design, resource management, stochastic programming, games, variational inequalities, and parameter identification in mathematical modeling. Joint with MATH 518. Prerequisite: 515 or permission of instructor. (Offered odd-numbered years.)

AMATH 519 Tensor Analysis (3) A Cartesian tensors; motivation, manipulation, applications. Riemannian space; Christoffel symbols, geodesics, covariant differentiation. Curvature tensor, geodesic deviations, flat space. Special local coordinate systems. Applications to classical mechanics, continuum mechanisms, electromagnetism, relativity. Special topics. Joint with MATH 519. Prerequisite: 401 or MATH 327, or permission of instructor. (Offered odd-numbered years.)

AMATH 520 Mathematical Modeling (3) W Processes used in physical, biological, and economic sciences, as well as in engineering, for providing mathematical descriptions of various problems pertinent to these disciplines. Emphasis on the modeling rather than on the solution. Students must have an undergraduate background in one or more mentioned areas.

AMATH 530 Parallel Numerical Algorithms (3) Sp Characteristics of parallel architectures, design and complexity analysis of parallel algorithms (communication, speedup, execution time, problem decomposition, problem ordering, problem mapping issues), parallel methods for elliptic PDEs, parallel methods for parabolic and hyperbolic PDEs, case studies of applications on current parallel machines. Prerequisite: 584 or equivalent.

AMATH 550 Mathematical Topics in Analytical Dynamics (3) Sp In-depth study of one or more aspects of current interest in analytical dynamics, such as the stability of many body systems, resonance and passage through resonance, exact and adiabatic invariants. Prerequisites: 403, others depending on topics; recommended: basic graduate course in analytical dynamics.

AMATH 551 Mathematical Topics in Solid Mechanics (3) Sp Topics vary and include: foundations of plate theories; structure of linear shell theory, static-geometric duality; asymptotic solutions for nonlinear plate and shell problems; bifurcation theory and solution methods; wave propagation and stability problems in random environments. Prerequisites: 403; graduate-level course in mechanics; and others, depending on topics.

AMATH 552 Mathematical Topics in Fluid Dynamics (3) Sp Mathematical development and foundations in fluid dynamics; topics selected from boundary layers, stability theory, turbulence, rotating-stratified fluid motion, gas dynamics. Prerequisites: 403, others depending on topics; recommended: graduate-level course in fluid dynamics.

AMATH 563, 564 Methods of Partial Differential Equations II, III (3,3) A,W First-order partial differential equations: characteristics, conservation laws, shocks, applications to geometrical optics and Hamiltonian-Jacobi theory. Elliptic equations: fundamental solution, Green's functions, conformal mapping, boundary-value problems. Parabolic equations. Hyperbolic equations: characteristics, shocks, examples from fluid dynamics, approximate methods. Post-master's sequence. Prerequisite: 569. (Offered odd-numbered years.)

AMATH 567 Analysis in Engineering and Science I (3) A Complex variable and associated topics. Branch cuts, series and product expansions. Contour integration, numerical implications. Harmonic functions. Complex potential (and singularities) in physical problems. Conformal mapping; applications and examples. Grid generation. Fourier and Laplace transforms, inversions and asymptotics. Spectral decomposition, FFT method. Joint with A A 567.

AMATH 568 Analysis in Engineering and Science II (3) W Survey of properties and practical solution techniques for ordinary differential equations. Series expansions; eigenvalue problems; transforms and applications; variational methods; asymptotic expansions; perturbations, regular and singular; difference equations; numerical procedures. Joint with A A 568. Recommended: 401 or equivalent.

AMATH 569 Partial Differential Equations (3) Sp Properties of diffusion, wave, and Laplace-type equations; Initial and boundary-value problems; series expansions; transform methods; singularities, Green's functions; classification of second-order equations, theory and applications of method of characteristics. Joint with A A 569 and MATH 569. Prerequisite: 403, 568 or MATH 428 or permission of instructor.

AMATH 577, 578 Perturbation Theory I, II (3,3) A,W Basic concepts of asymptotic expansions with applications to linear partial differential equations. Singular perturbations: matched asymptotic expansions, boundary layers, shock layers, uniformly valid solutions, the method of multiple scales, weakly nonlinear wave propagation problems and resonance phenomena, nonlinear wave propagation in fluid, solid and particle mechanics. Post-master's sequence. Prerequisites: 567, 568, 569, or equivalent. (Offered even-numbered years.)

AMATH 584 Applied Linear Algebra and Introductory Numerical Methods (3) A Applied linear algebra: matrix operations, linear systems, matrix factorization, eigenvalues, numerical methods, applications to optimization, circuits, differential equations. Survey of numerical methods: nonlinear systems, curve fitting, ordinary differential equations, quadrature, basic ideas in partial differential equations. Joint with A A 584.

AMATH 585, 586 Approximate and Numerical Analysis II, III (3,3) W,Sp Advanced topics in numerical analysis. More detailed consideration of topics in 584. Emphasis on methods for partial differential equations, integral equations, finite elements, stability and accuracy, mesh generation, adaptive meshes, sparse matrices, variational methods. Post-master's sequence. Joint with A A 585, 586. Prerequisites: 567, 584, 568, and 569, which may be taken concurrently.

AMATH 587 Asymptotics and Transcendental Functions (3) A Origin and properties of higher transcendental functions; theoretical basis and applications of Laplace, Fourier, Bessel, Mellin transforms; asymptotic analysis, including methods of steepest descent and stationary phase, WKB. Prerequisite: 567, 568, 569, or equivalent.

AMATH 588 Green's Functions and Integral Equations (3) W Review of Sturm-Liouville theory. Green's functions and integral representation of solution of PDE. Applications in science and engineering. Integral equations. Fredholm and Hilbert-Schmidt theories. Dual integral equations. Prerequisites: 567, 568, 569, or equivalent.

AMATH 589 Advanced Topics of Applied Analysis (3) Sp Numerical treatment of Fredholm and Volterra equations. Singular integral equations: transform approach and complex variables methods; Wiener-Hopf and other special techniques; the Hilbert problem. Nonlinear integral equations. Prerequisite: 588 or permission of instructor.

AMATH 594, 595, 596 Numerical Analysis (3,3,3) A,W,Sp Error analysis, linear systems, LU, QR and SVD factorizations, eigenvalues, least squares, iterative methods for linear and nonlinear systems, optimization, interpolation, approximation, splines, Fourier series, FFTs. Joint with MATH 594, 595, 596. Prerequisite: 584 or MATH 465 or permission of instructor.

AMATH 597, 598, 599 Numerical Solutions of Differential Equations (3,3,3) A,W,Sp Numerical quadrature and solution of ordinary differential equations,

initial- and boundary-value problems, solution of partial differential equations by finite difference and finite element methods, stability analysis and boundary conditions, solution of large sparse linear systems. Joint with MATH 597, 598, 599. Prerequisite: 584 or MATH 466 or permission of instructor.

AMATH 600 Independent Research or Study (*) AWSpS Offered on credit/no credit basis only.

AMATH 700 Master's Thesis (*) AWSpS Offered on credit/no credit basis only.

AMATH 800 Doctoral Dissertation (*) AWSpS Offered on credit/no credit basis only.

Art

102 Art

The School of Art is concerned with the practice, history, and teaching of the graphic and plastic arts. It offers undergraduate programs in ceramic art, fiber arts, graphic design, industrial design, metal design, painting, photography, printmaking, sculpture, and general art. In addition, the school offers graduate programs leading to the degrees of Master of Fine Arts in studio disciplines and Master of Arts and Doctor of Philosophy in art history.

Undergraduate Program

Advisers
L. Elizabeth Anderson
Stephen Dunthorne
104 Art

Admission Policy for Initial-Degree-Seeking Applicants

The Office of Admissions admits entering freshmen as art majors. Transfer students indicating an art major are admitted initially as premajors in the College of Arts and Sciences. Those with a minimum grade-point average of 2.50 are accepted as art majors during the first meeting with an art adviser.

So that placement within art programs can be determined, transfer students with college-level art experience must submit representative examples of studio work in slide or photograph form with transcripts to the School of Art advisory office at least two weeks before the initial advisory appointment. Art majors may follow the General Art curriculum without further review of work or record of accomplishment if a minimum grade-point average of 2.00 is maintained. All other studio majors are subject to the continuation policies appropriate to their major options.

Admission Policy for Postbaccalaureate Applicants

Postbaccalaureate art applicants must file an application through the Office of Admissions by the following deadlines: Autumn Quarter, July 1; Winter Quarter, November 1; Spring Quarter, February 1; Summer Quarter, May 15.

A supplementary information form is provided by the School of Art. By the above deadlines this form and slides of studio work must be submitted by studio art applicants to the School of Art advisory office for an admission review. Following the review, applicants are notified by the Office of Admissions regarding their admission.

Postbaccalaureate applicants who hope to transfer to art from other schools, departments, or colleges on the campus may pick up a supplementary information form from the School of Art advisory office. For an applicant to be considered for admission, this supplementary form, a complete academic record, and slides of studio work are required and may be submitted to the School of Art advisory office at any time.

Bachelor of Arts Degree**MAJOR REQUIREMENTS**

General Art: ART 105, 106, 109, 110; ART H 201, 202, 203; 54 credits chosen from the following optional fields so that one option includes no more than 20 credits and the others no more than 15 credits each: all undergraduate art history courses; ART 201, 202, 353; 250, 252, 255, 330, 340, 405; 265, 325; 258, 357, 358, 359, 457, 458, 459; 256, 257, 259, 260, 307, 360; 230, 370, 371, 372; 345, 347, 348, 349, 450, 452, 453, 454; 253, 272, 274, 332.

Bachelor of Fine Arts Degree

A minimum of 198 credits is required for graduation with a Bachelor of Fine Arts degree.

MAJOR REQUIREMENTS

Ceramic Art: ART 105, 106, 109, 110, 201, 202, 353 (15 credits), 485 (15 credits), 486 (15 credits); 15 credits selected from the following: ART 255, 258, 272, 335, 337, 357; 22 studio art or related elective credits. ART H 201, 202, 203; 3 elective credits.

Fiber Arts: ART 105, 106, 109, 110, 250 (10 credits), 252, 255 (10 credits), 259, 330, 340 (10 credits), 405, 425 (15 credits); 253; 24 studio art or related elective credits. ART H 201, 202, 203; 3 elective credits.

Graphic Design: ART 105, 106, 109, 111, 113, 205, 206, 207, 230, 366, 367, 368, 376, 377, 378, 466, 467, 468, 478, 479, 480; 9 studio art or related elective credits. ART H 201, 202, 203; 3 elective credits.

Industrial Design: ART 105, 106, 109, 110, 254, 261, 262, 263, 316, 317, 318, 321, 322, 422, 423, 445, 446, 447, 24 studio art or related elective credits. ARCH 310, 311, 312; SPCH 220; PHYS 110, 111. ART H 201, 202, 203; 3 elective credits.

Metal Design: ART 105, 106, 109, 110, 258, 357, 358, 359, 457, 458, 459, 460 (15 credits); 15 credits from: 201, 202, 255, 272, 335, 337; 27 studio art or related elective credits. ART H 201, 202, 203; 3 elective credits.

Painting: ART 105, 106, 109, 110, 265 (15 credits); 256, 257, 307 (10), 360 (10), 463 (10); 15 credits from 259, 280, 309, 325, 361, 463, 465. 22 studio art or related elective credits. ART H 201, 202, 203, 381, 391, any twentieth-century art history course.

Photography: ART 105, 106, 109, 110, 230, 370, 371, 372, 411 (15 credits), 412, 413, 414, 415 (10 credits); 32 studio art or related elective credits. ART H 201, 202, 203, 232.

Printmaking: ART 105, 106, 109, 110; 345, 347, 348, 349, 350; 30 credits from 450, 452, 453, 454, 455; 256, 257, 265 (10 credits); 17 studio art or related elective credits. ART H 201, 202, 203; 3 elective credits.

Sculpture: ART 105, 106, 109, 110, 253, 272, 274, 332 (15 credits), 335, 337, 436 (15 credits); 265, 345 or 347; three courses selected from 201, 202, 252, 255, 258, 357; 14 studio art or related elective credits. ART H 201, 202, 203; 3 elective credits.

Graduate Program

Charles W. Smith, Graduate Program Coordinator

Students accepted for admission into the Master of Fine Arts degree program in ceramic art, fiber arts, graphic design, industrial design, metal design, painting, photography, printmaking, or sculpture will be required to complete a minimum of 63 credits of scheduled class work and 9 credits of thesis for a total of 72 credits for the degree. No foreign language is required or the Graduate Record Examination. The thesis is in the nature of a studio project, such as a series of paintings, prints, ceramic objects, or sculptures.

A selection of the student's thesis work must be included in the annual studio master's exhibition of the School of Art.

Graduate students may participate in the School of Art's study abroad program.

Admission Requirements

Graduate standing is granted only on presentation of credentials from art schools or university art departments whose standards are recognized by this school. Samples of work done in these schools or art departments also must be presented by applicants for admission to the Master of Fine Arts degree program.

Students who desire to pursue a course of study leading to the master's degree must have a grade-point average of 3.00 or better in the undergraduate art major and must have completed the equivalent of the undergraduate degree requirements in the School of Art, University of Washington. Undergraduate work beyond the basic minimum may be required if it is necessary to make up deficiencies.

Financial Aid

The studio divisions offer several scholarship and financial aid programs for students who qualify. These programs include endowments and organizational and privately supported scholarships. Information concerning scholarships is available from the graduate program coordinator. Also available to graduate students are teaching assistantships, usually awarded to a limited number of candidates.

Correspondence and Information

Graduate Program Coordinator
102 Art, DM-10

Faculty**Director**

Constantine G. Christofides

Associate Director

Robert C. Jones

Graduate Program Coordinator

Charles W. Smith

Division Heads

Norman K. Lundin (Painting/Printmaking)

Mary L. Hu (3-Dimensional Design)

John Whitehill-Ward (Design)

Studio Faculty**Professors**

Alps, Glen E.,* 1947, (Emeritus), M.F.A., 1947, Washington; printmaking.

Anderson, Frederick N.,* 1947, (Emeritus), M.F.A., 1954, Minnesota; painting.

Arnold, Richard R.,* 1977, M.F.A., 1948, Cranbrook Academy of Art (Michigan); photography, drawing.

Carraher, Ronald,* 1967, M.A., 1961, San Jose State; photography.

Celentano, Francis M.,* 1968, M.A., 1957, Institute of Fine Arts (New York); painting, drawing.

Dahn, Richard F.,* 1965, M.F.A., 1959, Yale; graphic design.

Dailey, Michael D.,* 1963, M.F.A., 1963, Iowa; painting, drawing.

DuPen, Everett, 1945, (Emeritus), B.F.A., 1937, Yale; sculpture.

Erickson, John W., 1956, (Emeritus), M.F.A., 1951, Illinois; painting.

Hixson, William J.,* 1950, M.F.A., 1950, Oregon; painting.

Hu, Mary L.,* 1980, M.F.A., 1967, Southern Illinois; metal design.

Johnson, Pauline, 1941, (Emeritus), D.F.A. (Hon.), 1968, Moore; art education.

Jones, Robert C.,* 1960, M.S., 1959, Rhode Island School of Design; painting, drawing.

Kottler, Howard,* 1964, M.A., 1956, Ohio State; M.F.A., 1957, Cranbrook Academy of Art (Michigan); Ph.D., 1964, Ohio State; ceramics.

Lawrence, Jacob A.,* 1971, (Emeritus), D.F.A. (Hon.), 1981, Carnegie-Mellon; painting, drawing.

Lundin, Norman K.,* 1964, M.F.A., 1963, Cincinnati; painting, drawing.

Marshall, John C.,* 1970, M.F.A., 1968, Syracuse; metal design.

Mason, Alden C., 1946, (Emeritus), M.F.A., 1947, Washington; painting.

Moseley, Spencer A.,* 1948, M.F.A., 1952, Washington; painting, drawing.

Penington, Ruth E., 1928, (Emeritus), M.F.A., 1929, Washington; metal design.

Pizzuto, Eugene C.,* 1957, M.F.A., 1951, Cranbrook Academy of Art (Michigan); painting, drawing.

Smith, Charles W.,* 1956, M.F.A., 1956, Cranbrook Academy of Art (Michigan); sculpture.

Solberg, Ramona,* 1968, (Emeritus), M.F.A., 1957, Washington; art education, metal design.

Spafford, Michael C.,* 1963, M.A., 1960, Harvard; painting, drawing.

Sperry, Robert,* 1954, (Emeritus), M.F.A., 1955, Washington; ceramics.

Tsutakawa, George,* 1946, (Emeritus), M.F.A., 1950, Washington; sculpture.

Wadden, Douglas J.,* 1970, M.F.A., 1970, Yale; graphic design, photography.

Warashina, Patricia,* 1970, M.F.A., 1964, Washington; ceramics.

Whitehill-Ward, John,* 1975, M.S., 1974, Institute of Design (Chicago); graphic design.

Associate Professors

Berger, Paul E.,* 1978, M.F.A., 1973, State University of New York (Buffalo); photography.

Fuller, Steven, 1946, (Emeritus), M.F.A., 1948, Washington; art education.

Goldsmith, Layne,* 1983, M.F.A., 1979, Cranbrook Academy of Art (Michigan); fiber arts.

Hafermehl, C. Louis,* 1957, (Emeritus), M.F.A., 1955, Cranbrook Academy of Art (Michigan); painting, drawing.

Hennessey, James M.,* 1980, M.F.A., 1971, California Institute of the Arts; industrial design.

Kehl, Richard L.,* 1968, M.F.A., 1961, Kansas City Art Institute; painting.

Koenig, Hazel L.,* 1967, M.F.A., 1950, Washington; fiber arts.

Pawula, Kenneth J.,* 1965, M.A., 1962, California (Berkeley); painting, drawing.

Praczkowski, Edward L.,* 1965, M.F.A., 1965, Cranbrook Academy of Art (Michigan); painting, drawing.

Proctor, Richard M.,* 1962, M.A., 1962, Michigan State; fiber arts.

Taylor, Norman J.,* 1968, M.A., M.F.A., 1967, Iowa; sculpture.

Weiman, Valentine S.,* 1954, (Emeritus), M.F.A., 1954, Colorado; painting, drawing.

Young, John T.,* 1984, M.F.A., 1978, Rhode Island School of Design; sculpture.

Assistant Professors

Labitzke, Curt W.,* 1984, M.F.A., 1984, Notre Dame; printmaking.

Scheler, Shirley E.,* 1986, M.F.A., 1985, Wisconsin (Madison); printmaking.

Lecturer

Dunthorne, Stephen, 1961, M.F.A., 1950, Washington.

Art History Faculty**Professors**

Bliquez, Lawrence J.,* 1970, (Classics),† M.A., 1965, Ph.D., 1968, Stanford; Greek and Roman.

Bravmann, Rene A.,* 1968, M.A., 1965, Ph.D., 1971, Indiana; African, Oceanic.

Christofides, Constantine G.,* 1966, (Drama), (Comparative Literature, Romance Languages and Literature),† M.A., 1949, M.A., 1950, Ph.D., 1956, Michigan; Romanesque.

Hildebrand, Grant,* 1964, (Drama), (Architecture),† M.Arch., 1964, Michigan; architectural history.

Holm, Bill, 1968, (Emeritus), (Anthropology),† M.F.A., 1951, Washington; Northwest coast Indian.

Kingsbury, Martha,* 1968, M.A., 1963, Ph.D., 1969, Harvard; nineteenth and twentieth centuries.

Opperman, Hal N.,* 1967, M.A., 1963, Ph.D., 1972, Chicago; seventeenth- and eighteenth-century European.

Pascal, Paul,* 1953, ‡(Classics), Ph.D., 1953, North Carolina; Roman.

Pundt, Hermann,* 1968, (Architecture),† M.A., 1960, Illinois; Ph.D., 1969, Harvard; architectural history.

Silbergeld, Jerome,* 1975, M.A., 1967, Stanford; M.A., 1972, Oregon; Ph.D., 1974, Stanford; Chinese.

Associate Professors

Clausen, Meredith L.,* (Architecture),† 1979, M.A., 1972, Ph.D., 1975, California (Berkeley); aesthetics and contemporary architecture.

Karlonis, Anna D.,* 1983, M.A., 1968, Ph.D., 1982, Institute of Fine Arts (New York); medieval, Byzantine.

Langdon, Merle K.,* 1976, (Classics),† Ph.D., 1972, Pennsylvania; Greek.

Snow-Smith, Joanne,* 1981, M.A., 1968, Arizona; Ph.D., 1976, California (Los Angeles); Italian Renaissance.

Assistant Professors

Reed, T. Gervais, 1952, B.A., 1949, Yale; American film.

Wyatt, Victoria,* 1986, ‡(Anthropology), M.A., 1978, M.Phil., 1980, Ph.D., 1985, Yale; art and history of the natives of the Pacific Northwest coast and Alaska.

Course Descriptions**Courses for Undergraduates**

ART 102 Introduction to Painting (3) Painting from still life or landscape. Use of oil paints and acrylics. Painting methods and procedures, visual and artistic considerations. For nonmajors only.

ART 105, 108, Drawing (5,5) Perspective, light and shade, composition. Prerequisites: 105 for 108.

ART 109, 110 Design (3,3) Art structure as the basis for creative work. Organization of line, space, and color. Prerequisite: 109 for 110.

ART 111 Basic Visual Analysis (3) Symbolic representation of forms and ideas. Investigative drawing and varied photomechanical manipulation as fundamental components in visual analysis. Prerequisite: 109.

ART 113 Basic Color Theory and Form (3) Fundamental investigations into the synthesis of basic two- and three-dimensional design principles. Color theory and analysis for predesign majors. Prerequisites: 111, which may be taken concurrently, and 109.

ART 201 Ceramic Art: Handbuilding (5) Introduction to handbuilding; kiln firing and glazing processes. Contemporary sculpture in clay. Prerequisites: 106, 110.

ART 202 Ceramic Art: Wheel Throwing (5) Introduction to wheel throwing, glazing, and kiln firing processes. Contemporary vessel form in clay. Prerequisites: 106, 110.

ART 204 Graphic Design: Context, Formulation, Performance (3) Lectures and assignments exploring graphic design and its function in the context of specific visual situations. Primarily for nonmajors.

ART 205, 206 Graphic Design (5,5) Problem solving in basic graphic design, consisting of a sequence of applied visual projects intended to present a wide range of design experiences. Prerequisites: 106, 113 for 205; 205 for 206.

ART 207 Typographic Design: Methods and Processes (5) Operational typographic and reproduction methods as a foundation for two-dimensional design and laboratory assignments. Computerized phototypesetting, offset lithography, and photomechanical techniques as they relate to the design process. Prerequisite: 206.

ART 215 Principles of Dyes and Dyeing (5) History of dyes and dyed textiles from ancient use through current industrial practices. Dye studio practices and practical application of various dyes for accuracy and safety. Fiber preparation, dye fixation, and record-keeping of dye tests.

ART 230 Introductory Photography (5) Introduction to theory, techniques, and processes of still photography. Darkroom procedures and camera use. Visual and creative potential of the medium. Students must provide a camera with lens, shutter, and aperture controls. Prerequisite: art major standing.

ART 250 Design and Materials: Surface Design for Fabric (5, max. 15) Techniques include block printing, batik, tie and dye, discharging. Prerequisites: 106, 110.

ART 252 Fiber Arts: Introductory Weaving (5) Basic techniques and processes of four-harness loom woven structures. Fundamentals of drafting, loom design and operation, including study of fiber technology and dye chemistry. Prerequisites: 106, 110.

ART 253 Design and Materials: Wood (3) Shaping and forming of wood. Lamination and fabricating techniques. Usage of hand and power tools. Prerequisites: 106, 110.

ART 254 Design and Materials: Metal (3) Basic techniques in manipulation and construction of metals. Prerequisites: 106, 110.

ART 255 Design and Materials: Fabric Construction (5, max. 15) Knotting, hooking, stitching, and other nonwoven constructional techniques with a variety of textile fibers. Prerequisites: 106, 110.

ART 256 Painting (5) Beginning oil painting. Prerequisites: 106, 110.

ART 257 Painting (5) Oil painting. Prerequisite: 256.

ART 258 Jewelry Design (5) Introduction to jewelry design and construction through techniques of sawing, filing, soldering, forging, and casting in silver, copper, bronze, and brass, as well as simple stone setting. Prerequisites: 106, 110.

ART 259 Water-Soluble Media (5, max. 15) Prerequisites: 106, 110.

ART 260 Art Works on Paper (5, max. 15) Combines experiments and projects in various techniques of drawing, assemblage, and painting on paper. Prerequisite: 257.

ART 261, 262, 263 Introduction to Environmental Design (5,5,5) A,W,Sp Design methodology, structures, graphics, materials. Prerequisites: permission of Art advisory office for 261; 261 for 262; 262 for 263.

ART 265 Intermediate Drawing (5, max. 15) Prerequisites: 106, 110.

ART 272 Beginning Sculpture Composition (5) Fundamentals of composition in the round and in relief. Prerequisites: 106, 110.

ART 274 Life Sculpture (5, max. 15) Work in clay from the posed model. Prerequisites: 106, 110.

ART 275 A World History of Art in Public Places (5) Historical introduction to, and overview of, the placement of art in the public domain, examining major visual and conceptual developments in the history of art. Examples of how various public artworks have manifested or been affected by elements of these developments.

ART 276 Contemporary Directions, Art in Public Places (5) Contemporary directions in public art focusing on innovative public artworks, artists, and art programs of Washington State. Prerequisite: 275.

ART 307 Intermediate Painting (5, max. 10) Prerequisite: 257.

ART 309 Portrait Painting (5, max. 10) Prerequisite: 10 credits in 307.

ART 316, 317, 318 Design for Industry (5,5,5) Product design, working drawings, models, presentation drawings, product analysis, display, marketing. Prerequisites: junior standing in industrial design for 316; 316 for 317; 317 for 318.

ART 321 Furniture Design (5) Design of a furniture piece. Methodologies and construction, types of hardware, special shop techniques, scale modeling and full-scale functional designs. Prerequisite: junior standing in industrial design.

ART 322 Industrial Design Materials and Methods (3) Product form development of current design practice examined in the context of new materials and processes. Prerequisite: junior standing in industrial design.

ART 325 Advanced Drawing (5, max. 15) Study at an advanced level involving history, practice, and theory of drawing as an art form. Prerequisite: 15 credits in 265.

ART 330 Intermediate Weaving (5) Introduction to weaver-controlled structures and tapestry weaving. Alternative weaving tools and loom construction; studio dyeing processes. Development of original textile forms. Prerequisite: 252.

ART 332 Intermediate Sculpture Composition (5, max. 15) Advanced work in various media and techniques. Prerequisite: 272.

ART 335 Metal Casting (5, max. 15) Foundry techniques as applied to fine arts casting of ferrous and nonferrous material. Prerequisite: 272.

ART 337 Welding (5, max. 10) Study and application of welding methods as a sculpture technique making use of oxyacetylene, electric arc, and heliarc. Prerequisite: 272.

ART 340 Design for Printed Fabrics (5, max. 15) Hand-block and silk-screen printing; mass-production design. Prerequisite: 250.

ART 345 Intaglio (5) Traditional and contemporary etching and intaglio methods. Prerequisites: 106, 110.

ART 347 Lithography (5) Traditional and contemporary methods. Prerequisites: 106, 110.

ART 348 Relief (5) Traditional and contemporary methods. Prerequisites: 106, 110.

ART 349 Serigraphy (5) Traditional and contemporary methods. Prerequisites: 106, 110.

ART 350 Printmaking Special Projects (5) Prerequisite: permission of instructor.

ART 353 Intermediate Ceramic Art (5, max. 15) Ceramic design and construction, stoneware, clay bodies, glazes. Prerequisites: 201, 202, and permission of instructor.

ART 357 Holloware (5) Processes of raising, soldering, forging in copper, pewter, silver. Prerequisites: 106, 110.

ART 358 Jewelry Design (5) Intermediate jewelry design, such as etching, reticulation, makume, electroforming, repousse, chasing, and advanced stone-setting methods. Prerequisite: 258.

ART 359 Enameling (5) Enamel design for metal work or jewelry, Champleve, Plique-à-jour, Limoges, cloisonné on copper, silver, or gold. Prerequisite: 357 or 358.

ART 360 Life (5, max. 10) Drawing and painting from the model. Prerequisites: 257 and 15 credits in 265.

ART 361 Art Techniques (5, max. 15) Study of the materials and techniques of the artist and their application to painting and drawing. Prerequisite: 257.

ART 366 Graphic Design (5) Visualizations: non-applied problems requiring expression, illustration, or manipulation of ideas in any visual medium, with emphasis on innovative image development. Prerequisites: 207, 230.

ART 367 Graphic Design (5) Basic three-dimensional design: translation of form into three dimensions. Problems in packaging, requiring analysis of material and form, and product identification. Prerequisite: 366.

ART 368 Graphic Design (5) Persuasive communications: applied problems exploring the potential for persuasive verbal/visual communications. Responsibility of the designer to analyze and influence audience response, especially in the area of public service. Prerequisite: 367.

ART 370 Intermediate Photography I (5) Individual projects in photography combining technical and conceptual objectives. Emphasis on visual organization and contemporary photographic directions. Prerequisites: 230 and photography major priority.

ART 371 Intermediate Photography II (5) The photo essay. Thematic investigation of time and space, using the photographic image. In-depth treatment of a single topic. Prerequisites: 230 and photography major priority.

ART 372 Intermediate Photography III (5) Detailed investigation of the negative and print in black-and-white photography. Emphasis on creative application of exposure, development, and printing techniques. Includes preparation of prints for exhibition. Prerequisites: 230 and photography major priority.

ART 376 Graphic Design (5) Fundamentals of typography: functions and procedures, including the study of legibility, proportions, typesetting, and grid formulation. Prerequisites: 207, 230.

ART 377 Graphic Design (5) Two-dimensional composition: problems in typographic, symbolic, and pictorial composition that explores two-dimensional relationships and organizational principles. Prerequisite: 376.

ART 378 Graphic Design (5) Intermediate visual communications: specific applied design projects incorporating basic elements of printed communications. Prerequisite: 377.

ART 405 Advanced Weaving (5, max. 10) Loom- and weaver-controlled structures. Topics may include warp patterning, warp painting, printing and dyeing, ikat, multiple-harness weaves, and selected design problems for architectural textiles, utilitarian textiles, or experimental interpretation of traditional structures and materials. Prerequisite: 330.

ART 411 Advanced Photography (5, max. 15) Topics in advanced photography, including: color printing, large-format photography, artificial lighting, and photographic image transformation. Prerequisites: 370, 371, 372, and photography major priority.

ART 412 Extended Photographic Processes (5) Creative use of extended photographic processes such as high-contrast, infrared, and recording film. Prerequisites: 370, 371, 372, and photography major priority.

ART 413 Documentary Photography (5) Projects in photographic documentation involving either large- or small-format photography. Technical, conceptual, and historical considerations in documentary photography. Prerequisites: 370, 371, 372, and photography major priority.

ART 414 Color Photography (5) Theory and technique of color printing, manual and machine processing, with emphasis on C-41 and Type C chemistry. Prerequisites: 370, 371, 372, and photography major priority.

ART 415 Senior Thesis in Photography (5, max. 10) Development of a coherent photographic theme or topic over two consecutive quarters resulting in a finished thesis portfolio. Prerequisites: 411 and senior standing in photography.

ART 422 Industrial Design Computer Graphics I (3) Utilizes the microcomputer as a tool for the industrial designer's development of graphic solutions to two- and three-dimensional problems. Prerequisite: senior standing in industrial design.

ART 423 Industrial Design Computer Graphics II (3) Continuation of 422. Includes utilization of microcomputer intelligent products and robotics for effective design problem solving. Prerequisite: 422.

ART 425 Advanced Individual Projects in Fiber Arts (5, max. 15) Specialized investigation involving surface design and/or fabric structures. Prerequisite: upper-division standing in fiber arts.

ART 436 Sculpture Composition (5, max. 15) Individual compositions in various media in large scale. Prerequisites: 15 credits in 332.

ART 445, 446, 447 Advanced Industrial Design (5,5,5) Market analysis and selected professional problems in industrial design. Consultation techniques; psychological, sociological, and economic factors involved in designing for consumer acceptance. Prerequisites: 318 for 445; 445 for 446; 446 for 447.

ART 450 Advanced Intaglio (5, max. 15) Prerequisite: 345.

ART 452 Advanced Lithography (5, max. 15) Prerequisite: 347.

ART 453 Advanced Relief (5, max. 15) Prerequisite: 348.

ART 454 Advanced Serigraphy (5, max. 15) Prerequisite: 349.

ART 455 Advanced Printmaking (5) Prerequisites: 256, 265, 345, 347.

ART 457 Advanced Holloware (5) Individual problems in metal design and construction. Prerequisite: 357.

ART 458 Advanced Jewelry Design (5) Individual problems in jewelry design and construction. Prerequisite: 358.

ART 459 Advanced Enameling (5) Individual problems in enameling. Prerequisite: 359.

ART 460 Advanced Metal Design (5, max. 15) Advanced individual projects in metal design. Prerequisite: upper-division standing in metal design.

ART 463 Advanced Painting (5, max. 15) Development of individuality in painting through creative exercises. Prerequisites: 10 credits each in 307 and 360 and senior standing in painting.

ART 464 Advanced Painting/Drawing (5, max. 15) Advanced problems in composition. Prerequisite: 15 credits of 463.

ART 466 Graphic Design (5) Advanced two-dimensional design: integration of design elements in complex applied problems. Uses publications as the primary means of esthetic and organizational investigations. Prerequisites: 368, 378.

ART 467 Graphic Design (5) Exhibition design: fundamental problems of communications through environmental installations. Prerequisite: 466.

ART 468 Graphic Design (5) Independent study. Prerequisite: 467.

ART 478 Graphic Design (5) Information design I: investigations into the components of information design, with emphasis on signs, maps, charts, and diagrams. Prerequisites: 368, 378.

ART 479 Graphic Design (5) Information design II: objective transmittal of complex information in structured communications situations. Prerequisite: 478.

ART 480 Graphic Design (5) Design programs: a comprehensive presentation by the student requiring the analysis of a large-scale identity, institutional, or environmental problem. Prerequisite: 479.

ART 485 Advanced Ceramic Art (5, max. 15) Pottery design and construction, stoneware, clay bodies, glazes. Prerequisites: 15 credits in 353 and permission of instructor.

ART 486 Advanced Individual Projects in Ceramics (3-5, max. 15) Emphasis on pottery, sculpture, kiln building; historical and contemporary directions in clay. Prerequisite: 15 credits in 485.

ART 495 Graphic Design Seminars (5, max. 15) Independent and group work in graphic design theory. Prerequisites: senior standing in graphic design and permission of instructor.

ART 498 Individual Projects—Painting/Sculpture (3 or 5, max. 15) Prerequisite: permission of Art advisory office.

ART 499 Individual Projects—Design (3 or 5, max. 15) Prerequisite: permission of Art advisory office.

Courses for Graduates Only

ART 512 Graduate Seminar (3, max. 9)

ART 513 Contemporary Studio Theories and Problems (3)

- ART 515 Photography (3-15, max. 60)
 ART 522 Sculpture (3-15, max. 60)
 ART 540 Fiber Arts (3-15, max. 60)
 ART 547 Industrial Design (3-15, max. 60)
 ART 550 Printmaking (3-15, max. 60)
 ART 553 Ceramic Art (3-15, max. 60)
 ART 558 Metal Design (3-15, max. 60)
 ART 563 Painting (3-15, max. 60)
 ART 580 Graphic Design (3-15, max. 60)
 ART 600 Independent Study or Research (*)
 ART 700 Master's Thesis (*)

Art History

333 Art

Art history is the study of the creation and meaning of works of art in relation to the artists and societies that produce them. Comparative in nature, the history of art involves the interaction of styles, techniques, and ideas from different centers over long periods of time; hence, its study requires many different skills, including languages, bibliography, connoisseurship, and historic, iconographic, and stylistic analysis. Art History is a division of the School of Art.

Undergraduate Program

L. Elizabeth Anderson, Adviser
 104 Art

Bachelor of Arts Degree

Admission Requirements: The Office of Admissions admits entering freshmen and transfer students into art history. Postbaccalaureate applicants must file an application to the Office of Admissions and complete the supplementary information form provided by the School of Art advisory office by the following deadlines: Autumn Quarter, July 1; Winter Quarter, November 1; Spring Quarter, February 1; Summer Quarter, May 15.

Major Requirements: ART H 201; 47 additional art history credits, including at least 5 upper-division credits in each of the following areas: Asian; African, Native American, and Oceanic; Classical; Medieval; Renaissance; Baroque-Rococo; and Nineteenth-Twentieth Centuries; plus one of the following options: (1) ART 105, 106, 109, 110; or (2) 15 upper-division credits in one of the following (exclusive of courses offered jointly with Art History): Ancient and Medieval History, Anthropology, Asian Languages and Literature, Classics, Comparative Literature, English literature, Germanics, History of the Americas, History of Asia, Modern European History, Near Eastern Languages and Civilization, Romance Languages and Literature, Scandinavian Languages and Literature, or Slavic Languages and Literature.

Graduate Program

Jerome Silbergeld, Art History Graduate Program Coordinator

Admission to the Master of Arts program requires: (1) Bachelor of Arts degree with major in the history of art, or equivalent (students whose backgrounds are adjudged insufficient may be required to satisfy deficiencies before entering the program); (2) three letters of recommendation; (3) statement of professional ob-

jectives in the field; and (4) samples of the applicant's written work. Taking the Graduate Record Examination is not required. Graduation requirements are: (1) 55 credits in art history courses numbered 400 or above, of which 45 are course credits and 10 are thesis credits; 10 credits in related fields in courses at the 300 level and above may be approved to replace 10 credits in art history; (2) at least 5 credits each must be taken in four of these areas: African, Native American, and Oceanic; East Asian; Ancient, Classical, and Medieval; Renaissance and Baroque; eighteenth-twentieth-century Western; (3) two methodology seminars, one in Western and the other in non-Western art, preferably taken within the first year of residency, and an additional 15 credits in other 500-level seminars; (4) a reading knowledge of German or French, as well as a research capacity in a second language adjudged appropriate to the student's area of study. Language requirements may be satisfied either by passing the Graduate School Foreign Language Test (available in German, French, Spanish, and Russian only) with a minimum score of 550 or by passing a reading examination administered by the faculty; (5) 10 thesis credits in Art History 700 must be taken in preparation for the written presentation and oral defense of a thesis that demonstrates familiarity with sources and a capacity for synthesis and critical evaluation.

Admission to the Doctor of Philosophy program requires: (1) prior sound preparation at a general level, which usually means having acquired the Master of Arts degree in the history of art; students whose backgrounds are judged insufficient may be required to satisfy deficiencies before entering the program; (2) three letters of recommendation; (3) statement of professional objectives in the discipline; and (4) samples of written research work in art history. Taking the Graduate Record Examination is not required. Graduation requirements are a minimum of 90 credits, which include: (1) 60 credits in art history courses numbered 400 and above, beyond the Master of Arts degree or equivalent, and exclusive of dissertation credits; a maximum of 20 credits in related fields in numerically graded courses numbered 300 and above may be approved for credit in place of art history courses; a minimum of 10 credits must be in areas other than those tested by the General Examination; at least 30 credits must be in 500-level seminars; (2) a reading knowledge of German or French; a research capability in a second language adjudged appropriate to the student's area of study; a knowledge of any other languages considered necessary by the faculty. Language requirements may be satisfied either by passing the Graduate School Foreign Language Test (available in German, French, Spanish, and Russian only) with a minimum score of 550 or by passing a reading examination administered by the faculty; (3) a General Examination, written and oral, taken prior to enrollment for dissertation credits; this examination covers three specific fields of art history chosen from the following general areas: African, Native American, and Oceanic; East Asian; ancient, medieval; Renaissance; baroque and eighteenth century; modern; no more than two fields may be selected from the same area; (4) 30 additional credits at the 800 level taken after the General Examination in preparation and defense of the dissertation. In most cases, the student must expect to work and travel abroad in order to acquire firsthand knowledge of the works of art involved in the dissertation research.

Financial Aid

The Art History division offers certain funds, as well as teaching assistantships, for art history graduate students. A limited number of grants are awarded to outstanding entering students, but it is otherwise a policy to award financial aid and assistantships only to students who have completed at least one year of graduate study.

Correspondence and Information

Art History Graduate Program Coordinator
 102 Art, DM-10

Course Descriptions

Courses for Undergraduates

200-level courses in the history of art are intended for nonmajors, although they are also open to majors. They are designed to give an introduction to the subject matter of broad areas and to the history of art as a humanistic study. There are no prerequisites; each course is completely independent.

ART H 200 Ideas in Art (5) Selected monuments of art and architecture in the Western tradition, from the Greeks to the twentieth century, studied in relation to the intellectual background of the ages and civilizations that produced them. Slide lectures accompanied by discussion of assigned readings in philosophical, religious, scientific, political, literary, and artistic texts.

ART H 201 Survey of Western Art—Ancient (5) Major achievements in painting, sculpture, architecture, and the decorative arts in Europe, the Near East, and North Africa, from prehistoric times to the beginnings of Christianity.

ART H 202 Survey of Western Art—Medieval (5) The arts of the Byzantine Empire, Islam, and Western Christendom through the fifteenth century.

ART H 203 Survey of Western Art—Modern (5) European art and its extensions from 1500 to the present.

ART H 204 Survey of Asian Art (5) Origins and interplay of major movements of South and East Asian art.

ART H 205 Survey of Tribal Art (5) Arts of Sub-Saharan Africa and Oceania from prehistoric times to the present and to the pre-Columbian arts of the Americas.

ART H 230 Afro-American Art (3) History of Afro-American art from colonial times until the present, the African background and its extensions into the West Indies, Brazil, and Surinam.

ART H 232 Photography: Theory and Criticism (3) Art traditions of photography from its origins in the nineteenth century to the present. Emphasis on photographic traditions and photographers of the twentieth century.

300-level courses cover narrower times, spaces, and types of art than 200-level surveys and constitute the core curriculum for majors (although most enrollees come from other majors). Good basic university preparation (equivalent to upper-division standing) is needed. Relevant 200-level courses, although not required, may provide helpful background.

ART H 305 Introduction to Islamic Art and Civilization (5) Islamic art and civilization as represented by five court cities (Cairo, Cordova-Granada, Istanbul, Isfahan, Delhi-Fatehpur-Sikri) and the art and architecture, literature, religious expression, and social modes characteristic of each. Field trips to various local collections.

ART H 311 Chinese Art (5) Overview of the arts of China. Emphasis on the role of the arts in Chinese culture and on the traditional styles and techniques associated with each of the major media—painting, ceremonial bronzes, architecture, sculpture.

ART H 315 The Buddhist Art of East Asia (5) Buddhist painting and sculpture of China, Korea, and Japan. Its religious meaning, artistic development, and historical significance. Examples from the sixth to the seventeenth centuries, along with paintings and contemporary carvings.

ART H 316 Japanese Painting (5) Japanese painting traditions from earliest times to the present. Examples illustrated and discussed in the context of Japanese cultural history. Analysis of painting styles as well as of the roles artists have played and the meaning their works have had in Japanese society.

ART H 317 Chadō: Japanese Esthetics (4) History, theory, and practice of *chadō*, or "Way of Tea," a Zen-inspired art that has had notable effects on Japanese society. Lectures on esthetics and cultural history supplemented by participation in *chadō*, with the goal of developing sufficient understanding and skill to continue *chadō* as a discipline.

ART H 330 Tribal Art and Philosophy (5) Philosophical inquiry and thought in African, Ameri-Indian, and Pacific Island societies as expressed through the visual, musical, choreographic, and oral arts. Natural, moral, and ethical ideas as expressed in the arts.

ART H 332 Native American Art: Prehistory to Twentieth Century (5) Native American art north of Mexico, the prehistoric and historic periods. Regional examination of types and styles, with emphasis on esthetics, cultural function, and factors of change.

ART H 333 Art of the Northwest Coast Indian (3) Emphasis on the structure and style of two-dimensional art of the northern tribes. Joint with ANTH 333.

ART H 334 Art of the Northwest Coast Indian (3) Three-dimensional art of the Pacific Northwest coast culture area, with emphasis on esthetic principles, techniques, cultural functions. Joint with ANTH 334.

ART H 335 Art of the Northwest Coast Indian (3) Northwest coast Indian art as related to drama and dance, with special attention to the Southern Kwakiut. Joint with ANTH 335.

ART H 337 African Art and Society (5) Explores the ideas and notions expressed visually in sculpture, painting, ceramics, textiles, and architecture and describes their relationships to man and culture in Africa.

ART H 340 Pre-Classical Art and Archaeology (3) Art and the other material remains of the civilizations in the Aegean from the Neolithic period to the end of the Bronze Age, with special emphasis on Minoan Crete and the Mycenaean kingdoms of mainland Greece; illustrated by slides. The history, techniques, and results of significant excavations. Joint with CL AR 340.

ART H 341 Greek Art and Archaeology (3) Material remains and the developing styles in sculpture, vase painting, architecture, and the minor arts from the Geometric to the Hellenistic periods; illustrated by slides. Principal sites and monuments, as well as techniques and methods of excavation, are examined in an attempt to reconstruct the material culture of antiquity. Joint with CL AR 341.

ART H 342 Roman Art and Archaeology (3) Roman architecture and art, with emphasis on the innovations of the Romans; illustrated by slides. Joint with CL AR 342.

ART H 343 Hellenistic Art and Archaeology (3) Art of Greece and the eastern Mediterranean from the time of Alexander the Great to the Roman conquest. Principal sites with their sculpture, painting, mosaics, and minor arts examined in lectures with slides. Joint with CL AR 343.

ART H 350 The City of Cairo (3) Development of Fustat and Cairo, 600-1800, with special emphasis on art and architecture. Economic, social, and geographic influences on the creation of the distinctive Egyptian styles of Islamic art. Joint with NE 350.

ART H 351 Early Medieval and Byzantine Art (5) Christian art and architecture of the Roman and Byzantine empires and of western Europe through the eighth century.

ART H 352 High and Late Medieval Art (5) Art and architecture of western Christendom from the time of Charlemagne to the Renaissance.

ART H 381 Italian Renaissance Art (5) Sculpture, painting, and architecture from 1300 to 1600.

ART H 371 Baroque Art (5) Arts and architecture of Europe from the end of the sixteenth century to the first years of the eighteenth century.

ART H 372 Rococo to Romanticism (5) Mainstream of European art and architecture from about 1710 to about 1830. Attention is also given to central and eastern Europe, Scandinavia, and the colonial Americas.

ART H 380 Nineteenth- and Twentieth-Century Art (5) Arts and architecture of Europe and America from Realism to the present, with emphasis on stylistic and thematic changes in painting.

ART H 381 Art Since World War II (5) Art of Europe and the United States in the decades since World War II: painting, sculpture, and architecture, multiplication of new forms (video, performance pieces, land and installation pieces, etc.), changing context of patronage, publicity, and marketing.

ART H 382 Theory and Practice of Art Criticism (3) Major issues in art and architectural criticism: nature of art criticism, aims of the critic, differences between art and architectural criticism. Works by major critics and artists, mostly twentieth century.

ART H 384 American Art (5) Major achievements in painting, sculpture, printmaking, the decorative arts, architecture, urban design, and folk art in the United States from about 1800 to the present.

ART H 385 Survey of Early Film History (5) Origins and development of the motion picture from *circa* 1890 to *circa* 1950; major works in documentary, avant-garde, and animated film, as well as theatrical film, are shown and studied from art-historical and critical standpoints.

ART H 386 Art of Washington and the Pacific Northwest (5) History of painting, sculpture, printmaking, and decorative arts from mid-nineteenth century to present. Emphasis on Seattle and the Puget Sound region. Major developments in Oregon and British Columbia.

ART H 391 Painting Since the Renaissance (3) Illustrated lectures. Prerequisite: 203.

ART H 396 Study Abroad: Art in London (3-5, max. 15) Advanced or specialized work in art history based on materials available in the museums, private collections, libraries, and buildings of London, conducted through lectures, reading and research projects. Specific course content is determined by the assigned faculty member and is announced in Study Abroad bulletins. Prerequisite: permission of undergraduate adviser.

ART H 398 Study Abroad: Art in Provence (5, max. 15) Monuments in and around Avignon. Emphasis on Roman and Romanesque architecture and sculpture, later medieval French painting, great works of all periods and countries in regional museums, and the Provençal landscape of Cézanne, Van Gogh, and Gauguin. Prerequisite: permission of undergraduate adviser.

ART H 399 Study Abroad: Individual Projects (3-10, max. 20) For participants in Study Abroad programs. Prerequisite: permission of undergraduate adviser.

400-level courses are intensive, quite narrow in scope, and addressed to current scholarly problems. A relatively high level of sophistication is needed. In general, sound prior humanistic training and knowledge of at least one of the following are required: art of the period

or region at a general level (such as that provided by the relevant 200- or 300-level course); social or cultural history of the subject area; literature and thought of the area; or an appropriate foreign language. 400-level courses are available for both undergraduate and graduate credit. Each 400-level course is accompanied by two units of ART H 599, required of graduate majors.

ART H 400 Art History and Criticism (3, max. 9) Courses on special topics, frequently by visiting faculty, which cannot be offered on a continuing basis. Consult Art History office for subjects offered.

ART H 410 Chinese Figure Painting (3) Styles, content, and cultural role of Chinese figure painting, from historical narratives to religious icons.

ART H 411 Traditional Chinese Architecture (3) Introduction to Chinese architecture (palaces, homes, temples, tombs), urban planning, and gardens; techniques of production, visual styles, historical development, and relationship to traditional Chinese cultural values.

ART H 413 Selected Topics in Chinese Art (3, max. 9) Specific theme or area of Chinese art, such as the art of Bronze Age China or Chinese painting under Communist rule.

ART H 414 Early Chinese Painting: Neolithic Period to Five Dynasties (3) Emergence and development of Chinese painting, its styles, esthetic theories, and cultural content, from earliest times through the tenth century A.D.

ART H 415 Chinese Painting: The Sung Period (3) "Golden age" of Chinese painting, emphasizing the monumental, romantic, and Zen Buddhist landscape painting traditions of the tenth through thirteenth centuries.

ART H 416 Chinese Painting: The Yuan Period (3) Chinese painting under Mongol rule, in the fourteenth century: a period of political and social crisis that gave rise to a revolution in painting styles.

ART H 417 Later Chinese Painting: Ming, Ch'ing, and Modern Periods (3) Major masters and traditions, esthetic attitudes, and social role of Chinese painting from the fifteenth century to the present day.

ART H 418 Political Aspects of Chinese Painting (3) Examination of the close link between painting and politics in China, focusing on such aspects as imperial patronage and propaganda, paintings by Chinese courtiers and the arts of political protest and lament, Chinese painting under Communist rule.

ART H 419 Chinese and Japanese Architecture (3) Religious and secular architecture of China and Japan, with emphasis on Japanese temples and shrines.

ART H 420 Art of the Japanese Print (3) Foundations of Ukiyo-e in Japanese genre from the twelfth through mid-seventeenth centuries; woodblock technique from the Heian period through the early Edo period. Emphasis on the changing styles and subject matter in Ukiyo-e Hanga from Moronobu through Kuniyoshi.

ART H 421 The Yamato-e Tradition (3) Oldest (twelfth-to-fourteenth-century) narrative handscrolls and their descendants, the paintings of Tosa and other court artists from the fifteenth century onward, and the art of the Rimpa movement from Koetsu and Sotatsu (seventeenth century) to the present.

ART H 422 The Kan-ga Tradition (3) Ink paintings of Japanese Zen priests from the fourteenth century onward, and the works of professional artists belonging to those families (Kano, Hasegawa, Unkoku, and Kaiho) in which Chinese academic painting has been the principal inspiration, from the sixteenth century to the present.

ART H 423 Japanese Genre Painting (3) Various types of "popular" painting in Japan, including the *Namban-e* and townsman-painter art of the sixteenth and seventeenth centuries, the entire spectrum of *ukiyo-e*, and the "realistic" art of the Maruyama-Shijo school, from the eighteenth century to the present.

ART H 424 The Nanga Tradition (3) Works of painting and calligraphy by Japanese artists who have been part of the Chinese scholar-painting tradition from the late seventeenth century to the present.

ART H 425 Modern Japanese Painting (3) Painting of the Meiji, Taisho, and Showa eras (1868 to the present) by artists working in the modern idiom of either *Yoga* or *Nihonga*.

ART H 428 East Asian Calligraphy (3, max. 9) Classical calligraphy tradition of China and Japan in history and practice. Prerequisite: permission of undergraduate adviser.

ART H 431 Pre-Columbian Art (3) Arts of pre-Columbian cultures of Central and South America from prehistoric times to European contact.

ART H 432 Oceanic Art (3) Arts of Oceania, studied through cultures of Polynesia, Micronesia, Melanesia, and Australia.

ART H 436 Arts of Sub-Saharan Africa I (3) Traditional arts of the Western Sudan and the Western Guinea coast with their archaeological antecedents.

ART H 437 Arts of Sub-Saharan Africa II (3) Traditional arts of the Central Guinea coast, Nigeria, Cameroon, and Gabon, from precontact times to the present.

ART H 438 Arts of Sub-Saharan Africa III (3) Arts of Zaïre, Angola, the Swahili coast, and southern Africa.

ART H 442 Greek and Roman Painting (3) Painted decoration on Greek vases, and Roman wall painting, with emphasis on the historic and stylistic development of each. Joint with CL AR 442. (Offered alternate years; offered 1988-89.)

ART H 444 Greek and Roman Sculpture (3) History and development of Greek sculpture and sculptors, their Roman copyists, and Roman portraits and sarcophagi. Emphasis on Greek sculpture of the fifth century B.C. Joint with CL AR 444. (Offered alternate years; offered 1988-89.)

ART H 446 Greek Architecture (3) Detailed study of Greek architecture from its beginnings, with special emphasis on the Periclean building program in fifth-century Athens. Joint with CL AR 446 and ARCH 454. (Offered alternate years; offered 1988-89.)

ART H 451 Topics in Early Christian and Byzantine Art and Architecture (3, max. 9) Specific theme or area of early Christian and Byzantine art and architecture, such as early Christian and Byzantine mosaics or the art of Constantinople.

ART H 454 Romanesque Art (3) Western European art in the eleventh and twelfth centuries, focusing on monuments along the pilgrimage roads to Compostela in France and Spain.

ART H 455 Special Studies in Gothic Art and Architecture (3) Detailed study of Gothic architecture and its accompanying sculpture and stained glass, with special emphasis on the twelfth and thirteenth centuries in France and England. Joint with ARCH 455. Entry card required.

ART H 481 Early Renaissance Painting in Italy (3) Painting of the fourteenth and fifteenth centuries in central and northern Italy.

ART H 482 High Renaissance Painting in Italy (3) Painting in central and northern Italy, from about 1480 to about 1530: Leonardo, Raphael, the early Michelangelo, Sarto, Correggio, Bellini, Giorgione, and the early Titian.

ART H 463 Italian Renaissance Sculpture (3) From Nicola Pisano to Giambologna.

ART H 484 Late Renaissance Painting in Italy (3) Painting in central and northern Italy, from about 1515 to about 1580: Pontorno, Rosso, Parmigianino, Boccaccio, the later Michelangelo, Vasari, Bronzino, Salvati, the later Titian, Tintoretto, and Veronese.

ART H 465 Italian Renaissance Architecture (3) From the cathedral of Florence to St. Peter's in Rome: the style, symbolism, and theory of architecture.

ART H 466 High Renaissance Painting in Venice (3) Painting in Venice, circa 1480 to circa 1580: Bellini, Carpaccio, Giorgione, Titian, Lotto, del Plombo, Tintoretto, and Veronese.

ART H 470 English Art, 1500-1800 (3) English art, principally painting, and, to a lesser extent, architecture. Emphasis on patronage, on the conditions that produced the decided peculiarities of English art, and on the final triumph of the native tradition.

ART H 471 Rome in the Seventeenth Century (3) Painting, sculpture, and architecture; concentration on Caravaggio, Bernini, Poussin, and Borromini.

ART H 472 French Art—Seventeenth Century (3) Painting, sculpture, and prints. Special attention given to relations with Italy and the lowlands.

ART H 473 Age of Rembrandt and Vermeer (3) Art of the Dutch Republic in the late sixteenth and seventeenth centuries, concentrating on painting, prints, and drawings.

ART H 474 Studies in American Colonial Art (3, max. 6) Architecture, town design, painting, sculpture, and decorative arts in the eastern and southwestern colonies from original European settlement until the Revolutionary War. Key figures and developments in English art and architecture. Content varies from quarter to quarter.

ART H 476 French Art—Eighteenth Century (3) Painting, sculpture, and prints; emphasis on the successive phases of Rococo style and iconography and the emergence of Neoclassicism.

ART H 481 Romanticism (3) Romantic tendencies of the late eighteenth and early nineteenth centuries, with emphasis on stylistic and iconographic study of painting in Spain, England, Germany, France, and the United States to about 1830.

ART H 482 Realism and Impressionism (3) Art and the world, 1830-80: high Romanticism through Realism and Impressionism, with emphasis on painting in France.

ART H 483 Post-Impressionism to 1918 (3) Post-Impressionism and the great revolution of early twentieth-century art, with emphasis on painting. From the first revisions of Impressionism around 1880 to Fauvism, Cubism, Futurism, the Blaue Reiter, and Dadaism.

ART H 484 Thematic Studies in Modern Art (3, max. 9) Approach to art of the nineteenth/twentieth centuries through thematic content. Focus varies from year to year (e.g., development of landscape painting; treatment of the figure; woman in art; the crisis in portraiture).

ART H 485 Art Since World War I (3) Aspects of art in Europe and the United States from 1918 to the present, from the point of view of style and iconography.

ART H 487 American Art From the Revolution to the Civil War (3) Painting, sculpture, and architecture during the federal and early industrial periods. Developments in printmaking, the decorative arts, and folk art.

ART H 488 American Architecture (3) American architecture from the seventeenth-century colonial period to the present. Emphasis on architects and buildings, including features of urban development.

ART H 489 Washington Architecture (3) History of architecture in Washington State from pioneer days to the present. Broad perspective includes vernacular (popular, industrial, commercial) as well as fine architecture. Field trips encouraged.

ART H 491 Twentieth-Century Architecture (3) Traces the roots of today's architectural conflict: the pull of the past versus the allure of postmodernism. Major trends in twentieth-century architecture in this country and abroad.

ART H 499 Individual Projects (3, max. 9) Prerequisite: permission of undergraduate adviser.

Courses for Graduates Only

Most 500-level courses are specialized seminars oriented to new research, intended for graduate students in art history, but open to others who possess the necessary qualifications. Since specific content varies, all students must obtain the permission of the instructor or the art history graduate coordinator.

ART H 500 Methods of Art History (5) Introduction to the specialized bibliography of art historical research and to the wide variety of approaches to art historical problems of all periods and regions.

ART H 501 Seminar in the General Field of Art (5, max. 15)

ART H 502 Methodology Seminar: Western Art History (5) Introduction to the professional study of European and American art history; each quarter focuses on one aspect of study, such as connoisseurship, iconography, art history, or the social history of art.

ART H 503 Methodology Seminar: Non-Western Art History (5) Introduction to the professional study of non-Western art history, including Asian, African, Native American, and Oceanic; each quarter focuses on one aspect of study, such as traditionalism in art, problems of field research, or issues in the cross-cultural study of art.

ART H 511 Seminar in Chinese Art (5, max. 15) Critical appraisal of the principal research methods, theories, and types of literature dealing with the art of China.

ART H 515 Seminar in Japanese Art (5, max. 15) Critical appraisal of the principal research methods, theories, and types of literature dealing with the art of Japan.

ART H 531 Seminar in Tribal Art (5, max. 15) Methodological and cross-disciplinary problems in the visual arts of precolonial Africa, Oceania, and America. Specific content varies.

ART H 533 Seminar in North American Indian Art (5, max. 15) Problems in North American Indian visual arts. Content varies.

ART H 541 Seminar in Greek and Roman Art (3) *Langdon* In-depth study of selected topics and problems of the art of ancient Greece and Rome. Joint with CL AR 541.

ART H 551 Seminar in Early Christian, Byzantine, and/or Medieval Art and Architecture (5, max. 15) Problems in early Christian, Byzantine, and medieval art and architecture. Content varies. Prerequisite: permission of instructor.

ART H 561 Seminar in Italian Renaissance Art (5, max. 15) Problems and in-depth study of selected topics of the art of the Italian Renaissance.

ARTH 566 Seminar in North European Art (5, max. 15) Deals with problems of style and iconography of the northern European masters of the fourteenth through seventeenth centuries.

ARTH 577 Seminar in Baroque Art (5, max. 15) Iconographic and stylistic problems of the art of the Baroque period, with emphasis on the principal research methods, theories, and types of literature dealing with the art of the seventeenth and eighteenth centuries in Europe.

ARTH 581 Seminar in Modern Art (5, max. 15) Art historical problems of the nineteenth and twentieth centuries.

ARTH 590 Seminar in Criticism of Contemporary Art (5, max. 15) Contemporary art and appropriate critical methodology.

ARTH 599 Reading and Writing Projects (2) Art historical issues, methods, and materials. Required of all graduate majors registered in 400-level art history courses. Open also to graduate nonmajors. May be repeated for credit.

ARTH 600 Independent Study or Research (*)

ARTH 700 Master's Thesis (*)

ARTH 800 Doctoral Dissertation (*)

Asian American Studies

See *American Ethnic Studies*.

Asian Languages and Literature

223 Gowen

The Department of Asian Languages and Literature offers instruction in the principal languages and literatures of Asia, including East, Southeast, Central, and South Asian. Emphasis is placed on the roles of these languages within the cultures they serve as well as on linguistic (particularly historic) and literary analysis. Several courses on Asian literature are offered in English for both majors and nonmajors.

Undergraduate Program

Adviser
225 Gowen

Bachelor of Arts Degree

Major Requirements: *Chinese*—55 credits in the language, 10 beyond third-year level, including CHIN 451; 10 credits in Chinese literature, excluding 499, 3 credits in Chinese linguistics, 5 credits in area-related humanities or social science courses. *Japanese*—45 credits in the language, 15 beyond second-year level; 30 credits in area-related humanities or social science courses, including a sequence in either Japanese literature or linguistics. *Korean*—45 credits in the language, 15 beyond second-year level; 30 credits in literature and area-related humanities or social science courses. *South Asian languages*—60 credits in languages, 45 in the major language, 15 in the minor language; 15 credits in area-related humanities or social science courses to be chosen in consultation with adviser, including HSTAS 201 and ASIAN 401. If Tibetan is the major language: 42 major language credits, 15 minor language credits; 18 credits in area-related humanities or social science courses to be chosen in consultation with adviser, including HSTAS 201 and

ASIAN 401. *Thai*—45 credits in the language, 15 beyond second-year level; 20 credits in area-related humanities or social science courses to be chosen in consultation with adviser. *Turkic*—55 credits in the language, 10 credits beyond the second year including TKIC 301, 302, 303, 401, 402, 403, 411, 412, 413 (Uzbek), TKIC 304, 305, 306 (Kazakh), TKIC 341, 342, 343 (Uighur and/or Kirghiz and/or Tatar, etc.), TKISH 311, 312, 313; 20 credits in area-related humanities or social science courses, including 10 credits from literature, 10 credits from culture/history. Suggested courses: TKIC 363, SISRE 410, C LIT 496, SISRE 375, N E 210, HSTEU 439, HSTEU 444. Students intending to pursue graduate degrees should begin the study of Russian or German during their undergraduate programs.

Graduate Program

William G. Boltz, Graduate Program Coordinator

The Department of Asian Languages and Literature offers programs of study leading to the Master of Arts and Doctor of Philosophy degrees with specializations in Chinese, Japanese, Korean, Altaic languages (Turkic, Mongolian, and Manchu), and South Asian languages (Hindi, Sanskrit, Tamil, and Tibetan). Discipline concentrations include literary history and theory, linguistics, textual criticism and philology, and Buddhist studies. The department does not offer study in language pedagogy.

A full range of courses in other disciplines and aspects of Asian cultures and civilizations is available from other departments and schools of the University, such as the Departments of Anthropology, History, Linguistics, Comparative Literature, and Political Science, and the Henry M. Jackson School of International Studies. Students in the Department of Asian Languages and Literature are encouraged to avail themselves of these offerings to complement and supplement their language and literature studies.

Admission Requirements

Applicants for admission should present the equivalent of an undergraduate major in the language and literature of specialization. Students without such a background may be qualified for admission but will need initially to acquire the expected program prerequisites for graduate study.

Besides an application and two original sets of transcripts of prior postsecondary education, which are to be sent directly to Graduate Admissions, the department requires a statement of academic goals and three letters of recommendation addressed to the Graduate Program Coordinator.

Degree Requirements

The research component of the Master of Arts degree may be satisfied by the writing of either a thesis or two research papers. The Doctor of Philosophy degree requires a dissertation. In addition to the language of specialization, reading knowledge of a second (usually Western) language is required for the Master of Arts degree, and of a third (usually Asian) language for the Doctor of Philosophy degree. Neither English nor, usually, the student's native language may be used to fulfill these additional requirements.

Faculty

Chairperson

David R. Knéchtges

Professors

Chan, Hok-lam,* 1972, ‡(International Studies, History), M.A., 1963, Hong Kong; M.A., 1965, Ph.D., 1967, Princeton; late Imperial Chinese history.

Cirtautas, Ilse D.,* 1968, ‡(Near Eastern Languages and Civilization), Ph.D., 1958, Hamburg; Turkic language and literature.

Knéchtges, David R.,* 1972, A.M., 1965, Harvard; Ph.D., 1968, Washington; Han and Six Dynasties literature.

Miller, Roy A.,* 1971, M.A., 1950, Ph.D., 1953, Columbia; historical linguistics, including Japanese, Altaic, and Sino-Tibetan.

Norman, Jerry,* 1971, M.A., 1965, Ph.D., 1969, California (Berkeley); Chinese language and linguistics, Altaic linguistics.

Poppe, Nicholas N., 1949, (Emeritus), M.A., 1923, Petrograd; Ph.D., 1934, Petersburg; Altaic.

Potter, Karl H.,* 1971, ‡(International Studies, Philosophy), M.A., 1952, Ph.D., 1955, Harvard; South Asia.

Rubin, Jay,* 1975, Ph.D., 1970, Chicago; modern Japanese literature.

Schiffman, Harold F.,* 1967, (Anthropology, Linguistics), M.A., 1966, Ph.D., 1969, Chicago; Dravidian language and literature, sociolinguistics, Tamil, language policy.

Serruys, Paul L.-M., 1965, (Emeritus), Ph.D., 1956, California (Berkeley); classical Chinese.

Shih, Vincent Y. C., 1945, (Emeritus), M.A., 1930, Yenching; Ph.D., 1939, Southern California; Chinese.

Wang, Ching-hsien,* 1971, (Comparative Literature), ‡ M.F.A., 1966, Iowa; M.A., 1969, Ph.D., 1971, California (Berkeley); Chinese poetry and comparative literature.

Wilhelm, Hellmut, 1948, (Emeritus), Ph.D., 1932, Berlin; Chinese.

Associate Professors

Boltz, William G.,* 1981, M.A., 1969, Ph.D., 1974, California (Berkeley); classical Chinese.

Brandauer, Frederick P.,* 1973, M.A., 1965, Pittsburgh; Ph.D., 1973, Stanford; traditional Chinese vernacular fiction and modern Chinese literature.

Cooke, Joseph R.,* 1967, (Emeritus), Ph.D., 1965, California (Berkeley); Thai language and literature.

Lukoff, Fred,* 1964, (Linguistics), (International Studies), ‡ M.A., 1948, Ph.D., 1954, Pennsylvania; Korean language and linguistics.

Niwa-Kano, Tamako, 1962, (Emeritus), M.A., 1946, Ph.D., 1956, Radcliffe; Japanese language.

Salomon, Richard G.,* 1981, Ph.D., 1975, Pennsylvania; Sanskrit language and literature.

Shapiro, Michael C.,* 1970, (Linguistics), M.A., 1970, Ph.D., 1973, Chicago; Indo-Aryan languages and linguistics.

Suh, Doo Soo, 1955, (Emeritus), M.A., 1950, Ph.D., 1953, Columbia; Korean.

Tatsumi, Henry S., 1931, (Emeritus), M.A., 1935, Washington; Japanese.

Yen, Isabella Y., 1960, (Emeritus), A.M., 1951, Michigan; Ph.D., 1956, Cornell; Chinese.

Yue-Hashimoto, Anne O.,* 1980, M.A., 1963, Texas (Austin); Ph.D., 1966, Ohio State; Chinese language and linguistics and dialectology.

Assistant Professors

Cox, Collett D.,* 1985, M.A., 1974, M.Phil., 1976, Ph.D., 1983, Columbia; Indian and Chinese Buddhist philosophy, history of religions.

Entwistle, Alan W.,* 1986, M.A., 1975, Ph.D., 1982, London; Hindi literature and Hinduism.

Markus, Andrew L., 1986, M.Phil., 1979, Ph.D., 1985, Yale; literature and culture of Tokugawa-period Japan.

Treat, John Whittier,* 1983, M.A., 1979, Ph.D., 1982, Yale; Japanese language and literature.

van der Kuip, Leonard W., 1987, (Acting), M.A., 1976, Saskatchewan; Ph.D., 1979, Hamburg; Tibetan languages and literature, Buddhist studies.

Lecturers

Hines, Naseem, 1986, M.A., 1983, Washington; Hindi and Urdu language and literature.

Hsia, Huang-yi, 1973, B.A., 1953, National Taiwan; Chinese language.

Norman, Stella C., 1983, M.A., 1957, National Taiwan; Chinese language.

Course Descriptions**Courses for Undergraduates****Altai**

ALTAI 401, 402, 403 Written Mongolian (3,3,3) A,W,Sp Norman Introduction to Mongolian written in the vertical script. Texts of different periods and genres. Prerequisite: permission of instructor. (Offered alternate years.)

ALTAI 405, 406, 407 Manchu (3,3,3) A,W,Sp Norman Introduction to Manchu, with principal focus on the structure of the language. Reading of texts of different genres. Prerequisite: permission of instructor. (Offered alternate years.)

ALTAI 415, 416, 417 Spoken Mongolian (5,5,5) A,W,Sp Norman Introduction to the modern spoken language of Mongolia. Emphasis on correct pronunciation and oral skills.

Asian

ASIAN 401 Introduction to Asian Linguistics (5) A Schiffman, Shapiro Linguistic analysis, with emphasis on the languages of east, southeast, south, and central Asia. Includes phonetics, phonemics, morphology, syntax, lexicography, historical reconstruction, linguistic typology, and comparative grammar. Survey of major languages and language families of Asia. Diverse Asian languages used as subjects of linguistic analysis. Prior knowledge of linguistics is not required. Prerequisite: two years of an Asian language or permission of instructor.

ASIAN 404 Writing Systems (3) Boltz, Salomon Nature and development of writing systems. Alphabets, syllabaries, and logographic systems; relationship of writing systems to spoken languages; decipherment of previously undeciphered scripts. Prerequisite: 401 or equivalent or permission of instructor. (Offered alternate years.)

ASIAN 405 Advanced Problems in Asian Linguistics (3) Schiffman, Shapiro Advanced problems in the analysis of the languages of east, southeast, south, and central Asia. Includes phonology, morphology, syntax, lexicography, historical reconstruction, linguistic typology, and comparative grammar. Prerequisite: 401 or equivalent or permission of instructor. (Offered alternate years.)

ASIAN 498 Special Topics (1-5, max. 15) AWSp Offered occasionally by permanent or visiting faculty members. Topics vary.

Chinese

CHIN 111, 112, 113 First-Year Chinese (5,5,5) A,W,Sp Introduction to the standard language. Emphasis on learning correct pronunciation and basic structure. Drill in oral use of the language. No credit for 111, 112, 113 if 134 taken.

CHIN 134 First-Year Intensive Chinese (15) S Equivalent of 111, 112, 113. Introduction to the standard language; correct pronunciation and basic structure; drill in oral use of the language. Especially recommended for students (particularly graduate students) who plan to devote more time to other subjects during the regular academic year. No credit if 111, 112, 113 taken. (Offered Summer Quarter only.)

CHIN 211, 212, 213 Second-Year Chinese (5,5,5) A,W,Sp Hsia Continuation of 111, 112, 113. Advanced grammar and vocabulary expansion stressed. Oral practice and structural drills continued. No credit for 211, 212, 213 if 234 taken. Prerequisite: 113 or equivalent.

CHIN 234 Second-Year Intensive Chinese (15) S Equivalent of 211, 212, 213. No credit if 211, 212, 213 taken. Prerequisite: 113 or equivalent. (Offered Summer Quarter only.)

CHIN 301, 302, 303 Situational Chinese (5,5,5) A,W,Sp Concentrated practice in the use of Chinese as spoken in everyday life. Oral comprehension and speaking skills. Readings selected to broaden the students' understanding of modern Chinese culture. Improving pronunciation and mastery of Chinese grammar. Prerequisites: 213 and permission of instructor.

CHIN 311, 312, 313 Third-Year Chinese (5,5,5) A,W,Sp Yue-Hashimoto Reading of unedited texts—newspaper articles, essays, short stories. Oral practice, composition, and listening comprehension. No credit if 334 taken. Prerequisite: 213 or equivalent.

CHIN 333 Intensive Business Chinese (15) Introduction to oral Chinese as employed in business contexts. Illustrates the level of language common to a wide range of Sino-American business communication situations and to general situations in international trade. Prerequisite: 213 or equivalent.

CHIN 334 Third-Year Intensive Chinese (15) S Equivalent of 311, 312, 313. Reading of unedited texts—newspaper articles, essays, short stories. Oral practice and structural drill. No credit if 311, 312, 313 taken. Prerequisites: 213 or equivalent and permission of instructor.

CHIN 342 The Chinese Language (3) W Norman, Yue-Hashimoto (teaching alternate years) Nature and structure of the Chinese language, covering structural characteristics, genetic and typological affinity with other groups, sound system of standard Mandarin, Chinese writing system and language reforms, brief survey of the history of the Chinese language, and aspects of language in relation to culture. Prerequisite: 213 or equivalent.

CHIN 344 Intensive Chinese in Beijing (15) S Beijing University Teaching Staff Eight weeks of intensive instruction in modern Chinese, including readings in modern Chinese texts, oral conversation drill, an introduction to past and present Chinese culture, and weekly lectures on such topics as Chinese literature, art, economics, politics, and history. Informal visits with artists, writers, and scholars; weekend excursions to cultural and historic sites in and around Beijing; and a final two-week study tour of selected cities of north and east China. Prerequisite: permission of department.

CHIN 345 Spoken Chinese in Beijing (6, max. 18) AWSp Beijing University Teaching Staff Designed to increase active vocabulary, to enhance the student's understanding of Chinese grammar, to further the student's control of idiomatic Chinese, and, in general, to develop oral skills. Prerequisite: 313 or 344.

CHIN 348 Chinese Readings in Beijing (6, max. 18) AWSp Beijing University Teaching Staff General readings in textbooks prepared by Beijing University and specially selected readings in modern or traditional vernacular literature or in the social sciences. Prerequisite: 313 or 344.

CHIN 402 Advanced Readings (3) W Hsia Readings in contemporary Chinese literature. Development of oral and writing skills. Student discussions in Chinese. Prerequisite: 313 or equivalent.

CHIN 403 Advanced Readings (3) Sp S. Norman Readings in classical writings and related academic essays in modern Chinese. Topics vary and may in-

clude the Analects of Confucius and modern academic essays on the Analects. Prerequisite: 313 or equivalent.

CHIN 407 Chinese Reference Works and Bibliography (3) A Lo Introduction to the search of library information on Chinese studies through the use of basic reference works and modern library methods, with twenty-five percent of class time dealing with individual student's subject interest. Prerequisite: 313 or equivalent.

CHIN 415, 416, 417 Readings in Social Science Texts (5,3,3) A,W,Sp Yue-Hashimoto Readings of social science materials from contemporary China. Development of oral and writing skills. Student discussions. Prerequisite: 313 or equivalent.

CHIN 443 Structure of Chinese (3) Sp Yue-Hashimoto Outline of the major syntactic structures of Chinese. Focus on learning and teaching problems. Prerequisite: 313 or equivalent.

CHIN 451, 452, 453 First-Year Classical Chinese (5,5,5) A,W,Sp Boltz Selected texts of pre-Han literary works. Focus on systematic sentence analysis and distinctive functions of grammatical particles. To be taken in sequence. Prerequisite: 213 or equivalent for 451; 451 for 452; 452 for 453.

CHIN 481, 482, 483 Modern Chinese Literature (5,5,5) W Brandauer Modern literary texts in the original language, concentrating on the short story and the essay. Works studied come from May Fourth writers and from writers in the People's Republic of China and Taiwan. Literary, historical, and social significance with an introduction to bibliographic and reference resources. Prerequisite: 313 or equivalent.

CHIN 499 Undergraduate Research (3-5, max. 15) AWSpS For Chinese language and literature majors. Prerequisite: permission of instructor.

Hindi

HINDI 311, 312, 313 Elementary Hindi (5,5,5) A,W,Sp Entwistle, Hines, Shapiro Modern literary Hindi. Reading, writing, and conversation. Introduction to Devanāgarī script.

HINDI 321, 322, 323 Intermediate Hindi (5,5,5) A,W,Sp Entwistle, Hines, Shapiro Systematic expansion of vocabulary and grammar. Intermediate-level prose and poetry readings. Oral drills. Prerequisite: 313 or equivalent.

HINDI 401, 402, 403 Advanced Hindi (5,5,5) A,W,Sp Entwistle, Hines, Shapiro Rapid reading of contemporary Hindi prose, poetry, and drama. Advanced conversation and composition. Prerequisite: 323 or equivalent.

HINDI 431 Advanced Conversational Hindi (2, max. 8) Conversational practice in contemporary Hindi. Prerequisite: 323 or equivalent or permission of instructor.

HINDI 499 Undergraduate Research (3-5, max. 15) AWSpS Primarily for Hindi language and literature majors. Prerequisite: permission of instructor.

Indian

INDN 400 Practicum in South Asian Languages (3, max. 18) Introduction to any one of various South Asian languages (e.g., Kannada, Nepali, Punjabi, Sinhala, Marathi, Telugu, Urdu) not taught on a regular basis. Students may receive credit for more than one such language. Prerequisite: permission of instructor.

INDN 401, 402 Pali (3,3) W,Sp Cox Introduction to Pali language and literature. Prerequisite: SNKRT 403 or equivalent, or permission of instructor.

INDN 403 Introduction to Written Urdu (3) Hines, Shapiro Modern written Urdu for students with at least elementary knowledge of Hindi. Prerequisite: HINDI 313 or equivalent.

INDN 404 Readings in Urdu Literature (3, max. 18)
Hines, Shapiro Readings in Urdu prose and poetry. Urdu prose composition. Prerequisite: 403 or equivalent.

INDN 499 Undergraduate Research (3-5, max. 15)
AWSpS Primarily for South Asian language and literature majors. Prerequisite: permission of instructor.

Japanese

JAPAN 111, 112, 113 First-Year Japanese (5,5,5)
A,W,Sp *Treat* Introduction to modern Japanese conversation and grammar. Script, including 150 Sino-Japanese characters, taught in 112 and 113. Not open for credit to students who have taken 111, 112, 113, 134.

JAPAN 134 First-Year Intensive Japanese (15) S
Equivalent of 111, 112, 113. Not open for credit to students who have taken 111, 112, 113. (Offered Summer Quarter only.)

JAPAN 211, 212, 213 Second-Year Japanese (5,5,5)
A,W,Sp *Markus* Reading and translation of modern Japanese. Extensive memorization of written characters and continued oral practice. Review and expansion of fundamental grammatical patterns. Not open for credit to students who have taken 211, 212, 213, 234. Prerequisite: 113 or equivalent.

JAPAN 234 Second-Year Intensive Japanese (15) S
Equivalent of 211, 212, 213. Not open for credit to students who have taken 211, 212, 213. Prerequisite: 113 or equivalent. (Offered Summer Quarter only.)

JAPAN 311, 312, 313 Third-Year Japanese (5,5,5)
A,W,Sp *Rubin* Reading and translation of modern Japanese at a more advanced level, with oral practice based on written materials. Prerequisite: 213 or equivalent for 311, permission of instructor for 312 and 313.

JAPAN 405-406 History of the Japanese Language (3-3)
W,Sp *Miller* Introduction to the history of Japanese, including phonology, morphology, syntax, and lexicon. Prerequisite: ASIAN 401. (Offered alternate years.)

JAPAN 431, 432, 433 Readings in Modern Japanese Literature (5,5,5)
A,W,Sp *Rubin* Reading and discussion of selected modern literary texts in the original language, concentrating on the short story and novel. Close attention to grammar and syntax. Prerequisite: 313 or equivalent. (Offered alternate years.)

JAPAN 471, 472 Classical Japanese Grammar (5,5)
A,W *Markus* Introduction to classical grammatical forms and translation of classical literary texts. Prerequisites: 313 or equivalent for 471; 471 for 472. (Offered alternate years.)

JAPAN 473 Readings in Classical Japanese Literature (5)
Sp *Markus* Readings in prose, poetry, and drama, antiquity to nineteenth century. Prerequisite: 472 or equivalent. (Offered alternate years.)

JAPAN 499 Undergraduate Research (3-5, max. 15)
AWSpS For Japanese language and literature majors. Prerequisite: permission of instructor.

Korean

KOR 301, 302, 303 Introduction to Korean (5,5,5)
A,W,Sp *Lukoff, Staff* Fundamentals of the Korean language. Emphasis on Korean alphabet and spelling, pronunciation, and basic grammar.

KOR 304 Spoken Korean (10) S
Lukoff, Staff The Korean language as spoken in ordinary conversational situations. Phonetic accuracy and appropriateness of idiom. May be taken any summer after completion of first-year Korean. Prerequisite: 303 or permission of instructor. (Offered irregularly.)

KOR 311, 312, 313 Introduction to Korean Writing in Mixed Script (5,5,5)
A,W,Sp *Lukoff, Staff* Chinese characters as used in Korean mixed script. Sys-

tematic expansion of vocabulary and grammatical forms of standard Korean. Prerequisite: 303 or equivalent.

KOR 411, 412, 413 Readings in Contemporary Korean (5,5,5)
A,W,Sp *Lukoff* 411 completes the introduction to Korean writing in mixed script of 311, 312, 313. 412 and 413 provide experience in reading a variety of contemporary styles. Materials from published works include informal essays, short stories, one-act plays, academic essays, and newspaper editorials. Prerequisite: 313 or equivalent.

KOR 415 Social Science Literature in Korean (3)
A *Lukoff* Readings in selections from contemporary Korean publications in social science topics. Prerequisite: 413 or equivalent.

KOR 416 Korean Narrative and Dramatic Literature (3)
W *Lukoff* Linguistic features rather than purely literary qualities of modern Korean literature. Includes figures of speech and sophisticated linguistic expression. Prerequisite: 413 or equivalent.

KOR 417 Readings in Korean Journals (3)
Sp *Lukoff* Selections from Korean newspapers, news magazines, and other journals. Topics from international and domestic affairs, including politics, business, and problems of everyday life. Prerequisite: 413 or equivalent.

KOR 499 Undergraduate Independent Study (3-5, max. 15)
AWSpS For students who have completed 417 or equivalent. Prerequisite: permission of instructor.

Sanskrit

SNKRT 301, 302, 303 Introduction to Sanskrit (5,5,5)
A,W,Sp *Salomon* Basic grammar and vocabulary of the classical language. Reading of elementary texts from the epic or Purāṇic literature.

SNKRT 401, 402, 403 Intermediate Sanskrit (5,5,5)
A,W,Sp *Salomon* Advanced classical grammar; introduction to classical literature and Vedic language and texts. Prerequisite: 303.

SNKRT 411, 412, 413 Advanced Sanskrit (5, max. 15; 5, max. 15; 5, max. 15)
A,W,Sp *Salomon* Reading and analysis of classical texts, chosen from the Śāstra or Kāvya literatures. Prerequisite: 403 or permission of instructor.

SNKRT 491, 492, 493 Vedic Studies (3,3,3)
A,W,Sp *Salomon* Readings of selected Vedic texts, with linguistic, religious, and historical analyses. Includes background material on Vedic religion, literature, and culture. Prerequisite: 303 or equivalent. (Offered alternate years.)

SNKRT 494 Readings in Religious Classics of India (5)
Sp *Potter, Salomon* Introduction to the older religious literature, with emphasis on the Upaniṣads, the Dharmasāstras, and the Bhagavad Gītā. Rapid reading of the texts, plus content analysis of the developing religious forms. Prerequisite: 402.

SNKRT 495 Studies in Indian Thought (3, max. 9)
A *Cox* Religious and philosophical traditions in South Asia. The original documents studied vary from year to year. Prerequisite: 402 or permission of instructor.

SNKRT 499 Undergraduate Research (3-5, max. 15)
AWSp Primarily for Sanskrit language and literature majors. Prerequisite: permission of instructor.

Tamil

TAMIL 311, 312, 313 Elementary Tamil (5,5,5)
A,W,Sp *Schiffman* Introduction to the modern spoken language; emphasis on basic sentence types and transformation drills. The writing system and literary dialect are introduced.

TAMIL 321, 322, 323 Intermediate Tamil (5,5,5)
A,W,Sp *Schiffman* Intensified use of the modern spoken language, beginning with moderately difficult conversation and drills, and working up to more advanced materials. Continuation of work with written language. Prerequisite: 313 or equivalent.

TAMIL 401, 402, 403 Advanced Tamil (5,5,5)
A,W,Sp *Schiffman* Readings in modern literary Tamil, including the modern novel and short story. Work with radio plays in spoken Tamil. Prerequisite: 323 or equivalent.

TAMIL 455 Topics in Dravidian Linguistics (3)
Schiffman Selected topics in Dravidian linguistics. Phonological, morphological, syntactic, or historical linguistics of a selected Dravidian language or group of languages. Prerequisite: two years of a Dravidian language or permission of instructor.

TAMIL 499 Undergraduate Research (3-5, max. 15)
AWSpS Primarily for Tamil language and literature majors. Prerequisite: permission of instructor.

Thai

THAI 301, 302, 303 Basic Thai (5,5,5)
A,W,Sp *Cooke* Introduction to modern spoken and written Thai. Emphasis on spoken language competence with additional skills in elementary reading and spelling.

THAI 401, 402, 403 Intermediate Thai (5,5,5)
A,W,Sp *Cooke* Short stories; articles on Thai history, geography, culture, politics, economics, etc. Primary emphasis on reading, translation, comprehension, and grammar. Prerequisite: 303.

THAI 411, 412, 413 Readings in Thai (5,5,5)
A,W,Sp *Cooke* Advanced reading and translation of selections from various Thai authors, with occasional practice in conversation and composition. Prerequisite: 403.

THAI 499 Undergraduate Research (3-5, max. 25)
AWSpS For Thai language and literature majors. Prerequisite: permission of instructor.

Tibetan

TIB 304, 305, 306 Colloquial Tibetan (5,5,5)
A,W,Sp *Norman* Introduction to phonology, morphology, and syntax of spoken Tibetan, Lhasa dialect. (Offered alternate years.)

TIB 307, 308, 309 Intermediate Colloquial Tibetan (5,5,5)
A,W,Sp *Norman* Instruction and drill in advanced colloquial sentence patterns and syntactical constructions. Prerequisite: 306 or equivalent. (Offered alternate years.)

TIB 311, 312, 313 Literary Tibetan (3,3,3)
A,W,Sp Introduction to the phonology, grammar, and syntax of written Tibetan. Materials selected for rapid development of reading knowledge.

TIB 407, 408, 409 Advanced Colloquial Tibetan (5,5,5)
A,W,Sp Advanced instruction and practice in colloquial Tibetan, Lhasa dialect, intended to build on previous oral-aural experience and increase fluency in the modern spoken language. Prerequisite: 309 or equivalent.

TIB 411, 412, 413 Readings in Tibetan (3,3,3)
A,W,Sp Selections from various Tibetan materials. Prerequisite: 313 or equivalent.

TIB 415, 416, 417 Readings in Tibetan Literature (3,3,3)
A,W,Sp Reading of selections from Tibetan philosophical literature. May be taken in any sequence. Prerequisite: 413 or permission of instructor.

TIB 499 Undergraduate Research (3-5, max. 15)
AWSpS For Asian languages and literature majors. Prerequisite: permission of instructor.

Turkic

TKIC 301, 302, 303 Elementary Uzbek (3,3,3) A,W,Sp Cirtautas Introduction to the modern written and spoken language. Joint with TKISH 301, 302, 303. Prerequisite: permission of instructor.

TKIC 304, 305, 306 Introduction to Kazakh (3,3,3) A,W,Sp Cirtautas Position of Kazakh within the community of other Turkic languages; alphabets used for Kazakh; reading of texts from the Soviet Union and China (Sinkiang); exercises. Joint with TKISH 304, 305, 306. Prerequisite: permission of instructor.

TKIC 341, 342, 343 Introduction to Uighur (3,3,3) A,W,Sp Cirtautas Phonology, morphology, and syntax of Uighur. Joint with TKISH 341, 342, 343. Prerequisite: permission of instructor.

TKIC 383 Oral Literature of the Turkic Peoples of Central Asia I: The Heroic Epos (3) A Cirtautas Representative heroic poems of Central Asian Turkic peoples now living in the USSR and China. Origin of the heroic epos, its relation to the romantic epos and other oral literary genres. Art of the singer and his role in nomadic Turkic society. Emphasis on Manas, the monumental epos of the Kirghiz.

TKIC 401, 402, 403 Intermediate Uzbek (3,3,3) A,W,Sp Cirtautas Continuation of elementary Uzbek. Oral work, grammar, and readings in Uzbek literature. Joint with TKISH 405, 406, 407. Prerequisite: permission of instructor.

TKIC 404 Introduction to Turkic Studies (3) A Cirtautas Bibliography, problems, and methods of research in the field of Turkic studies for advanced students of Turkish/Turkic languages, including readings in those languages on the languages, literatures, and ethnography of past and present Turkic peoples. Joint with TKISH 404. Prerequisite: permission of instructor.

TKIC 411, 412, 413 Introduction to Uzbek Literature (3,3,3) A,W,Sp Cirtautas Continuation of 401, 402, 403. Readings from selected Uzbek writers. Joint with TKISH 414, 415, 416. Prerequisite: permission of instructor.

TKIC 499 Undergraduate Research (3-5, max. 15) AWSpS For Turkic language and literature majors. Prerequisite: permission of instructor.

Literature Courses in English

ASIAN 263 Great Works of Asian Literature (5) Sp Selected major works of Asian literature. Taught on a rotational basis with the literary traditions of China, Japan, India covered in successive years. Content varies depending on specialization and interest of instructor. Primary emphasis on literary values of works and their tradition; attention also given to historical and social contexts and the thought and value systems of the culture involved.

CHIN 280 The Chinese Novel in English (5) A Brandauer The Chinese novel from the Ming dynasty to the present. Readings in English translation. Literary values of works and their tradition. Historical and social contexts and thought and value systems of the Chinese. (Offered alternate years.)

CHIN 281 Literature in Modern China (5) A Brandauer Literature in China from the 1911 revolution to the present. May Fourth literature, Taiwan literature, and People's Republic of China literature. Readings in English translation. (Offered alternate years.)

CHIN 293 Introduction to Literature and Ideas in China (5) Sp Knechtges Basic concepts of Chinese thought (Confucianism, Taoism, and Buddhism) as reflected in philosophical writings and literature. Focus on a single idea (e.g., human nature) for an entire quarter. In English; previous course work on China not required.

INDN 420 Classical Indian Literature in English (5) Entwistle, Salomon Major classical works in Indian literature, both South and North, up to the thirteenth century: epics, dramas, and lyrics. Major themes, their philosophical and religious backgrounds, and correlation with music and the visual arts.

teenth century: epics, dramas, and lyrics. Major themes, their philosophical and religious backgrounds, and correlation with music and the visual arts.

INDN 421 Modern Indian Literature in English (5) Entwistle Major works in Indian literature from the medieval period onward, considered against their cultural background.

JAPAN 321 Japan in Literature and Film: I (5) A Markus, Rubin Literary history of Japan from the eighth to the late twelfth centuries, with readings in *The Tale of Genji* and other major works of the imperial court, plus films reflecting the architecture, life, and natural milieu of classical Japan.

JAPAN 322 Japan in Literature and Film: II (5) W Markus Literary history of Japan from the thirteenth to early nineteenth centuries, with readings from Zen-influenced warrior culture, Edo townsman culture, plus films on the Nô, Bunraku puppet, and Kabuki theaters. Recommended: 321.

JAPAN 323 Japan in Literature and Film: III (5) Sp Treat Literary history of Japan in the modern period, with readings in the major novelists on the clash of cultures, the generational struggle, war, and the search for inner peace, plus films that portray these themes and reflect the variety of modern Japanese life. Recommended: 321, 322.

Courses for Graduates Only

Altalic

ALTAI 579 Comparative Altalic Linguistics (3) Norman Comparative phonology and morphology of Mongolian, Turkic, and other Altalic languages. Joint with LING 579. Prerequisite: permission of instructor.

Asian Languages and Literature

ASIAN 503 Seminar in Asian Linguistics (1-5, max. 15) AWSp Topics vary. Prerequisite: permission of instructor.

ASIAN 585 Seminar in Buddhism (3, max. 27) AWSp Cox Systems of Buddhist thought with special reference to their technical terminology. Original sources are used. Combines the methods of specialists in south, central, and east Asian Buddhism with those of historians of religion and philosophy. Prerequisite: permission of instructor.

ASIAN 600 Independent Study or Research (*) AWSpS

ASIAN 700 Master's Thesis (*) AWSpS

ASIAN 800 Doctoral Dissertation (*) AWSpS

Chinese

CHIN 540 Seminar on Chinese Linguistics (3, max. 9) WSp Norman Problems of Old and Middle Chinese phonology; dialectology. Prerequisites: 443 and ASIAN 401.

CHIN 541 Seminar in Chinese Grammar (3, max. 9) A Boltz, Norman, Yue-Hashimoto Problems of theory and analysis of Chinese grammar, both synchronic and diachronic, modern and classical. Prerequisites: ASIAN 401 and permission of instructor.

CHIN 542 Chinese Historical Phonology (3) W Norman Introduction to Chinese historical phonology; emphasis on the Middle Chinese period. Prerequisites: ASIAN 401 and permission of instructor.

CHIN 543 Texts in Ancient Script (3) Sp Boltz Current research in the origin and development of the Chinese writing system and the structure of Chinese characters. Readings in texts written in ancient scripts, with special attention to grammatical and phonological problems related to graph identification and analysis. Topics vary among *Shuo wen* studies, bronze inscriptions, and "oracle" bone inscriptions. Prerequisites: five quarters of classical Chinese and ASIAN 401. (Offered alternate years.)

CHIN 551, 552 Second-Year Classical Chinese (5,5) A,W Boltz Continuation of 451, 452, 453. Problems of textual criticism and grammar. 551: focus on early belletristic texts. 552: focus on early historical texts. Prerequisite: 453 or equivalent for 551; 551 for 552.

CHIN 553 Introduction to Chinese Philology (5) Sp Boltz Philological principles and methods in the study of Han and pre-Han texts. Specific texts vary. Prerequisites: five quarters of classical Chinese and ASIAN 401. (Offered alternate years.)

CHIN 554, 555, 556 Readings in Chinese Prose (5,5,5) A,W,Sp Knechtges 554: selected readings in the *fu* of the Han, Wei, Jin, and North-South Dynasties period. 555: selected readings in parallel prose (*planti wen*). 556: selected readings in *guwen* prose of the Tang and Song periods. Recommended: 551, 552. (Offered alternate years.)

CHIN 560 Proseminar in Chinese (3-5) AWSp Knechtges Methods and materials in the study of Chinese texts. Problems in textual analysis and Chinese literary history. Prerequisites: 553 and one of 554, 555, and 556.

CHIN 561, 562, 563 Studies in Chinese Literature (5,5,5) A,W,Sp Wang 561: literature before Ch'in; 562: poetry of the T'ang and Sung periods; 563: literary theory and criticism. Prerequisite: permission of instructor.

CHIN 564, 565, 566 History of Chinese Literature (5,5,5) A,W,S Knechtges Methods and materials in Chinese literary history: 564: earliest times to Tang; 565: Tang through Song; 566: Yuan to twentieth century. Recommended: 551, 552 for 564; 564 for 565, 565 for 566.

CHIN 567 History of Chinese Literature (5) Sp Brandauer Historical coverage of traditional vernacular literature (excluding drama) and modern literature, with emphasis on transformation texts and chatefable literature, short stories, Ming and Qing novels, and twentieth-century fiction and prose. Prerequisite: 564.

CHIN 573 Seminar in Chinese Poetry (5, max. 15) A Wang Directed study of selected works of poetry. Subject emphasis varies each year. Prerequisite: permission of instructor. (Offered alternate years.)

CHIN 575 Studies in Chinese Drama (5, max. 15) A Wang Readings and discussion of Chinese drama. Subject emphasis varies. Prerequisite: permission of instructor. (Offered alternate years.)

CHIN 580 Readings in Vernacular Chinese Fiction (5, max. 15) A Brandauer Readings and discussion of traditional vernacular texts. Emphasis on Sung, Yuan, and Ming short stories and on Ming and Ch'ing full-length novels. Prerequisite: permission of instructor.

CHIN 582 Seminar in Chinese Fiction (5, max. 15) W Brandauer Directed study of selected works of fiction, focusing on the vernacular short story and novel. Prerequisite: permission of instructor.

CHIN 583 Seminar in Modern Chinese Literature (5) Sp Brandauer Directed study of selected works of modern Chinese literature. Primary focus on the novel, short story, and essay. Recommended: 281, 482.

CHIN 591, 592, 593 Studies in the History of Chinese Thought (5,5,5) A,W,Sp Chan, Knechtges Directed readings in selected traditional philosophical texts. 591: Han through Tang; 592: Song and Yuan; 593: Ming and Qing. Prerequisite: permission of instructor.

Hindi

HINDI 501, 502, 503 Studies in Medieval Hindi Literature (3, max. 9; 3, max. 9; 3, max. 9) A,W,Sp Entwistle, Shapiro Representative readings in medieval Hindi literature. Works by various authors emphasized in different years. Prerequisite: 403 or equivalent.

HINDI 510 Structure of Hindi (3) Shapiro Grammatical analysis of Hindi, phonology, syntax, and semantics. Readings from both Western and native grammarians. Prerequisite: 403 or permission of instructor. Recommended: course in linguistics.

Indian

INDN 530 Readings in Pali Literature (3, max. 18) A,W,Sp Cox Reading and interpretation of intermediate and advanced texts in Pali. Prerequisite: 402 or equivalent.

Japanese

JAPAN 531, 532, 533 Advanced Readings in Modern Japanese Literature (5,5,5) A,W,Sp Treat Rapid reading of modern literary texts; discussion of style, content, and problems of literary translation. Prerequisite: 433 or equivalent.

JAPAN 540 Seminar on Japanese Linguistics (3, max. 9) Miller Problems in the history and structure of the Japanese language. Topics vary each quarter, according to the needs and interests of the students. Prerequisites: 405-406 and permission of instructor.

JAPAN 571, 572, 573 Advanced Readings in Classical Japanese Literature (5,5,5) A,W,Sp Continued readings in classical literary texts. Prerequisite: 473 or permission of instructor.

JAPAN 590 Seminar in Japanese Literature (5, max. 15) A,W,Sp Close examination of selected periods, writers, or genres, including problems of literary criticism in Japanese literature. Prerequisite: permission of instructor.

Korean

KOR 501, 502, 503 Seminar in Korean Linguistics (3-5,3-5,3-5) A,W,Sp Lukoff Topics in Korean linguistics. For majors in Korean language and literature or linguistics. Prerequisites: background in linguistics and permission of instructor.

Sanskrit

SNKRT 550 Seminar on Sanskrit Literature (3, max. 9) Salomon Detailed study of selected authors, periods, or traditions, within the context of Indian literary history. Prerequisite: 403 or permission of instructor.

SNKRT 555 Seminar on Sanskrit Grammar (3, max. 6) Salomon Reading and critical study of traditional literature on grammar and language, including texts of Pāṇinian and other schools.

SNKRT 560 Readings in Philosophical Sanskrit (3, max. 9) A,W,Sp Cox, Potter, Salomon Intensive reading and analysis of Hindu or Buddhist philosophical texts. Prerequisite: 494 or permission of instructor.

SNKRT 570 Seminar in Indian Epigraphy and Paleography (3, max. 6) Salomon Introduction to the study of inscriptions and other original documents in Sanskrit and Prakrit languages and in Kharosthī, Brāhmī, and derived scripts. History of writing in India and development of Indic scripts. Methods of critical evaluation of inscriptions as sources of political and cultural history. Prerequisite: 403.

SNKRT 581, 582 Readings in Buddhist Texts (3, max. 9; 3, max. 9) W,Sp Cox Interpretation of original sources. Texts vary from year to year. Prerequisites: ability to study sources in the original languages and an introduction to Buddhist thought.

Tamil

TAMIL 501, 502, 503 Studies in Tamil Literature (3,3,3) A,W,Sp Schiffman Introduction to Tamil literature, beginning with Sangam poetry and culminating in modern post-independence fiction. Prerequisites: 403 or permission of instructor.

Tibetan

TIB 511, 512, 513 Advanced Literary Tibetan (3, max. 9; 3, max. 9; 3, max. 9) A,W,Sp Reading of manuscripts and xylographs with emphasis on biographical, historical, and geographical material. Prerequisite: 413 or equivalent.

TIB 531, 532, 533 Buddhist Tibetan (3, max. 9; 3, max. 9; 3, max. 9) A,W,Sp Reading and analysis of Tibetan Buddhist texts and associated literature. Selections vary each quarter and may be taken out of sequence. Prerequisite: 413 or permission of instructor.

Turkic

TKIC 542, 543 Comparative and Historical Grammar of Turkic Languages (3,3) W,Sp Cirtautas Classification of the Turkic languages; alphabets used; phonology, morphology, and syntax; lexical composition; structure changing developments. Prerequisites: 303 and 404, or TKISH 313.

TKIC 546 Old Turkic (3) W Cirtautas Introduction to Runic script; phonology, morphology, and syntax of the oldest form of Turkic; reading and translation of eighth-century inscriptions of historical and literary importance. Prerequisite: permission of instructor.

TKIC 547 Old Uighur (3) Sp Cirtautas Introduction to script systems; phonology, morphology, and syntax. Reading and translation of mainly Buddhist texts in Uighur script, eighth through eleventh centuries. Prerequisite: background in a Turkic language or permission of instructor.

TKIC 561, 562 Middle Turkic (3,3) A,W Cirtautas Introduction to the phonology, morphology, and syntax of the Middle Turkic languages; reading and translation of texts in Karakhanid, Khorazmian Turkic, Kipchak, and Chagatai. Prerequisite: permission of instructor.

TKIC 563 Seminar on Turkic Literature (5) Sp Cirtautas Topics in oral and written literature. Prerequisite: permission of instructor.

Astronomy**260 Physics**

Modern research in astronomy and astrophysics encompasses a large number of disciplines and specialties, and the faculty members of the Department of Astronomy are active in most of these areas. Research areas of the department include planetary astronomy, stellar structure and evolution, interstellar matter, x-ray sources, galactic structure, extragalactic astronomy, galactic dynamics, quasars and galactic nuclei, and theoretical and observational cosmology. The department is part of a consortium of universities now completing the construction of a 3.5-meter optical/infrared telescope located on Sacramento Peak, New Mexico. Students also have access to a variety of national facilities, such as the Kitt Peak and Cerro Tololo observatories and the Very Large Array. A variety of research is conducted with such satellite instruments as the International Ultraviolet Explorer, and instrument development for the Hubble Space Telescope is also under way. The department operates a well-instrumented thirty-inch telescope at the Manastash Ridge Observatory, near Ellensburg. Data analysis and theoretical research are conducted on a local cluster of eight DEC/VAX computers, including a sophisticated digital image processing system, shared by the astronomy and physics departments. The University also is a member of a consortium operating a Cray computer, thereby

having dedicated access to supercomputer facilities. Undergraduate majors often assist faculty members in acquisition, reduction, and interpretation of data.

Undergraduate Program

Paula Szkody, Adviser
219 Johnson

Bachelor of Science Degree

Major Requirements: ASTR 321, 322, 323, 421, 422, 423, or nine units of other astronomy 400- or 500-level courses; PHYS 121, 122, 123; 131, 132, 133; 224, 225, 227, 228; 321, 322, 334, 335; MATH 124, 125, 126, 238; 327, 328; 9 additional credits in courses at the 300 level or above in physics or related fields, approved by adviser (PHYS 323, 324, 325; 421, 424, 425, 426 recommended for students planning to do graduate work in astronomy); junior year (survey) and senior year (research) papers recommended as ASTR 499 projects, with emphasis on the senior paper for students planning graduate work. For those not planning on graduate study, a program directed toward applied science also is available. No grade lower than 2.0 is acceptable in courses fulfilling the above requirements. Undergraduates interested in advanced work in astronomy may wish to take a double major in astronomy and a related field, such as physics. Undergraduates interested in immediate employment at an observatory or other scientific institution should include computing and electronics courses as part of their program.

Graduate Program

Karl-Heinz Bohm, Graduate Program Coordinator

Master of Science, Doctor of Philosophy Degrees

A series of graduate courses in solar system, stellar, galactic, and extragalactic astrophysics is offered. Because astronomy study depends on the fundamentals of physics, a minimum of 24 credits in physics is required for a doctorate. The student is allowed much flexibility in the planning of a program of study.

The heart of the graduate program is the collaboration of student and faculty members in research at the frontiers of current knowledge in astronomy. At first, the student usually works under the close supervision of a faculty member to develop the techniques and insight necessary for successful research. The student's thesis research may use observational material obtained by using the facilities of either the University of Washington or one of the national observatories, or the thesis preparation may involve analysis and interpretation of existing material. Alternatively, the student may do a purely theoretical thesis. Active research programs are being carried out in the area of stellar interiors, stellar atmospheres, planetary atmospheres and surfaces, theory of convection, x-ray sources, interplanetary dust, extragalactic astronomy, radio astronomy, interstellar matter, cosmology, and relativistic astrophysics.

Admission Qualifications

Entering students are not required to have a background in astronomy, although some knowledge of general astronomy is expected of those to whom a teaching assistantship is to be offered. Undergraduates interested in graduate work in astronomy are urged to concentrate primarily on their preparation in physics and mathematics. One foreign language, usually German, French, or Russian, is required for an advanced degree in astronomy.

Assistantships

A number of teaching assistantships, primarily in the elementary astronomy courses, and research assistantships are available.

Correspondence and Information

Graduate Program Coordinator
260 Physics, FM-20

Faculty**Chairperson**

Paul W. Hodge

Professors

Adams, John B.,* 1975, ‡(Geological Sciences), M.S., 1958, Ph.D., 1961, Washington; planetology, remote sensing.

Balick, Bruce,* 1975, Ph.D., 1971, Cornell; radio astronomy, ionized nebulae, peculiar galaxies.

Bardeen, James M.,* 1976, ‡(Physics), Ph.D., 1965, California Institute of Technology; general relativity, theoretical astrophysics.

Bohm, Karl-Helinz,* 1967, M.S., 1951, Ph.D., 1954, Kiel (Germany); stellar atmospheres, star formation.

Bohm-Vitense, Erika K.,* 1967, M.S., 1948, Ph.D., 1951, Kiel (Germany); stellar atmospheres, magnetic stars.

Boynton, Paul E.,* 1970, (Physics), ‡ Ph.D., 1967, Princeton; high-energy astrophysics, infrared astronomy, x-ray sources.

Brownlee, Donald E.,* 1971, Ph.D., 1971, Washington; origin of the solar system, comets, interplanetary dust.

Hodge, Paul W.,* 1965, Ph.D., 1960, Harvard; extragalactic astronomy, interplanetary dust.

Jacobsen, Theodor S., 1928, (Emeritus), Ph.D., 1926, California (Berkeley); astronomy.

Leovy, Conway B.,* 1968, ‡(Atmospheric Sciences, Environmental Studies, Geophysics), Ph.D., 1963, Massachusetts Institute of Technology; planetary atmospheres.

Margon, Bruce H.,* 1980, (Physics), M.A., 1971, Ph.D., 1973, California (Berkeley); galactic and extragalactic x-ray astronomy, optical counterparts of x-ray sources.

Peters, Philip C.,* 1964, ‡(Physics), Ph.D., 1964, California Institute of Technology; general relativity, theoretical astrophysics.

Sullivan, Woodruff T.,* 1973, Ph.D., 1976, Maryland; radio astronomy, galactic and extragalactic structure, history of astronomy.

Wallerstein, George,* 1965, M.S., 1954, Ph.D., 1958, California Institute of Technology; chemical composition of stars, peculiar stars, interstellar matter.

Associate Professor

Szkody, Paula,* 1975, (Research), M.S., 1972, Ph.D., 1975, Washington; cataclysmic variables, photometry, spectroscopy.

Assistant Professors

Lake, George R.,* 1985, M.A., 1977, Ph.D., 1979, Princeton; clustering in the Universe, numerical astrophysics.

Ward, Martin J.,* 1986, (Research), M.Sc., 1974, D.Phil., 1979, Sussex (England); active galactic nuclei.

Course Descriptions**Courses for Undergraduates**

ASTR 101 Astronomy (5) Introduction to the universe, with emphasis on conceptual, contrasted with mathematical, comprehension. Modern theories, observations; ideas concerning nature, evolution of galaxies; quasars, stars, black holes, planets, solar system. Not open for credit to students who have taken 102 or 201; not open to upper-division students majoring in physical sciences or engineering.

ASTR 102 Introduction to Astronomy (5) For students who have had high school physics or the equivalent introduction to physics at the college level. No credit for students who have taken 101, 201, or 301. Prerequisites: one year of high school physics or PHYS 101-102 or PHYS 110, 111, 112.

ASTR 150 The Planets (5) For liberal arts and beginning science students. Survey of the planets of the solar system, with emphases on recent space exploration of the planets and on the relationship of man and his earth to the other planets.

ASTR 190 Modern Topics in Astronomy for Non-Science Majors (3) Topics of current interest, such as origin of chemical elements, novae and supernovae, white dwarfs, neutron stars, black holes, active galaxies, quasars, or interstellar medium and astrochemistry. Choice of topics depends on instructor and class interest. Prerequisite: 5 credits of astronomy courses at the 100 or 200 level or permission of instructor.

ASTR 201 The Universe and the Origin of Life (5) Sequel to 101 or 102, emphasizing modern views of the atomic and molecular evolution of the universe from the initial "big bang" through the formation of the solar system and the emergence of biologic forms on the earth. The latter part of the course considers questions about the existence of, and communication with, extraterrestrial intelligent life, and finally the ultimate fate of the cosmos. Prerequisite: 101 or 102, or PHYS 110 or 114 or 121.

ASTR 210 Distance and Time: Size and Age in the Universe (5) A Space and time as basic concepts in physical science. How we define and measure them, how the concepts have developed over the centuries, and how modern measurements allow us to determine the size and age of the universe.

ASTR 211 The Universe and Change (5) W Gravity as central to the form and evolution of the universe. Conceptual formulation of gravity from the Renaissance to Einstein. Its consequences from the falling of an apple to the slowing of the expansion of the universe. Prerequisite: 210.

ASTR 212 Life in the Universe (5) Sp Nature and origin of cosmic large numbers. Steps to the formation of life, formation of planets (stars, galaxies, a long-lived universe), the anthropic principle. Searches for other planetary systems and extraterrestrial life. Prerequisite: 101 or 211.

ASTR 301 Astronomy for Scientists and Engineers (3) Introduction to astronomy for students in the physical sciences or engineering. Topics similar to 101, but the approach uses more mathematics and physics. Prerequisite: PHYS 123.

ASTR 321 The Solar System (3) A Solar system; planetary atmospheres, surfaces and interiors, the moon, comets. The solar wind and interplanetary medium. Formation of the solar system. Prerequisites: PHYS 224, 225, 227, 228, or equivalent.

ASTR 322 The Contents of Our Galaxy (3) W Introduction to astronomy. Basic properties of stars, stellar systems, interstellar dust and gas, and the structure of our galaxy. Prerequisites: PHYS 224, 225, 227, 228, or equivalent.

ASTR 323 Extragalactic Astronomy and Cosmology (3) Sp Galaxies, optical and radio morphology and properties. Clusters of galaxies, radio sources, and quasars. Observational cosmology. Prerequisites: 101 or 102 or 322, and PHYS 224, 225, 227, 228, or equivalent.

ASTR 421 Stellar Observations and Theory (3) Observations and theory of the atmospheres, chemical composition, internal structure, energy sources, and evolutionary history of stars. Prerequisites: 101 or 102 or 322, and PHYS 224, 225, 227, 228.

ASTR 422 Interstellar Material (3) W Description and physics of the matter between the stars. Physical conditions, distribution, evolution, and motions of interstellar atoms, molecules, and dust grains. Exchange of energy and matter between stars and interstellar material. Prerequisites: 101 or 102 or 322, and PHYS 224, 225, 227, 228.

ASTR 423 High-Energy Astrophysics (3) Sp High-energy phenomena in the universe. Includes supernova, pulsars, neutron stars, X-ray and gamma-ray sources, black holes, cosmic rays, quasi stellar objects, active galactic nuclei, diffuse background radiations. Radiative emission, absorption processes, and models derived from observational data. Prerequisites: PHYS 224, 225, 227, 228, or equivalent, or permission of instructor.

ASTR 497 Topics in Current Astronomy (1-3) Recent developments in one field of astronomy or astrophysics. Prerequisite varies according to the subject matter.

ASTR 499 Undergraduate Research (*, max. 15) AWSp Special astronomical problems and observational projects, by arrangement with instructor. Prerequisite: permission of instructor.

Courses for Graduates Only

ASTR 500 Seminar in Elementary Astronomy Instruction (1, max. 5) Seminar in the preparation of lecture and workshop materials with emphasis on demonstration and visual aids, and on evaluation of students' progress.

ASTR 507 Physical Foundations of Astrophysics I (3) Thermodynamics from an astronomer's point of view: black body radiation, basic radiative transfer, equation of state, degenerate gases, crystallization at high density, introduction to hydrodynamics and gas dynamics for astronomers: turbulence, convection, shock waves, radiation gas dynamics.

ASTR 508 Physical Foundations of Astrophysics II (3) Introduction to magnetohydrodynamics, basic theorems and application to stellar and interstellar magnetic fields. Introduction to plasma physics, waves in a plasma, kinetic theory and transport phenomena in astrophysics. Prerequisite: PHYS 513 or equivalent.

ASTR 511 Galactic Structure (3) Kinematics, dynamics, and contents of the galaxy. Spiral structure. Structure of other galaxies. Evolution of galaxies.

ASTR 512 Extragalactic Astronomy (3) Types of galaxies. Integrated properties, content, and dynamics. Extragalactic distance scale, groups and clusters. Radio sources. Observational cosmology.

ASTR 513 Cosmology (3) Homogeneous isotropic models. Microwave and X-ray background radiation, radio galaxies, quasars. Nucleosynthesis, galaxy formation.

ASTR 521, 522 Stellar Atmospheres (3,3) Theory of continuous radiation and spectral line formation. Applications to the sun and stars. Prerequisite: PHYS 421 or equivalent.

ASTR 523 Solar Physics (3) Sun as a star, solar photosphere and outer convection zone, granulation and related phenomena, solar chromosphere, and corona, solar activity (especially sunspots and solar flares), sun's radio emission, solar-terrestrial relations. Prerequisite: 521.

ASTR 531 Stellar Interiors (4) Physical laws governing the temperature, pressure, and mass distribution in stars. Equation of state, opacity, nuclear energy generation. Models of main sequence stars. Prerequisite: PHYS 421 or equivalent.

ASTR 532 Stellar Evolution (3) Theoretical and observational approaches to stellar evolution. Structure of red giants and white dwarfs. Prerequisite: 531.

ASTR 541 Interstellar Matter (3) Physical conditions and motions of neutral and ionized gas in interstellar space. Interstellar dust, magnetic fields, formation of grains, clouds, and stars. Prerequisite: modern physics or permission of instructor.

ASTR 555 Planetary Atmospheres (3) A Problems of origin, evolution, and structure of planetary atmospheres, emphasizing elements common to all; roles of radiation, chemistry, and dynamical processes; new results on the atmospheres of Venus, Mars, Jupiter, and other solar system objects in the context of comparative planetology. Joint with ATM S 555 and GPHYS 555.

ASTR 556 Planetary Surfaces (3) Comparison of surface processes and conditions on Mercury, Venus, Earth, moon, Mars, asteroids, and satellites of the great planets. Emphasis on understanding how and why planetary surfaces differ from one another and the implied course of solar-system evolution. Analysis of data from Earth-based telescopes and manned and unmanned space missions. Joint with GEOL 556 and GPHYS 556.

ASTR 557 Origin of the Solar System (3) Nebular and nonnebular theories of the solar system origin; collapse from the interstellar medium, grain growth in the solar nebula, formation of planetesimals and planets, early evolution of the planets and other possible planetary systems; physical and chemical evidence upon which the ideas concerning the origin of the solar system are based. Joint with GEOL 557 and GPHYS 557.

ASTR 561 High Energy Astrophysics (3) Observed properties of supernovae, X-ray stars, radio sources, quasars. Theories explaining such objects. Origin of cosmic rays.

ASTR 575 Seminar in Astronomy (1-2, max. 20) Discussion of recent research in astronomy and astrophysics. Prerequisite: permission of department.

ASTR 576 Astronomy Colloquium (1, max. 20) Current research topics in astronomy and astrophysics. Prerequisite: permission of department.

ASTR 581 Techniques in Optical Astronomy (5) S Theory and practice of obtaining optical data. Astronomical photoelectric photometers, spectrum scanners, spectrographs, interferometers, image tube, and TV systems. Data-reduction techniques with emphasis on statistical analysis using digital computers. Observations with MRO thirty-inch telescope.

ASTR 582 Techniques in Radio Astronomy (3) Theory and practice in use of radio telescopes and receivers. History, basic definitions, and place of radio astronomy; basics of Fourier transforms; general antenna theory; theory and practice of parabolic reflectors, other filled apertures, interferometers, aperture synthesis arrays, and very long baseline interferometry; microwave receiver systems.

ASTR 597 Topics in Observational Astrophysics (1-5, max. 20)

ASTR 598 Topics in Theoretical Astrophysics (1-5, max. 20)

ASTR 600 Independent Study or Research (*)

ASTR 700 Master's Thesis (*) AWSP

ASTR 800 Doctoral Dissertation (*) AWSP

pects of the field. Courses offered include dynamical meteorology, cloud physics, radiative transfer, turbulence, atmospheric chemistry, and weather analysis and prediction. The Bachelor of Science degree qualifies students for professional employment in weather forecasting, air-quality control and monitoring, and other areas of atmospheric sciences and related fields. The baccalaureate degree also is appropriate preparation for graduate study in atmospheric sciences. Students majoring in physical science, mathematics, or engineering who plan to pursue graduate study in atmospheric sciences may take a subset of the undergraduate courses (listed below) to aid in their preparation. Special arrangements are made for students opting for an honors curriculum. A degree in mathematical sciences with an atmospheric sciences option is offered by the Department of Mathematics.

Undergraduate Program

Robert A. Houze, Jr., Adviser
602 Atmospheric Sciences-Geophysics

Bachelor of Science Degree

Major Requirements: ATM S 301, 321, 340, 350, 362, 431, 441, 450 and 458, plus 3 additional credits in atmospheric sciences courses numbered above 400 (excluding 406); ENGR 141; MATH 124, 125, 126, 327; PHYS 117, 118, 121, 122, 123 or equivalents (131 and 132 recommended in place of 117 and 118); CHEM 140; and one course from the following: MATH 328, A A 370, PHYS 224, 225; a grade of 2.0 or better in each of the required courses in atmospheric sciences, mathematics, physics, and chemistry; an overall grade-point average of at least 2.50 in all atmospheric sciences courses used for graduation. Students are encouraged to take a course in oceanography (e.g., OCEAN 203).

Pregraduate Program for Physical Science, Mathematics, and Engineering Majors

The following elective course sequence is suitable preparation for students interested in pursuing graduate study in atmospheric sciences: ATM S 301, 340, 441.

Graduate Program

Dennis L. Hartmann, Graduate Program Coordinator

Master of Science, Doctor of Philosophy Degrees

Admission to the graduate program requires a baccalaureate degree in a physical science, engineering, or mathematics, or its equivalent, as well as the Graduate Record Examination. The program of graduate study varies with each individual.

During the first year of graduate study, most students concentrate on developing a strong background in the fundamentals that underlie the atmospheric sciences and on getting a broad understanding of the wide range of problems encountered in the atmosphere. A qualifying examination is given toward the end of the first year of graduate study as soon as possible after the student has completed 24 credits, including 12 credits in courses numbered 500 and above. All students desiring to proceed toward the Ph.D. degree must take this examination, and students desiring the Master of Science degree may elect to take it. This examination tests understanding of the fundamental aspects of the atmospheric sciences and of the relevant mathematics and physics. Physical reasoning, rather than factual information, is stressed. Those who pass the examination with distinction are encouraged to work toward the Ph.D. degree; those who pass at a lower level may continue toward the Master of Science degree. Alternatively, students whose objective is the Master of Science degree may elect to submit a written thesis proposal in lieu of the qualifying examination.

Research assistantships and a few teaching assistantships are available to full-time students. Applications are made through the department office.

Correspondence and Information

Graduate Program Coordinator
606 Atmospheric Sciences/Geophysics, AK-40

Faculty

Professors

Badgley, Franklin I.,* 1950, (Emeritus), M.S., 1948, Ph.D., 1951, New York; turbulence.

Booker, John R.,* 1971, ‡(Geophysics), M.S., 1965, Ph.D., 1968, California (San Diego); geophysical fluid dynamics.

Businger, Joost A.,* 1958, (Emeritus), (Geophysics), † M.S., 1950, Ph.D., 1954, Utrecht; energy transfer.

Charlson, Robert J.,* 1965, (Chemistry), (Environmental Studies, Geophysics), † M.S., 1959, Stanford; Ph.D., 1964, Washington; atmospheric chemistry.

Fleagle, Robert G.,* 1948, (Emeritus), (Marine Studies), M.S., 1944, Ph.D., 1949, New York; air-sea interaction.

Fritschen, Leo J.,* 1966, ‡(Architecture, Forest Resources), M.S., 1958, Kansas State; Ph.D., 1960, Iowa State; agricultural climatology, micrometeorology, instrumentation.

Hobbs, Peter V.,* 1963, (Geophysics), Ph.D., 1963, Imperial College (England); cloud/precipitation physics, atmospheric chemistry, air pollution.

Holton, James R.,* 1965, Ph.D., 1964, Massachusetts Institute of Technology; stratospheric dynamics, dynamic meteorology.

Houze, Robert A., Jr.,* 1972, M.S., 1969, Ph.D., 1972, Massachusetts Institute of Technology; mesoscale meteorology.

LaChapelle, Edward R.,* 1969, (Emeritus), (Geophysics), † B.S., 1949, Puget Sound; snow-cover geophysics.

Leovy, Conway B.,* 1968, (Astronomy), (Environmental Studies, Geophysics), † Ph.D., 1963, Massachusetts Institute of Technology; planetary atmospheres.

Parks, George K.,* 1971, ‡(Geophysics, Physics), Ph.D., 1966, California (Berkeley); magnetospheric geophysics.

Radke, Lawrence F.,* 1968, (Research), M.S., 1967, Ph.D., 1968, Washington; cloud and aerosol physics, airborne instrumentation.

Reed, Richard J.,* 1954, Sc.D., 1949, Massachusetts Institute of Technology; synoptic meteorology, numerical prediction.

Rhines, Peter B.,* 1984, (Oceanography), † Sc.M., 1964, Massachusetts Institute of Technology; Ph.D., 1967, Cambridge (England); dynamical oceanography, ocean/atmosphere interaction.

Sarachik, Edward S.,* 1984, (Research), (Oceanography), † M.S., 1963, Ph.D., 1965, Brandeis; ocean/atmospheric interaction, equatorial oceanography.

Untersteiner, Norbert,* 1962, (Geophysics), † Ph.D., 1950, Innsbruck; Dozent, 1961, Vienna; arctic heat budget, glaciology.

Wallace, John M.,* 1966, (Environmental Studies), Ph.D., 1966, Massachusetts Institute of Technology; large-scale motions.

Welander, Pierre L. R.,* 1973, ‡(Oceanography), M.S., 1950, Ph.D., 1954, Stockholm (Sweden); theory of general ocean circulation, large-scale ocean-atmosphere interaction, equatorial oceanography.

Zoller, William H.,* 1984, ‡(Chemistry), Ph.D., 1969, Massachusetts Institute of Technology; analytical, environmental, and nuclear chemistry.

Atmospheric Sciences

408 Atmospheric Sciences-Geophysics

At the undergraduate level, the department provides a curriculum that covers both theoretical and applied as-

Associate Professors

Baker, Marcia B.,* 1971, (Geophysics),† M.S., 1960, Stanford; Ph.D., 1971, Washington; cloud physics.

Brown, Robert A.,* 1971, (Research), M.S., 1962, California (Berkeley); Ph.D., 1969, Washington; planetary boundary layers, air-sea interaction, turbulence.

Harrison, D. Edmunds,* 1985, (Affiliate), (Oceanography),† M.S., 1977, Ph.D., 1977, Harvard; equatorial models and ocean circulation.

Harrison, Halstead,* 1971, (Civil Engineering, Environmental Studies, Geophysics), Ph.D., 1960, Stanford; atmospheric chemistry.

Hartmann, Dennis L.,* 1977, M.A., 1973, Ph.D., 1975, Princeton; climate theory.

Hegg, Dean A.,* 1979, (Research), M.S., 1976, Ph.D., 1979, Washington; cloud chemistry, atmospheric chemistry.

Katsaros, Kristina B.,* 1969, Ph.D., 1969, Washington; air-sea interaction, radiation, remote sensing.

Mass, Clifford F.,* 1981, Ph.D., 1978, Washington; synoptic and mesoscale meteorology.

Overland, James E.,* 1983, (Affiliate), M.S., 1971, Washington; Ph.D., 1973, New York; synoptic meteorology, air-sea interaction.

Warren, Stephen G.,* 1982, (Geophysics),† A.M., 1969, Ph.D., 1973, Harvard; radiation and climate, glaciology.

Assistant Professors

Bretherton, Christopher S.,* 1984, ‡(Applied Mathematics), Ph.D., 1984; Massachusetts Institute of Technology; mesoscale meteorology.

Durrant, Dale R.,* 1987, M.A., 1975, California (Berkeley); Ph.D., 1981, Massachusetts Institute of Technology; atmospheric dynamics, mesoscale modeling.

Ferek, Ronald J.,* 1985, (Research), M.S., 1978, Ph.D., 1982, Florida State; atmospheric chemistry.

Senior Research Associates

Grenfell, Thomas C.,* 1972, M.S., 1968, Chicago; Ph.D., 1972, Washington; radiative transfer, remote sensing, sea ice optics.

Maykut, Gary,* 1969, (Geophysics),† Ph.D., 1969, Washington; polar air-sea-ice interaction.

Course Descriptions**Courses for Undergraduates**

ATM S 101 Weather (5) AWSpS The earth's atmosphere, with emphasis on weather observations and forecasting. Daily weather map discussions. Highs, lows, fronts, clouds, storms, jet streams, air pollution, and other features of the atmosphere. Physical processes involved in weather phenomena. Intended for nonmajors.

ATM S 102 Climate of the Earth and Other Planets (5) W A global view of the earth's atmosphere. Factors controlling the earth's climate, its changes from year to year, and through the ages. Natural climatic variations and human effects on the atmosphere. Atmospheres of other planets. Prerequisite: 101.

ATM S 301 Introduction to Atmospheric Sciences (5) A Composition and structure of the atmosphere. Clouds and weather phenomena. Thermodynamic processes. Solar and terrestrial radiation. Air motions. Daily weather discussions and forecasts. For majors and nonmajors. Prerequisites: PHYS 121 and MATH 125, which may be taken concurrently.

ATM S 319 Microclimatology (3) A Interaction of biological and meteorological processes with applications to forestry, recreation, wildlife, landscape design, and architecture. Surface energy balances in terms of evaporation, radiation exchange, air and soil temperature, wind speed, and humidity in the lower layer of the atmosphere. Joint with FPE 319. Prerequisite: 101 or 301, or permission of instructor.

ATM S 321 Physical Climatology (3) Sp Evolution and present state of earth's climate. Emphasis on physical processes determining the climate of the earth's atmosphere and surface: radiative transfer, energy balance, hydrologic cycle, atmospheric and oceanic energy transport. Factors controlling climate change. Prerequisite: 301.

ATM S 340 Introduction to Atmospheric Physics (5) Sp Thermodynamics and hydrostatics. Cloud and precipitation processes with emphasis on the microphysics. Prerequisite: MATH 125 or permission of instructor.

ATM S 350 Atmospheric Structure and Analysis (3) W Atmospheric soundings. Thermodynamic diagrams. Diagnosis of circulation systems; general circulation, monsoons, extratropical cyclones and fronts, convective phenomena, tropical systems, mountain waves, and other small-scale phenomena. Scalar and streamline analysis. Applications of radar and satellite data. Prerequisite: 301.

ATM S 382 Instruments and Observations (3) A Principles of operation of instruments for measuring pressure, temperature, humidity, wind, solar and infrared radiation, precipitation amounts and particle size, ozone and other chemicals, condensation, and ice nuclei. Methods of using these instruments, manipulation of output data to put them in usable format, including analog-to-digital converters, microprocessors, satellites. Prerequisites: MATH 126, PHYS 123.

ATM S 390 Honors Tutorial in Atmospheric Sciences (*, max. 6) AWSpS Review and discussion of selected problems in atmospheric sciences. Introduction to research methods. Presentation of a research paper. Recommended: MATH 124, PHYS 123.

ATM S 408 Geophysics: The Atmosphere (3) Sp Phenomena of the lower atmosphere; simple applications of the principles of classical thermodynamics and fluid dynamics to the atmospheric hydrological cycle, global energy balance, and atmospheric dynamics. Joint with GPHYS 408. Prerequisite: GPHYS 404 or permission of instructor.

ATM S 431 Atmospheric Physics (5) A Energy transfer processes: solar and atmospheric radiation, turbulence and boundary-layer structure, applications. Prerequisite: 340 or PHYS 224.

ATM S 441 Atmospheric Motions (5) W The basic equations governing atmospheric motions, and their elementary applications; circulation and vorticity; dynamics of midlatitude disturbances. Includes laboratory exercises. Prerequisites: 301, MATH 327.

ATM S 450 Atmospheric Data Analysis (5) W Statistical and other methods employed in atmospheric data analysis. Frequency distributions, sampling theory, linear correlation, elementary time-series analysis, objective map analysis. Prerequisites: 350, ENGR 141, or equivalent.

ATM S 452 Forecasting Laboratory (5) Sp Daily practice in map analysis and forecasting, using current weather data. Severe-storm forecasting. Statistical methods. Prerequisites: 350, 441, and 450.

ATM S 458 Introduction to Air Chemistry (4) A The atmosphere as a chemical system; analytical and physical chemistry of trace atmospheric constituents, both natural and manufactured. Joint with CHEM 458. Prerequisites: CHEM 140; CHEM 350 or 456 or ATM S 340.

ATM S 462 Sea-Air Transfer Processes (*, max. 6) S Classroom work and field observations relating to the physical processes occurring at the ocean-atmosphere boundary. Transfer of energy, momentum, and moisture and their effects on small- and large-scale phenomena, including fog formation, convection, modification of air masses. Prerequisite: 441 or permission of instructor.

ATM S 466 Air Quality Modeling (3) W Evaluation of air quality models relating air pollution emissions to environmental concentrations. Meteorological dispersion models and various "receptor" models based on chemical "fingerprinting" of sources. Current problems. Joint with CEWA 466. Prerequisite: 458 or CEWA 461 or permission of instructor.

ATM S 492 Readings in Meteorology or Climatology (*) AWSp Prerequisite: permission of instructor.

ATM S 493 Special Problems in Meteorology or Climatology (*) AWSp Prerequisite: permission of instructor.

Courses for Graduates Only

ATM S 501 Fundamentals of Physical and Synoptic Meteorology (6) A Fundamentals of hydrostatics, thermodynamics, radiative transfer with application to planetary atmospheres. Global energy balance and general circulation. Atmospheric chemistry. Cloud physics. Elementary synoptic analysis. Description and qualitative physical interpretation of atmospheric composition, structure, and motions.

ATM S 509 Geophysical Fluid Dynamics I (3) W Large-scale dynamics of rotating stratified fluids, introductory fluid mechanics. Observed properties of oceanic, atmospheric circulation. Development of geostrophic flow, thermal-wind balance, velocity spirals. Potential vorticity, instability of large-scale flows, Ekman layers. Gravity, inertial, Rossby waves; ray theory, equatorial waveguide. Action, energy principles. Joint with OCEAN 509.

ATM S 510 Physics of Ice (3) W Structure of the water molecule. Crystallographic structures of ice. Electrical, optical, thermal, and mechanical properties of ice. Growth of ice from the vapor and liquid phases. Physical properties of snow. Joint with GPHYS 510. Prerequisite: permission of instructor. (Offered odd-numbered years.)

ATM S 511 Formation of Snow and Ice Masses (3) A Snow climatology. Transport of snow by wind. Transfer of radiative, sensible, and latent heat at the surface of snow and ice. Freezing of natural water bodies. Heat and mass budget of ice masses. Remote sensing of snow and ice. Theories of ice ages. Joint with GPHYS 511. Prerequisite: permission of instructor. (Offered even-numbered years.)

ATM S 512 Dynamics of Snow and Ice Masses (3) Sp Rheology of snow and ice. Sliding and processes at glacier beds. Thermal regime and motion of seasonal snow, glaciers, and ice sheets. Avalanches and glacier surges. Deformation and drift of sea ice. Response of natural ice masses to change in climate. Joint with GPHYS 512. Prerequisite: permission of instructor. (Offered odd-numbered years.)

ATM S 513 Structural Glaciology (3) W *Raymond* Physical and chemical processes of snow and stratigraphy and metamorphism. Interpretation of ice sheet stratigraphy in terms of paleoenvironment. Dynamic metamorphism from ice flow. Structures formed at freezing interfaces. Structure of river, lake, and sea ice. Relationship between structures and bulk physical properties. Joint with GPHYS 513. Prerequisite: permission of instructor. (Offered even-numbered years.)

ATM S 514 Ice and Climate Modeling (3) A Principles of global climate modeling. Modeling seasonal cycles of snow cover and sea ice. Ice-sheet mass balance and flow. Solar radiation anomalies due to changes in earth's orbit. Climate/ice-sheet models of Pleistocene ice ages. Joint with GPHYS 514. Prerequisite: permission of instructor. (Offered odd-numbered years.)

ATM S 521 Seminar in Atmospheric Dynamics (*) AWSp Directed at current research in the subject. For advanced students. Prerequisite: permission of instructor.

ATM S 523 Seminar in Cloud Physics (*) ASP
See 521 for course description.

ATM S 524 Seminar in Energy Transfer (*) AWSp
See 521 for course description.

ATM S 525 Seminar in Atmospheric Problems Associated With Air Pollution (2) W Seminar for both engineers and atmospheric scientists in the atmospheric problems related to air pollution. A wide variety of topics is covered. Faculty lectures and student participation. Joint with CEWA 525. Prerequisite: 301 or permission of instructor.

ATM S 532 Remote Sensing of the Atmosphere and Climate System (3) Sp Satellite systems for sensing the atmosphere and climate system. Recovery of atmospheric and surface information from satellite radiance measurements. Applications to research. Prerequisites: 533, 534.

ATM S 533 Atmospheric Radiation I (3) Sp Principles of radiative energy exchange in planetary atmospheres with emphasis on emission and absorption of infrared and microwave radiation. Applications to atmospheric and surface energy balance and remote sensing. Prerequisite: PHYS 225 or permission of instructor.

ATM S 534 Atmospheric Radiation II (3) W Principles of radiative transfer in planetary atmospheres with emphasis on single and multiple scattering of visible and infrared radiation. Applications to atmosphere and surface energy balance and remote sensing. Prerequisite: 533 or permission of instructor.

ATM S 535 Cloud Microphysics and Dynamics (5) W Basic concepts of cloud microphysics, water continuity in clouds, cloud dynamics, and cloud models. Prerequisite: 501 or permission of instructor.

ATM S 536 Mesoscale Storm Structure and Dynamics (3) Sp Techniques of observing storm structure and dynamics by radar and aircraft, observed structures of precipitating cloud systems, comparison of observed structures with cloud models. Prerequisite: 535.

ATM S 541 Dynamic Meteorology (3) W Equations of motion, energy equations, vorticity and potential vorticity. Linear wave theory; gravity waves and Rossby waves. Prerequisite: 546, AMATH 401, or equivalents.

ATM S 542 Dynamic Meteorology (3) Sp Quasi-geostrophic theory, baroclinic instability, planetary waves, wave-mean flow interaction, equatorial flows. Prerequisite: 541, AMATH 402, or equivalents.

ATM S 544 Numerical Modeling and Prediction (3) A Numerical methods for initial value and boundary value problems in atmospheric and fluid dynamics. Numerical weather prediction models. Objective analysis and initialization of forecast models. Prerequisite: 542 or permission of instructor.

ATM S 545 The General Circulation of Atmosphere (3) Sp Requirements of the global angular momentum, heat, mass, and energy budgets upon atmospheric motions as deduced from observations. A study of the physical processes through which these budgets are satisfied. Prerequisite: 541 or permission of instructor.

ATM S 546 Introduction to Atmospheric Fluid Dynamics (3) A Review of derivation of Navier-Stokes equations; turbulent and laminar flow; Reynolds averaging and statistical description of turbulent flow; characteristics of isotropic turbulence; velocity correlations and spectra; turbulent energy equation and scalar variance equation. The closure problem and some examples of how to do it; observational evidence.

ATM S 547, 548 Atmospheric Turbulence (3,3) W,Sp 547: turbulent flux of heat, momentum, and moisture in the layer of the atmosphere next to the

earth; Richardson's stability criterion; free convection. 548: diffusion of matter in the atmosphere; application of Fickian and statistical theories of diffusion; use of Lagrangian and Eulerian correlation functions. Prerequisite: 546 for 547.

ATM S 551 Atmospheric Structure and Analysis I: Synoptic Scale Systems (3) A Extratropical cyclones and cyclogenesis. Jet streams. Upper waves in the westerlies. Diagnosis of vertical motions. Fronts and frontogenesis. Prerequisite: 501.

ATM S 552 Objective Analysis (3) W Review of objective analysis techniques commonly applied to atmospheric problems; examples from the meteorological literature and class projects. Superposed epoch analysis, cross-spectrum analysis, filtering, eigenvector analysis, optimum interpolation techniques. Prerequisite: FORTRAN programming. (Offered even-numbered years.)

ATM S 553 Atmospheric Structure and Analysis II: Non-Convective Mesoscale Circulation (3) W Thermally forced circulation systems, including sea/land breezes and mountain/valley winds. Topographic deflection, channeling and blocking in mesoscale flows. Analysis and forecasting of local mesoscale phenomena. (Offered odd-numbered years.)

ATM S 555 Planetary Atmospheres (3) A Problems of origin, evolution, and structure of planetary atmospheres, emphasizing elements common to all planetary atmospheres; roles of radiation, chemistry, and dynamical processes; new results on the atmospheres of Venus, Mars, Jupiter, and other solar system objects in the context of comparative planetology. For students interested in atmospheric processes or those specifically interested in planets. Joint with ASTR 555 and GPHYS 555. (Offered even-numbered years.)

ATM S 556 Middle Atmosphere Meteorology (3) Sp Composition and structure. Radiative processes. Extratropical and equatorial circulations. Sudden stratospheric warmings. Transport of trace constituents. Dynamics and chemistry of ozone layer. Prerequisites: 533, 542, and 558 or permission of instructor. (Offered odd-numbered years.)

ATM S 558 Atmospheric Chemistry (3) W Photochemistry of urban, rural, and marine tropospheric air, and of the natural and perturbed ozone in the middle atmosphere. Unity of the chemistries in these apparently different regimes. Prerequisite: 458 or 501 or CHEM 457 or permission of instructor.

ATM S 564 Atmospheric Aerosol and Multiphase Atmospheric Chemistry (3) W Physics and chemistry of particles and droplets in the atmosphere. Statistics of size distributions, mechanics, optics, and physical chemistry of atmospheric aerosols. Brownian motion, sedimentation, impaction, condensation, and hygroscopic growth. Prerequisite: permission of instructor. (Offered even-numbered years.)

ATM S 565 Seminar in Atmospheric and Marine Science Policy (1-3) W Decision making and policy determination in major atmospheric and marine programs. Case studies of policy development relating to global observations, air and water quality, climate change. Individual study of selected topics, with emphasis on developing and evaluating alternate policies. Joint with IMS 565. Prerequisite: permission of instructor.

ATM S 571 Theoretical Climatology (3) A Physical processes determining the climate and its sensitivity to extrinsic climate controls. Radiative and dynamical feedback processes, climate modeling, past and future climate, orbital parameter theory. Response of the earth's climate to CO₂ increase, volcanic aerosols, and solar variations. Prerequisite: permission of instructor.

ATM S 591 Special Topics (1-4, max. 9) AWSp Lecture series on topics of major importance in the atmospheric sciences. Prerequisite: permission of instructor.

ATM S 600 Independent Study or Research (*)

ATM S 700 Master's Thesis (*)

ATM S 800 Doctoral Dissertation (*)

Biology

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Undergraduate Program

Advisers
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Undergraduate programs leading to a baccalaureate degree are offered by the departments of Botany, Microbiology and Immunology, and Zoology. An interdisciplinary program leading to a baccalaureate degree in biology is described below. Baccalaureate degree programs with a strong biological orientation are also offered by the Department of Psychology and the colleges of Forest Resources and Ocean and Fishery Sciences. In addition to the departments and colleges already noted, courses in the biological sciences are offered by departments in the College of Arts and Sciences (e.g., Anthropology and Genetics) and in the schools of the health sciences (Dentistry, Medicine, Nursing, Pharmacy, and Public Health and Community Medicine). The departments of Botany and Zoology jointly offer a major in biology for students in the College of Education (additional information appears in the College of Education section of this catalog). Interdisciplinary study of biology is supervised by the director of the Biology Program.

Bachelor of Science Degree

Major Requirements: The program leading to a Bachelor of Science degree is in cellular and molecular biology. It is designed for students who wish to obtain undergraduate training that emphasizes the chemical and cellular aspects of biology. The program is particularly well suited to students who wish to pursue graduate work in the areas of genetics, biochemistry, microbiology, cellular physiology and anatomy, developmental biology, or molecular biology. The following courses are required: MATH 124, 125, and either MATH 126, STAT 311, or Q SCI 381; CHEM 140 or 145, 150 or 155; 160 or 164; 231, 232; CHEM 350 or 456; one chemistry laboratory; BIOL 210, 211, 212; BIOC 440, 441, and either 442 or GENET 455; GENET 385 (or GENET 380 for students who have not taken BIOL 210 at this university); and 15 credits of advanced biology course work selected in consultation with the biology adviser. PHYS 114, 115, 116 or 121, 122, 123 strongly recommended.

Faculty

Professor

Cleland, Robert E.,* 1964, (Botany),† Ph.D., 1957, California Institute of Technology; plant physiology.

Associate Professors

Calvin, William H., 1967, ‡(Neurological Surgery), Ph.D., 1966, Washington; neurology and biophysics.

Piternick, Leonie K., 1972, (Emeritus), M.A., 1942, Ph.D., 1946, California (Berkeley); introductory biology.

Lecturers

Nicotri, M. Elizabeth, 1974, Ph.D., 1974, Washington; marine ecology and introductory biology teaching.

Russell, Millie L., 1974, (Community Health Care Systems), M.S., 1979, Washington; kinesiology.

Course Descriptions**Courses for Undergraduates**

The courses in biology listed below are administered by several departments. Other courses in biology are listed under such headings as Biochemistry, Biological Structure, Botany, Microbiology, and Zoology.

BIOL 100 Introductory Biology (5) AWSpS Biological principles and concepts and the application of biological knowledge to problems of human beings and society; development of an awareness of science. For nonscience majors only.

BIOL 101-102 General Biology (5-5) A,W Principles of living systems as viewed at levels from the sub-cellular to the community. Emphasis on structural and functional analysis of biological organization—its adaptiveness, its genetic diversity, its energetics—leading to an evolutionary synthesis. The position of human beings in the biological world. For nonmajors and majors in biology-related fields who need a thorough two-quarter introduction to biology.

BIOL 103 Introduction to Biology (5) WSp Basic biological concepts within the context of human biology. For students in the Educational Opportunity Program. No credit allowed if 100 has been taken. Prerequisite: permission of instructor.

BIOL 104 Biology for Elementary School Teachers (5) AW Basic concepts of biology, with emphasis on background needed for confident use of the new science curriculum materials in the elementary school. Prerequisite: permission of instructor.

BIOL 110 Elementary Biology for Health Professions I (2) A Russell Elementary biomedical concepts. For Equal Opportunity Program students only. Prerequisite: permission of instructor.

BIOL 111 Elementary Biology for Health Professions II (2) W Russell Elementary human anatomy and physiology, including selected areas in laboratory medicine. For Equal Opportunity Program students only. Prerequisite: 110.

BIOL 112 Elementary Biology for Health Professions III (1-4) Sp Russell Field experience in a health profession. For Equal Opportunity Program students only. Prerequisite: 111.

BIOL 113 Biology Tutorial (1-3, max. 6) Independent study. Topics related to material taken in 110, 111, and 112. For Equal Opportunity Program students only. Prerequisite: permission of instructor.

BIOL 210, 211, 212 Introductory Biology (5,5,5) AWSp,WSp,ASp Introduction to phenomena of life for students intending to take advanced biology courses and preprofessional programs. Emphasis on features common to all living things: molecular and submolecular phenomena; cell structure, metabolism, and energetics; genetic basis of inheritance; structure, function, and development of whole organisms; principles of ecology and evolution. Prerequisites: CHEM 140, 150; 210 for 211 or 212, or permission of Biology office.

BIOL 213 Scientific Illustration (3) W Practical course designed to acquaint the science student with the techniques of illustrating. Accurate and selective interpretation of shape, texture, and consistency of biological materials, working in black and white and using a variety of illustration techniques. Students may choose objects of special interest to them. (Offered through University Extension only.)

BIOL 214 Scientific Illustration (3) Sp Continuation of 213. Further training techniques: tone, color, and working from the live animal. Exploration of specifications for ultimate use in projection or print. (Offered through University Extension only.)

BIOL 313, 314, 315 Advanced Scientific Illustration (3,3,3) Sweeney Intensive treatment of techniques. 313: five continuous-tone techniques, lighting, form, and texture rendition; 314: seven black-and-white techniques, reproduction, typesetting, pasteup, and layout; 315: color illustration techniques. Each includes historical perspective on the techniques under study and critique of published material. Prerequisites: 213, 214, and introductory biology. (Offered through University Extension only.)

BIOL 401 Cell Biology (3) ASP Structure and function of the cell. Prerequisites: 210, 211, 212 or equivalent; one upper-division course in a related area (embryology, histology, physiology, or biochemistry).

BIOL 402 Cell Biology Laboratory (2) Prerequisites: 401 and permission of instructor.

BIOL 454 Evolutionary Mechanisms (3) Evolutionary change as determined by mutation, recombination, and selection. Effects of the genetic system, isolating mechanisms, hybridization, and polyploidy on speciation. Examples of microevolutionary and macroevolutionary changes from plant and animal kingdoms. For advanced undergraduate and graduate students in the biological sciences.

BIOL 460 Biology of Eukaryotic Microorganisms (5) Whisler Introduction to the comparative biology of the algae, fungi, and protozoa. Emphasis on the life history, physiology, and structure of protists most commonly used in contemporary biological research. Prerequisites: 210, 211, 212 or 101-102 or introductory microbiology.

BIOL 472 Principles of Ecology (4) WS Bliss, Kareiva, Odell, Orians, Paine Population biology, interactions between species in biological communities, relationship of community to environment, physiological ecology, principles of natural selection. Prerequisites: 15 credits in biological sciences and upper-division standing, or permission of instructor.

BIOL 473 Limnology (3) A Biological, physical, and chemical features of lakes and other inland waters. Prerequisites: 15 credits in biological sciences, 10 credits in college chemistry, and upper-division standing, or permission of instructor.

BIOL 474 Ecology Laboratory (3) S Students may be required to share a portion of the transportation costs of field trips. Prerequisites: 472 and permission of instructor.

BIOL 475 Limnology Laboratory (2) A Examination of biota of fresh waters, survey of limnological methods, and analysis of data. Prerequisites: 473, which may be taken concurrently, and permission of instructor.

BIOL 499 Independent Studies in Biology Instruction (1-5, max. 15) AWSpS Cleveland Individual exploration and direct experience with modes of thought and activity in biology instruction. Prerequisite: permission of instructor.

Courses for Graduates Only

BIOL 501 Advanced Cytology (1-5, max. 5) Detailed study of the structure and function of the cell. Prerequisite: permission of instructor.

BIOL 508 Cell Biology (3, max. 6) Four to five topics of current interest in cell biology selected to meet the needs of the enrollees. Prerequisite: permission of instructor.

BIOL 573 Topics in Limnology (2 or 3) Readings in the literature of limnology, with discussion of modern problems. May be repeated for credit. Prerequisite: permission of instructor.

BIOL 581 Biology of Drosophila Seminar (1, max. 12) Weekly presentation by participants of classical literature, current literature, and research in the molecular biology, developmental biology, neurobiology, and genetics of *Drosophila*. Prerequisite: permission of instructor.

BIOL 586 Analysis of Development (3, max. 6) A Analysis of structural, physiological, and molecular levels of developmental processes, including gametogenesis, fertilization, cell and tissue movements, induction, and cytodifferentiation. Prerequisites: ZOOL 456 and BIOC 442 or permission of instructor.

BIOL 587 Analysis of Development Laboratory (1-5, max. 5) WSp Series of intensive workshops in developmental biology, each extending over three to five days. Each is based on problems under study in the laboratory of the instructors involved, using materials, methods, and approaches characteristic of that laboratory. Prerequisite: permission of instructor.

Botany

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Botany is concerned with the structure, ecology, physiology, classification, and evolution of plants, with emphasis on both organismal and cellular biology. Special courses and programs in botany of the Pacific Northwest are shared with related departments.

Undergraduate Program

Advisers

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The Department of Botany offers two undergraduate degrees. The Bachelor of Arts degree is designed for students who wish to obtain a broad training in the biology of plants and plant-like organisms, but who do not plan to continue with further graduate training in the biological sciences. The Bachelor of Science degree includes a more extensive training in mathematics and chemistry and is designed for students who are planning to continue with graduate training in botany or other areas of biology.

Bachelor of Arts Degree

Major Requirements: Minimum of 59 credits as follows: BIOL 101-102 or BIOL 210, 211, 212; CHEM 101, 102 or 140, 150, 231; BOT 113, 360, 371, 372, 441; BOT 445 or 446; BOT 354 or BIOL 472; BOT 428 or 480. Minimum of four upper-division courses: two in botany and two from botany, zoology, microbiology, genetics, biology, and certain courses in forest resources, oceanography, and fisheries.

Bachelor of Science Degree

Major Requirements: Minimum of 85 credits as follows: BIOL 210, 211, 212 (or BIOL 101-102, 210, or equivalent); GENET 365; CHEM 140, 150, 231, 232. One of the following laboratory courses in chemistry: CHEM 151 or 241 or 321. One of the following sequences: MATH 124, 125; Q SCI 291, 292; Q SCI 381, 482; or one quarter of calculus and one quarter of statistics. BOT 113, 360, 371, 372, 441; BOT 445 or 446. BOT 354 or BIOL 472; BOT 428 or 480. Minimum of 10 credits of upper-division courses (excluding courses without prerequisites) in botany, zoology, microbiology, genetics, biology, and certain courses in forest resources, oceanography, and fisheries.

Graduate Program

The Department of Botany offers programs of graduate study leading to the Master of Science and Doctor of Philosophy degrees. Each program of study is planned individually and takes into consideration the background and interests of the student.

Research Facilities

Special departmental facilities include a greenhouse, growth chambers for both higher plants and algal cultures, and herbarium. The Friday Harbor Laboratories on San Juan Island offer opportunities for the study of marine botany, and the great variety of habitats in the Pacific Northwest provide many opportunities for field investigations.

Special Requirements

A prospective graduate student is expected to have had the equivalent of an undergraduate major in biological science, with training in chemistry (at least through organic chemistry), general botany, plant physiology, and genetics. Calculus is recommended.

Financial Aid

A number of teaching and research assistantships are awarded to selected applicants in March of each year.

Correspondence and Information

Graduate Program Coordinator
Department of Botany, KB-15

Faculty

Chairperson

Melinda F. Denton

Professors

Ammirati, Joseph F.,* 1979, (Forest Resources), M.A., 1967, San Francisco State; Ph.D., 1972, Michigan; mycology, taxonomy and ecology of the fleshy fungi.

Bendich, Arnold J.,* 1970, (Genetics), Ph.D., 1969, Washington; nucleic acids as evolutionary indicators, DNA sequence organization in plants, plant cancer.

Bliss, Lawrence C.,* 1978, M.S., 1953, Kent State; Ph.D., 1956, Duke; physiological plant ecology, arctic, alpine environments.

Cattolico, Rose A.,* 1975, M.A., 1968, Temple; Ph.D., 1973, State University of New York (Stony Brook); plastid replication, nucleic acid biochemistry in synchronized unicellular algae.

Cleland, Robert E.,* 1964, Ph.D., 1957, California Institute of Technology; physiology, growth substances, cell wall, tissue culture.

del Moral, Roger,* 1968, (Environmental Studies, Landscape Architecture), M.A., 1966, Ph.D., 1968, California (Santa Barbara); ecology, gradient analysis, community structure, phytosociology.

Denton, Melinda F.,* 1972, M.A., 1967, Ph.D., 1971, Michigan; Herbarium curator; systematics and evolution of vascular plants, phytogeography.

Haskins, Edward F.,* 1966, M.A., 1962, Ph.D., 1965, Minnesota; cytology, ultrastructure of microorganisms, especially slime molds.

Kruckeberg, Arthur R.,* 1950, Ph.D., 1950, California (Berkeley); evolution, biosystematics, edaphic ecology.

Leopold, Estella B.,* 1976, (Environmental Studies, Geological Sciences, Quaternary Research Center), (Forest Resources),† M.S., 1950, California (Berkeley); Ph.D., 1955, Yale; palynology and Quaternary environments.

Meeuse, Bastiaan J. D.,* 1952, (Emeritus), M.S., 1939, Leiden; Doctoral, 1943, Delft (Holland); plant physiology, algal physiology, metabolism, plant biochemistry.

Tsukada, Matsuo,* 1969, (Geological Sciences, Quaternary Research Center), M.S., 1958, D.Sc., 1961, Osaka City (Japan); interpretation of Quaternary events from palynological and kindred data.

Waaland, J. Robert,* 1969, Ph.D., 1969, California (Berkeley); biology of algae, experimental, cytological, and ecological studies of marine algae, gas vacuoles of blue-green algae.

Walker, Richard B.,* 1948, (Emeritus), Ph.D., 1948, California (Berkeley); plant physiology, mineral nutrition, water relations.

Whisler, Howard C.,* 1963, Ph.D., 1961, California (Berkeley); mycology, aquatic fungi, slime-molds and phycomycetes, development.

Associate Professors

DiMichele, William A.,* 1979, (Affiliate), M.S., 1976, Ph.D., 1979, Illinois; morphology, paleobotany.

Halperin, Walter,* 1968, M.S., 1961, Southern Connecticut State; Ph.D., 1965, Connecticut; plant physiology, developmental anatomy, plant cancer, tissue culture.

Spaulding, W. Geoffrey,* 1979, (Research), (Quaternary Research Center),† M.S., 1974, Ph.D., 1981, Arizona; paleobotany of North American deserts, late Quaternary phytogeography and climate history of the Southwest and Great Basin, macrofossil paleoecology.

Assistant Professors

Mitchell-Olds, Thomas,* 1986, Ph.D., 1985, Wisconsin (Madison); plant population ecology, ecological genetics, agricultural ecology and genetics.

Van Volkenburgh, Elizabeth,* 1985, Ph.D., 1980, Washington; analysis of growth mechanisms, leaf growth, photobiology.

Williams, Susan L.,* 1986, (Research), M.S., 1977, Alaska; Ph.D., 1981, Maryland; physiological ecology of marine plants, nutrient cycling.

Course Descriptions

Courses for Undergraduates

BOT 110 Introductory Plant Biology (5) AWSp Ammirati, Bliss, del Moral, Haskins, Leopold Basic concepts in plant biology for the nonmajor, with emphasis on plant diversity and how plants grow and reproduce. Modern ideas concerning genetic engineering, ecology, agriculture, medicine, practical gardening, and conservation and environmental issues. Laboratories include greenhouse and field studies.

BOT 113 Plant Identification and Classification (5) SpS Denton Plant classification; field study and laboratory identification of the common plant families and the conspicuous flora of western and central Washington. Two full-day field trips.

BOT 220 The Plant Kingdom (5) A Kruckeberg, Waaland Natural history of fungi, algae, and land plants, stressing ecological and structural diversity. Laboratories include plants native to western Washington. Prerequisite: one quarter of college biology or general botany or permission of instructor.

BOT 301 Plant Propagation (2) A Practical course in methods of plant propagation by seeds, cuttings, budding, layering, bulbs, divisions, and other special structures. Includes consideration of care and handling of plants in the home, garden, and greenhouse. Prerequisites: BIOL 101-102 or equivalent.

BOT 331 Ornamental Plants (3) SpS Kruckeberg, Tsukada Identification, recognition, and use of cultivated trees and shrubs. Emphasis on laboratory and field study of woody species used in Pacific Northwest landscapes; plant exploration and origins of ornamentals. For nonmajors, teaching majors in biology, and students in forestry and landscape design. Prerequisite: 113 or 10 credits in biological science.

BOT 350 Introduction to Plant Geography (4) W Tsukada Patterns of world vegetation distributions; the relationships between vegetation and climate; introduction to general theories of plant distribution. Emphasis on the affinities within vegetation in different parts of the world.

BOT 354 Introduction to Plant Ecology (5) Sp Bliss Basic concepts of plant ecology, including studies of the biotic environment, plant-environment interactions, communities, and ecosystems. Laboratory includes two field trips, laboratory and greenhouse experiments, and an introduction to ecological problem solving. Prerequisite: BIOL 101-102 or BIOL 211.

BOT 356 Washington Plant Communities (4) A del Moral Lowland plant communities of western Washington, including mature, seral, and ruderal vegetation. Recognition of common species, environmental factors controlling distributions, knowledge of indicator species, and uses of native species in landscape design. Recommended: 113 or 354 or L ARC 463. (Offered alternate years; offered 1988-89.)

BOT 360 General Mycology (5) W Ammirati, Whisler General survey of the fungi with emphasis on life cycles, structure, physiology, economic importance. Prerequisite: 10 credits in biological science or permission of instructor.

BOT 371 Elementary Plant Physiology (3) W Bendich, Cleland, Halperin, Van Volkenburgh Nutrition, assimilation, transport, growth, photosynthesis, and cellular respiration in plants. Prerequisite: BIOL 211 or equivalent or permission of instructor.

BOT 372 Plant Physiology Laboratory (2) W Laboratory experiments on the growth, nutrition, and metabolism of plants. Prerequisite: 371, which may be taken concurrently.

BOT 380 Economic Botany (3) A Tsukada Plants useful or harmful to man; their taxonomic and morphological characteristics and chemical constituents; history, distribution, production, usage, and roles in prehistoric and modern cultures and civilization. Prerequisite: 110 or 113 or 10 credits in biological sciences.

BOT 421 Bryology (3) Taxonomy of mosses, with emphasis on the moss flora of the Pacific Northwest. Intensive practice in identification of mosses in laboratory. Field study for collections, recognition, and natural history of mosses. For undergraduate and graduate majors in botany and related fields. (Offered upon demand.)

BOT 428 Molecular and Cellular Biology of Plants (3) W Bendich, Cattolico Structure of chloroplasts and mitochondria, nuclear and organelle gene-sequence arrangement and expression, genetic engineering and molecular evolution. Methods used in molecular biology such as cloning, DNA sequencing, electrophoresis, and hybridization. Prerequisites: BIOL 210, 211, 212.

BOT 431 Topics in Horticultural Botany (3, max. 6) A Kruckeberg Topics include selected families or genera of ornamental importance, urban stress, hardiness, propagation, plant breeding, plant introduction, and diseases of ornamentals. Prerequisite: 331 or equivalent. (Offered alternate years; offered 1989-90.)

BOT 433 Advanced Systematics (5) A Denton Analysis of characters and examination of evolutionary principles as they relate to systematic studies in vascular plants. Prerequisite: 113 or equivalent. (Offered alternate years; offered 1988-89.)

BOT 435 Biology of Grasses and Allies (5) A Denton Biology, taxonomy, and evolutionary relationships of graminoid plants (Gramineae, Cyperaceae, and Juncaceae). Keying and recognition of families and genera in field situations. Prerequisite: 113 or equivalent. (Offered alternate years; offered 1989-90.)

BOT 439 Forest History in Pacific Northwest (4) Sp Franklin, Leopold Reconstructing ecological history of old-growth forests in the Pacific Northwest, including human beings' successive impacts on the primeval forest. Use of historical timber-cruise data and burn maps to estimate stand structure, composition, and dynamics of old growth. Joint with FRM 423. Prerequisite: Introductory ecology.

BOT 441 Morphology and Anatomy of Land Plants (5) A Halperin Comparative morphology and anatomy of land plants. Derivation of morphological structures and basis for current classification schemes examined using living and fossil organisms. Laboratories emphasize live plants native to the Pacific Northwest. Prerequisite: BIOL 101-102 or BIOL 211 or equivalent.

BOT 443 Origins of Our Modern Floras (4) W Leopold Evolution and biogeographic development of our modern forest taxa and their associations. Late Cenozoic forests (last 60 million years) of western North America and their environments. Geologic and climatic shifts that have shaped temperate forest types from tropical vegetation during early Cenozoic Era. Prerequisite: 113 or equivalent. (Offered alternate years; offered 1989-90.)

BOT 445 Marine Botany (8) ASp Survey of plants represented in marine environments; natural history; ecology, distribution, habitat, adaptation, and trophic interrelationships. Offered at Friday Harbor Laboratories. Prerequisites: appropriate credits in biological sciences, concurrent registration in ZOOL 430, and permission of the Director of Friday Harbor Laboratories.

BOT 448 Algology (5) Sp Cattolico, Waaland Examination of algal phyla from the viewpoint of morphological and physiological characteristics important to their systematics. Emphasis on phylogeny of various lines of evolution in algae, relationships between algae and other parts of plant and animal kingdoms, algal geography and species of economic importance. Prerequisite: 220 or BIOL 211 or permission of instructor.

BOT 448 Marine Algal Ecology (3) W Waaland Marine environment in relation to requirements for algal life. Intertidal, subtidal, geographical, and seasonal distribution of marine algae. Functional aspects of algal form, structure, productivity, and energy economy of marine algal communities. Algal utilization and aquaculture. Prerequisite: 445 or 446, or permission of instructor. (Offered alternate years.)

BOT 451 Plant Population Ecology (3) Sp Mitchell-Olds Analysis of natural plant populations in an evolutionary framework. Demography, population growth, life history strategies, reproduction, and breeding systems. Effects of competitors, herbivores, and pathogens. Relationship of theory to empirical observations and tests of hypotheses. Prerequisite: permission of instructor. (Offered alternate years; offered 1988-89.)

BOT 453 Concepts and Methods in Paleoecology (4) A Brubaker, Leopold, Tsukada Conceptual framework and methods of study for interpretation of fossils in sediments; tree rings, sedimentary/geochemical evidence. Past dynamic changes in plant communities and species history evaluated in context of modern ecological theory. Joint with QUAT 422 and FRM 422. Prerequisite: 354. (Offered alternate years; offered 1988-89.)

BOT 456 Plant Community Ecology (5) A del Moral Development of plant community theory; theory of vegetation structure and type identification; numerical methods for vegetation description and pattern analysis; gradient analysis; competition and allelopathy in complex systems; vegetation dynamics; niche theory. Laboratory emphasizes sampling design and field and computer methods. Two weekend field trips required. Prerequisite: 354 or permission of instructor. (Offered alternate years; offered 1989-90.)

BOT 462 Agarics and Gasteromycetes (5) A Ammirati Structure, classification, and biology of mushrooms, puffballs, and their relatives. Emphasis on fungi from the Pacific Northwest. Prerequisite: 360 or permission of instructor. (Offered alternate years; offered 1989-90.)

BOT 465 Lichenology (5) A Ammirati Structure, classification, and general biology of lichens. Emphasis on families and genera; local lichens collected and identified to species. Prerequisite: 360 or permission of instructor. (Offered alternate years.)

BOT 480 Plant Cell Biology (3) W Haskins Analysis of structure and function of plant cells. Emphasis on the ultrastructure of plant cells and cell components. Prerequisites: 15 credits in biological science.

BOT 480 Undergraduate Seminar (1) Presentation and discussion of special topics in botany.

BOT 488 Special Problems in Botany (1-15) AWSp Students with suitable background in botany may enroll for special study in algology, anatomy, bryology, cytology, mycology, morphology, paleobotany, physiology, or taxonomy. Prerequisite: permission of instructor.

Courses for Graduates Only

BOT 501 Tutorial in Botany (1-5, max. 10) AWSp Small-group study and discussion of a specified topic in the plant sciences, largely in fields not covered by courses and existing special area seminars. Impetus for registration would come from two or more graduate students finding a faculty member who shares with them an interest in the topic. Prerequisite: permission of instructor.

BOT 502 Teaching Assistant Orientation (3) A Haskins Laboratory and lecture preparation, organization, and presentation for incoming botany graduate students. Two student presentations required; to be self-, instructor, and peer evaluated.

BOT 503 Quaternary Ecology and Biogeography of the American West (4) Focuses on the last 50,000 years of ecological and biogeographic change in interior western North America; techniques of reconstructing past environments from fossil record; plant community response to glacial/interglacial climatic oscillations. Review of the paleoecological record of arid and semiarid regions of North America. Joint with QUAT 503.

BOT 520 Seminar (1, max. 18) AWSp Prerequisite: permission of instructor.

BOT 521 Topics in Plant Physiology (1-3, max. 10) AWSp Bendich, Cleland, Halperin, Van Volkenburgh Modern trends and methods in plant physiology. Prerequisite: permission of instructor.

BOT 522 Seminar in Morphology and Taxonomy (1-3, max. 10) AWSp Denton, Kruckeberg, Mitchell-Olds Current research and trends in morphology and taxonomy of higher plants. Prerequisite: permission of instructor.

BOT 523 Selected Topics in Mycology (1-3, max. 10) AWSp Ammirati, Whisler Selected topics from all phases of mycology. Prerequisite: permission of instructor.

BOT 524 Topics in Phycology (1-3, max. 10) AWSp Cattolico, Waaland, Williams Topics from all phases of phycology. Prerequisite: permission of instructor.

BOT 525 Topics in Plant Ecology (1-3, max. 10) AWSp Bliss, del Moral, Leopold, Mitchell-Olds, Tsukada Selected topics from various phases of plant ecology. Prerequisite: permission of instructor.

BOT 526 Topics in Palynology (1-3, max. 6) AWSp Leopold, Tsukada Discussion and review of literature in pollen structure, disposition in sediments, and paleoecology. Prerequisite: permission of instructor.

BOT 528 Plant Molecular Biology (3) A Bendich Current research and trends in plant nucleic acids, including such topics as plastid and nuclear genomes, regulation of organelle biogenesis, the cell cycle, and evolution. (Offered alternate years; offered 1989-90.)

BOT 545 Marine Phycology (9) S Waaland, Williams Morphology, life histories, systematics, and ecology of marine algae, with emphasis on the local flora. Prerequisite: 220 or permission of the Director of Friday Harbor Laboratories. (Consult Friday Harbor Laboratories bulletin for the year offered.)

BOT 549 Advanced Phycology (9) S Waaland, Williams Varied marine algal flora of the San Juan region. Topic changes from year to year. Individual research projects. Prerequisites: 545 or equivalent and permission of the Director of Friday Harbor Laboratories. (Consult Friday Harbor Laboratories bulletin for the year offered.)

BOT 552 Vegetation of North America (5) W Bliss Detailed analysis of the biomes of America north of Columbia, including principles of plant geography, floristics, climate, soils, ecophysiology, paleobotany, vegetation structure, and community patterns. Prerequisite: 350. (Offered alternate years; offered 1989-90.)

BOT 554 Palynology and Quaternary Phytogeography (5) A Tsukada Study of former vegetation and environments by relating the fossil pollen record to ecological principles; fundamentals and applications of pollen-spore morphology and pollen analysis. Two full-day (Friday and Saturday) field trips required. Prerequisites: 113; BIOL 472, or permission of instructor. (Offered alternate years; offered 1989-90.)

BOT 565 Marine Mycology (9) Whisler Taxonomy and morphology of aquatic fungi with emphasis on marine forms. Prerequisites: 360 or 20 credits in biology and permission of the Director of Friday Harbor Laboratories. (Consult Friday Harbor Laboratories bulletin for the year offered.)

BOT 577 Plant Growth and Development (3) A Cleland Control of growth, development, and differentiation in higher plants by hormones. Prerequisite: permission of instructor. (Offered alternate years; offered 1988-89.)

BOT 579 Environmental Control of Plant Growth and Development (3) A Cleland Effects of light, temperature, and water stress on the growth, development, and metabolism of higher plants. Prerequisite: 371 or permission of instructor. (Offered alternate years.)

BOT 600 Independent Study or Research (*) AWSp

BOT 700 Master's Thesis (*) AWSp

BOT 800 Doctoral Dissertation (*)

Canadian Studies

Chairperson

W. A. Douglas Jackson

Students may receive a degree in General Studies with an emphasis on Canadian Studies.

Major Requirements: (1) Core courses (33 credits)—ANTH 488, GEOG 308, HSTAA 377, HST 425, POL S 341, SIS 356, SOC 110; (2) language training (15 credits)—second-year French; (3) selected discipline—15 upper-division credits from one discipline, such as geography, history, or political science; (4) senior requirements (15 credits)—senior seminar and internship, 5 credits each, in a field relevant to Canadian Studies; senior study (G ST 493). Requirements (3) and (4) must be planned in consultation with the Canadian Studies adviser.

Chemistry

109 Bagley

Chemistry is a branch of natural science that deals principally with the properties of substances, the changes they undergo, and the natural laws that describe these changes.

Undergraduate Program

Special options: Within the traditional degree programs below, elective study options are available in environmental chemistry in cooperation with the Institute for Environmental Studies.

Bachelor of Science Degree

Admission: Recommended high school preparation includes four years of college preparatory mathematics, one year of physics, one year of chemistry, and three years of German.

Major Requirements: CHEM 145 (or 140), 155 (or 150), and 160 (or 164), (students with inadequate backgrounds in laboratory work should include CHEM 151 in their freshman program; CHEM 157 and 167 may replace 151 and 321); CHEM 321; 335, 336, 337, 346, 347 (or 231, 235, 236, 241, 242, and a passing score on the standard American Chemical Society examination in organic chemistry, if necessary); CHEM 455, 456, 457; 460 or 464; a minimum of 5 credits from 426, 461, 462, or 463; 414, 416, or 417; one year of physics, including one credit of laboratory (PHYS 121, 122, 123, 132 recommended); MATH 124, 125, 126, and two additional courses numbered 200 or above (MATH 238 and 205 recommended); 19 credits of approved upper-division science electives (may include ENGR 141). Grade-point average of 2.80 in chemistry courses, with 1.7 or better in all required chemistry courses and a graduation grade-point average of 2.80 or better.

Bachelor of Arts Degree

Admission Requirements: Same as for the Bachelor of Science degree.

Major Requirements: Chemistry requirements through 321 are the same as those listed for the Bachelor of Science degree: CHEM 231, 235, 236, 241, 242 (or 335, 336, 337, 346, 347); 350, 351, 455 (or 455, 456, 457); 460 or 464; at least 2 credits from among 426, 461, 462, or 463; (414, 416, or 417 recommended); one year of physics, including one credit of laboratory; MATH 124, 125, 126. Grade-point average of 2.00 in chemistry courses, with 1.7 or better in all required chemistry courses. Required science courses may not be taken on a satisfactory/not satisfactory basis.

Bachelor of Science Degree in Biochemistry

The Departments of Biochemistry and Chemistry have submitted plans to offer an undergraduate degree in biochemistry, which deals with the structure and interconversions of biological compounds. Final approval is pending.

Graduate Program

The Master of Science and Doctor of Philosophy programs are designed to lead to positions of leadership and independent investigation with research institutes, industrial laboratories, and government agencies, and as teachers, researchers, or administrators in colleges and universities in chemistry or in fields having substantial chemistry content.

Qualifying examinations to assess knowledge and understanding of undergraduate material in four areas

(analytical, inorganic, organic, physical with substitution of one of these by biochemistry, mathematics, or physics possible with permission) are given to entering students as an aid to planning course programs.

Thesis research for the Master of Science degree and dissertation research for the Doctor of Philosophy degree should constitute an original contribution to knowledge worthy of report in the scientific literature.

Master of Science Degree

Admission Requirements: Baccalaureate degree with major in chemistry; Graduate Record Examination.

Graduation Requirements: *With Thesis*—36 approved credits with 18 in courses at the 500 level or above; 18 in courses at the 400 or 500 level taken for numerical grade; 9 credits in thesis research. *Without Thesis*—Same as with thesis, except that additional course work may be substituted for the required research. Grade-point average of 3.00 required for both degrees.

Doctor of Philosophy Degree

Admission Requirements: Same as for the Master of Science degree.

Graduation Requirements: 18-27 credits of approved courses at the 400 or 500 level, with a total grade-point average of 3.00; candidacy examinations covering area of specialization; dissertation; experience as a teaching assistant or predoctoral teaching associate.

Faculty

Chairperson

Thomas Engel

Professors

Andersen, Niels H.,* 1968, Ph.D., 1967, Northwestern; bioorganic and biophysical chemistry, natural products synthesis and structure elucidation, biorecognition phenomena.

Anderson, Arthur G., Jr.,* 1946, (Emeritus), M.S., 1942, Ph.D., 1944, Michigan; chemistry of nonclassical aromatic compounds and novel heterocycles.

Borden, Weston T.,* 1972, M.A., 1968, Ph.D., 1968, Harvard; molecular orbital theory of organic molecules and reactions, synthesis of unnatural products.

Cady, George H., 1938, (Emeritus), A.M., 1928, Kansas; Ph.D., 1930, California; inorganic chemistry.

Callis, James B.,* 1975, Ph.D., 1970, Washington; instrumentation development, process analytical chemistry, noninvasive clinical chemistry.

Charlton, Robert J.,* 1965, ‡(Atmospheric Sciences, Environmental Studies, Geophysics), M.S., 1959, Stanford; Ph.D., 1964, Washington; atmospheric and cloud chemistry, aerosol physics.

Christian, Gary D.,* 1972, M.S., 1962, Ph.D., 1964, Maryland; atomic spectroscopy, clinical analysis, electroanalysis, flow injection analysis, optodes, process control.

Eggers, David F., Jr.,* 1950, Ph.D., 1950, Minnesota; rotation analysis of gas phase molecular spectra, infrared lasers.

Eichinger, Bruce E.,* 1968, Ph.D., 1967, Stanford; physical chemistry and synthesis of macromolecules.

Engel, Thomas,* 1980, (Physics), M.A., 1964, Johns Hopkins; Ph.D., 1969, Chicago; surface chemistry and catalysis.

Epitiotis, Nicolaos D.,* 1972, M.A., 1967, Harvard; Ph.D., 1972, Princeton; applied quantum chemistry.

Fairhall, Arthur W., 1954, (Emeritus), Ph.D., 1952, Massachusetts Institute of Technology; nuclear geochemistry.

Floss, Heinz G.,* 1987, Ph.D., 1961, Technical University of Munich; biorganic and natural products chemistry.

Gouterman, Martin P.,* 1966, M.S., 1955, Ph.D., 1958, Chicago; electronic structure, spectra, luminescence of porphyrins, use of porphyrins as sensors.

Gregory, Norman W.,* 1946, M.S., 1941, Washington; Ph.D., 1943, Ohio State; structure and thermodynamic properties of inorganic substances, vaporization reactions.

Hakomori, Sen-itiro G.,* 1967, ‡(Biochemistry, Microbiology, Pathobiology), M.D., 1951, D.Med.Sci., 1956, Tohoku (Japan); membrane biochemistry and glycoproteins.

Halsey, George D.,* 1951, Ph.D., 1948, Princeton; absorption and interaction of rare gases with surfaces, solid solutions of rare gases, catalysis, colloids.

Heller, Eric J.,* 1984, (Physics), † Ph.D., 1973, Harvard; semiclassical methods, photodissociation dynamics and spectroscopy, molecular spectroscopy, radiationless transitions in molecules, quantum mechanics of nonlinear systems, surface scattering.

Kowalski, Bruce R.,* 1973, Ph.D., 1969, Washington; analytical chemometrics and computerized instrumentation for process monitoring and control.

Kwiram, Alvin L.,* 1970, Ph.D., 1963, California Institute of Technology; molecular structure and dynamics in the solid state with emphasis on excited states, magnetic resonance (ESR, NMR, ENDOR, and optical detection methods).

Lingafelter, Edward C., 1939, (Emeritus), Ph.D., 1939, California (Berkeley); crystal and molecular structure of coordination compounds.

Norman, Joe G., Jr.,* 1972, Ph.D., 1972, Massachusetts Institute of Technology; synthesis and structures of transition metal complexes, theoretical calculations on large molecules.

Pocker, Yeshayau,* 1961, M.Sc., 1949, Hebrew University of Jerusalem; Ph.D., 1953, D.Sc., 1960, London (England); organic reaction mechanisms, chemical and enzymatic catalysis, metalloenzymes.

Rabinovitch, B. Seymour,* 1948, (Emeritus), Ph.D., 1942, McGill; chemical dynamics, energy relaxation, properties of silver surfaces.

Reid, Brian R.,* 1980, (Biochemistry), † M.A., 1960, Cambridge (St. Johns); Ph.D., 1965, California (Berkeley); biophysical chemistry.

Ritter, David M., 1947, (Emeritus), Ph.D., 1937, Chicago; inorganic chemistry.

Robinson, Rex J., 1929, (Emeritus), M.S., 1927, Ph.D., 1929, Wisconsin; analytical chemistry.

Rose, Norman, J.,* 1966, Ph.D., 1960, Illinois; design, synthesis, and study of coordination compounds of transition metals, including the lanthanides.

Ruzicka, Jaromir,* 1987, Ph.D., 1967, Charles (Prague); flow injection analysis, instrumental analysis, trace analysis.

Schomaker, Verner, 1965, (Emeritus), M.S., 1935, Nebraska; Ph.D., 1938, California Institute of Technology; crystal structures by x-ray diffraction, molecular-sieve catalysts.

Schubert, Wolfgang M.,* 1947, Ph.D., 1947, Minnesota; mechanism and steric course of organic reactions; substituent and solvent effects, acid-base catalysis.

Schurr, J. Michael,* 1966, Ph.D., 1965, California (Berkeley); physical chemistry of DNA and other biopolymers, photon correlation techniques, dynamics of Brownian motions and internal deformations, polyelectrolytes, macromolecular theory, structures and dynamics of super-coiled DNAs.

Slutsky, Leon J.,* 1961, Ph.D., 1957, Massachusetts Institute of Technology; lattice dynamics, kinetics of conformational change, physical absorption.

Trager, William F.,* 1972, ‡(Medicinal Chemistry), Ph.D., 1965, Washington; medicinal chemistry, bioanalytical chemistry drug metabolism.

Vandenbosch, Robert,* 1963, (Physics), Ph.D., 1957, California (Berkeley); nuclear studies, particularly fission and nuclear reaction mechanisms, heavy ion reactions.

Watts, Robert O.,* 1986, Ph.D., 1988, Australian National; properties of small molecular clusters by theoretical and experimental investigations.

Zoller, William H.,* 1984, (Atmospheric Sciences), Ph.D., 1969, Massachusetts Institute of Technology; analytical, environmental, and nuclear chemistry.

Associate Professors

Crittenden, Alden L.,* 1947, Ph.D., 1946, Illinois; mass spectra, solid electrode polarography.

Hopkins, Paul B.,* 1982, Ph.D., 1982, Harvard; organic synthesis, bioorganic chemistry.

Macklin, John W.,* 1968, Ph.D., 1969, Cornell; spectroscopic studies of materials in condensed phase and in solution.

Raucher, Stanley,* 1975, Ph.D., 1973, Minnesota; new methods in synthetic organic chemistry, total synthesis of natural products.

Robinson, Bruce H.,* 1980, Ph.D., 1975, Vanderbilt; magnetic resonance, molecular dynamics, polymer dynamics, nonlinear response theory.

Sivertz, Victorian, 1926, (Emeritus), M.S., 1924, West Virginia; Ph.D., 1926, McGill; physical chemistry.

Woodman, Darrell J.,* 1985, (Environmental Studies), A.M., 1965, Ph.D., 1965, Harvard; peptide synthesis, heterocyclic compounds, chemistry of ketoketenes.

Assistant Professors

Burgess, Lloyd W., Jr., 1985, (Research), M.S., 1979, Syracuse; Ph.D., 1985, Virginia Polytechnic Institute; optical waveguide-based chemical transducers and instrumentation.

Doherty, Nancy M.,* 1985, Ph.D., 1984, California Institute of Technology; inorganic and organometallic chemistry, synthesis and structures, reactivity and mechanisms.

Drobny, Gary,* 1982, Ph.D., 1981, California (Berkeley); two-dimensional and multiple quantum studies in nuclear magnetic resonance.

Gelb, Michael H.,* 1985, (Biochemistry), Ph.D., 1982, Yale; mechanistic enzymology, bioorganic and medicinal chemistry.

Imre, Dan G.,* 1984, Ph.D., 1984, Massachusetts Institute of Technology; molecular dynamics and laser spectroscopy of the transition state.

Mayer, James M.,* 1984, Ph.D., 1982, California Institute of Technology; inorganic and organometallic chemistry: synthesis and mechanism of reactions of transition metal compounds.

Synovec, Robert E.,* 1986, Ph.D., 1986, Iowa State; laser-based liquid chromatography detectors, separation theory, analytical instrumentation.

Course Descriptions

Courses for Undergraduates

Credit may be received for only one of each of the following: 140 or 145; 150 or 155; 151 or 157; 157, 167, or 321; 160 or 164; 231 or 335; 232 or 236; 232 or 337; 235 or 336; 236 or 337; 241 or 346; 242 or 347; 350, 351, or 456.

CHEM 100 Chemical Science (5) Sp Terminal course for students with little or no high school chemistry. Electronic structure of atom and periodic table of elements. Types of bonds and examples of simple molecules. Topics from organic chemistry, synthetic and biopolymers.

CHEM 101 General Chemistry (5) AWSpS For nonscience, nonengineering majors planning to terminate their study of chemistry with 101 and 102. Molecular theory, quantitative relationships in chemical processes, solutions, ionic equilibria, acids, bases, and salts. Chemistry of common metals and nonmetals. Laboratory included.

CHEM 102 General and Organic Chemistry (5) AWSpS Organic compounds; hydrocarbons, alcohols, aldehydes, ketones, ethers, acids, aromatics, fats and oils, proteins, and carbohydrates. Students who plan to take 231 should not take 102. Prerequisite: 101 or 101 exemption examination.

CHEM 105 Introduction to General Chemistry (3) AWSpS For students with little or no high school chemistry who plan to take 140 or 145. Basic introduction to chemistry for physical science, biological science, premedical, or engineering majors who intend to take a year or more of college chemistry. Emphasis on quantitative reasoning.

CHEM 140 General Chemistry (4) AWSpS For science, engineering, and other majors who plan to take a year or more of chemistry courses. Chemical reactions, basic principles, equilibrium systems, structure and bonding, properties of matter. Prerequisites: high school chemistry or physics (both recommended), or 101 or 105; and qualification for MATH 124 or placement on basis of Washington Precollege Testing quantitative composite score.

CHEM 145 Honors General Chemistry (4) A Parallels 140. For science, engineering, and other majors who plan to continue their study of chemistry through physical chemistry. Assumes strong high school background in chemistry or 105 and good aptitude for study of science. Familiarity with differential calculus encouraged. Prerequisite: concurrent enrollment in MATH 124 or 125.

CHEM 150 General Chemistry (4) AWSpS Continuation of 140. Concurrent registration in 151 recommended. Prerequisite: 140 or 145.

CHEM 151 General Chemistry Laboratory (2) AWSpS Experiments illustrating quantitative relationships in chemistry. Prerequisite: concurrent registration in, or prior completion of, 150 or 155.

CHEM 155 Honors General Chemistry (4) W To follow 145. Parallels 150. Prerequisite: 145.

CHEM 157 General Chemistry Honors Laboratory (3) WSp Introduction to experimental chemistry with emphasis on quantitative chemical analysis, error sources, and experimental procedure. Principles of conservation of mass, equilibria, conductance, potential energy, and acid-base behavior. (May be used instead of 151 for degree requirements.) Prerequisite: 150 or 155, which may be taken concurrently.

CHEM 160 General Chemistry (4) AWSpS Chemistry of representative elements, metals, and nonmetals. Introduction to organic and nuclear chemistry. Prerequisite: 150 or 155.

CHEM 164 General and Introductory Environmental Chemistry (5) Sp Parallels 160. Beyond the coverage of descriptive general chemistry of 160, additional material emphasizes environmental applications of basic chemistry. Prerequisite: 150 or 155.

CHEM 167 General Chemistry Honors Laboratory (3) A Continuation of 157 with emphasis on characterizing the physical properties of materials. Both 157 and 167 can be used instead of 151 and 321 for degree requirements. Prerequisite: 157.

CHEM 198 Tutorial Study (1, max. 3) AWSpS For chemistry majors only. Small-group discussions of aspects of chemistry of current interest to undergraduates. May not be taken concurrently with 199. Prerequisites: permission of chemistry adviser and grade-point average of 3.00 for freshmen, 2.50 for sophomores.

CHEM 199 Special Problems (1, max. 6) AWSpS Research in chemistry. For chemistry majors only. Prerequisites: permission of chemistry adviser and chemistry grade-point average above 3.00.

CHEM 231 Organic Chemistry (4) AWSpS For students planning two or three quarters of organic chemistry. Structure, nomenclature, reactions, and synthesis of the main types of organic compounds. Prerequisite: 150 or 155.

CHEM 232 Organic Chemistry (3) AWSpS Continuation of 231 for students planning only two quarters of organic chemistry. Polyfunctional compounds and natural products, lipids, sugars, amino acids, and heterocycles. Prerequisite: 231.

CHEM 235 Organic Chemistry (4) AWSpS Continuation of 231 for those desiring three quarters of organic chemistry. Further discussion of physical properties and transformations of organic molecules, especially aromatic and carbonyl compounds. Prerequisite: 231.

CHEM 236 Organic Chemistry (3) AWSpS Continuation of 235 for those desiring three quarters of organic chemistry. Polyfunctional compounds and natural products, lipids, carbohydrates, amino acids, proteins, and nucleic acids. Prerequisite: 235.

CHEM 241 Organic Chemistry Laboratory (3) AWSpS Preparation of representative compounds. Prerequisites: 231, which may be taken concurrently, and one laboratory course in chemistry.

CHEM 242 Organic Chemistry Laboratory (3) AWSpS Usually to accompany 232 or 236. Preparations and qualitative organic analysis. Prerequisites: 232 or 235, either of which may be taken concurrently, and 241.

CHEM 299 Special Problems and Report Writing (1, max. 6) AWSpS For chemistry majors only. Research in chemistry and/or study in the chemical literature. Requires writing a scientific report. Prerequisites: permission of chemistry adviser and a chemistry grade-point average above 3.00.

CHEM 303 Chemistry of Trace Materials: The Environmental Impact (3) A Nonmathematical examination of role of small amounts (traces) of chemicals in our bodies and in global, regional, and local environments. Traces of certain chemicals influence events leading to acid rain, smog, nuclear waste management, wastewater treatment. Intended for nonscience majors. Prerequisite: one quarter of college-level chemistry.

CHEM 321 Quantitative Analysis (5) AWSpS Introduction to chemical analysis, including gravimetric, volumetric, spectrophotometric, and potentiometric analyses. Laboratory computer use included. Not intended for students who have completed 167. Prerequisites: 150 or 155, and 151 or strong high school laboratory preparation.

CHEM 335, 336, 337 Honors Organic Chemistry (4,4,4) A,W,Sp For chemistry majors and otherwise qualified students planning three or more quarters of organic chemistry. Structure, nomenclature, reactions, and synthesis of organic compounds. Theory and mechanism of organic reactions. Studies of biomolecules. Prerequisites: 160 or 155 for 335; 335 for 336; 336 for 337.

CHEM 346 Organic Chemistry Honors Laboratory (3) W Usually to accompany 336. Prerequisite: 336, which may be taken concurrently.

CHEM 347 Organic and Qualitative Organic Honors Laboratory (3) Sp Continuation of 346. Usually to accompany 337. Prerequisites: 337, which may be taken concurrently, and 346.

CHEM 350, 351 Elementary Physical Chemistry (3,3) W,Sp Survey of some major topics in physical chemistry with emphasis on thermodynamics. Equilibrium systems, solutions, electrochemistry, phase diagrams, and kinetics. Prerequisites: two quarters of general chemistry, PHYS 116, and MATH 125 (126 recommended) or MATH 157 for 350; 350 for 351.

CHEM 399 Undergraduate Research (*, max. 12) AWSpS For chemistry majors only. Research in chemistry. Prerequisites: permission of chemistry adviser, chemistry grade-point average above 3.00, and junior standing in chemistry.

CHEM 410 Radiochemical Techniques and Radioactivity Measurements (3) Introductory general service course for students planning further work in nuclear or tracer applications. Safety procedures, detection and measurement of nuclear radiations, radiochemical and tracer techniques. Prerequisites: 150 or 155, MATH 124, and PHYS 116.

CHEM 414 Chemistry of the Main Group Elements (3) W The elements and their compounds in relation to the periodic system. Prerequisites: senior standing and 457, or 351 and 455. (Offered alternate years.)

CHEM 415 The Chemical Bond (3) W Nature of the chemical bond. Simple bonding theories, molecular orbital methods, symmetry, and group theory. Prerequisite: 455.

CHEM 416 Transition Metals (3) A Survey of selected key topics in the chemistry of the transition metals, including emphasis on the structure, bonding, and reactivity of major classes of compounds.

CHEM 417 Organometallic Chemistry (3) Sp Chemistry of the metal-carbon bond for both main group and transition metals. Structure and reactivity with applications to organic synthesis and catalysis. Prerequisites: 160 or 164 and 337; recommended: 416.

CHEM 418 Nuclear Chemistry (3) Sp Natural radioactivity, nuclear systematics and reactions, radioactive decay processes, statistical consideration of decay laws, applications of radioactivity. Prerequisite: 350 or 455.

CHEM 426 Instrumental Analysis (4) Sp Introduction to modern instrumental methods of chemical analysis, including chromatography, optical and mass spectroscopy, electrochemistry and flow injection analysis. Basic concepts of electronics, transducers, spectrometers, mass analysis, separation sciences, computerized data acquisition and reduction. Prerequisite: 167 or 321.

CHEM 427 Sampling Methodology and Wet Chemical Analysis (3) A Includes sampling and sample dissolution, multiple chemical equilibria, solvent extraction, nonaqueous titrations, pH measurement, kinetic and enzyme assays.

CHEM 429 Chemical Separation Techniques (3) W Introduction to modern separation techniques such as gas chromatography, high-performance liquid chromatography, electrophoresis, and field flow fractionation. Prerequisite: one year of organic chemistry.

CHEM 435 Introductory Biophysical Chemistry (3) W Survey of the statics and dynamics of biophysical and/or biochemical processes. Prerequisites: organic and physical chemistry. (Offered alternate years.)

CHEM 436 Bioorganic Chemistry of Enzymes (3) W Introduction to enzyme chemistry and inhibition. Includes modes of biological catalysis, chemistry of coenzymes, stereochemistry of enzymatic reactions, enzyme characterization and kinetics, and design and principles of enzyme inhibitors. Prerequisite: 236 or 337; recommended: BIOC 405 or 440.

CHEM 450 Applied Physical Chemistry (3) Sp Chemistry in environmental, biological, and material science. Methods rather than theory. Includes heterogeneous equilibrium in multicomponent systems, ionic solutions, nonideal solutions and gases, surface chemistry and catalysis, and thermodynamic calculations using tabulated data. Primarily for undergraduates and graduates in related fields, but acceptable for chemistry majors. Prerequisite: 350 or 456. Recommended: 351 or 457.

CHEM 455 Physical Chemistry (3) ASpS Introduction to quantum chemistry and spectroscopy. Theory of quantum mechanics presented at an elementary level and applied to the electronic structure of atoms and molecules and to molecular spectra. Honors section available Winter Quarter. Prerequisites: 150 or 155, MATH 126 (238 recommended), and college physics.

CHEM 456 Physical Chemistry (3) WS Chemical thermodynamics. Laws of thermodynamics presented with applications to phase equilibria, chemical equilibria, and solutions. Honors section available Autumn Quarter. Joint with CH E 456. Prerequisites: 150 or 155, MATH 126 (238 recommended), and college physics. May be taken without 455.

CHEM 457 Physical Chemistry (3) ASp Introduction to statistical mechanics, kinetic theory, chemical kinetics, and statistical thermodynamics. Other topics of physical chemistry not in 455 or 456 may be covered. Honors section available Spring Quarter. Prerequisites: 455 and 456.

CHEM 458 Introduction to Air Chemistry (4) A The atmosphere as a chemical system; analytical and physical chemistry of trace atmospheric constituents, both natural and manufactured. Joint with ATM S 458. Prerequisites: 140 and 350, or 456 or ATM S 340.

CHEM 460 Spectroscopic Molecular Identification (3) ASp Basic theory of spectral techniques—irradiated and ultraviolet/visible spectroscopy, NMR, and mass spectrometry—with emphasis on spectral interpretation skills needed for the elucidation of complex organic structures or conformations.

CHEM 461 Physical Chemistry Laboratory (2-3) AWSp Physical measurements in chemistry. Vacuum and high-temperature techniques, calorimetry, spectroscopic methods, electrical measurements. Prerequisites: 455, 457 or 351. Recommended: 464.

CHEM 462 Techniques of Synthetic Chemistry (2-3) ASp Techniques of synthetic chemistry with examples from organic, inorganic, and biological chemistry. Vacuum line synthesis, low- and high-temperature techniques, high-pressure syntheses, photochemical reactions, radiochemical synthesis, gas phase reactions, etc. Chromatography and separation techniques. Prerequisite: 347 or 242; 460, which may be taken concurrently.

CHEM 463 Spectroscopic Techniques for Structural Identification (2) ASp Laboratory techniques of spectroscopic analysis for structural determination using UV, IR, NMR, mass spectroscopy. Prerequisite: 460, which may be taken concurrently.

CHEM 464 Computers in Data Acquisition and Analysis (3) W Introduction to use of the computer in the chemistry laboratory. Principles of microcomputers and their use for such problems as data acquisition, noise reduction, instrument control, least squares analysis, multiple linear regression, Fourier transform techniques, autocorrelation, variance analysis. Prerequisites: 455, ENGR 141, MATH 205 or equivalent.

CHEM 470 Physical Chemistry of Macromolecules (3) W Solution thermodynamics, chain dimensions, rubber elasticity, solid-state morphology, and viscoelastic behavior of high polymers. Prerequisites: 457 or 351 or equivalent, and FPE 488 or CH E 570. (Offered alternate years.)

CHEM 471 Physical Chemistry of Macromolecules (3) Sp Classical hydrodynamic methods, and modern optical correlation and pulse techniques for studying dynamical motions and conformations of macromolecules, especially biopolymers, in solution. Cooperative thermal transitions, optical properties, and polyelectrolyte effects. Prerequisites: 457 or 351 and 455; recommended: 470. (Offered alternate years.)

CHEM 480 Topics in Applied Chemistry (1, max. 3) A Applications of pure chemistry, as practiced in industrial and academic settings. Seminar topics vary

and may include pulp and paper, petroleum, medicinal, environmental, and cosmetic chemistry, and biochemistry.

CHEM 488 Teaching Experience in Chemistry (1, max. 6) AWSpS Students are trained as assistants in laboratories and quiz sections. For chemistry majors, especially those planning graduate work or secondary education. Prerequisites: permission of instructor, grade-point average above 3.00, and upper-division standing.

CHEM 499 Undergraduate Research and Report Writing (*, max. 12) AWSpS For chemistry majors only. Research in chemistry and/or study in the chemical literature. Prerequisites: permission of chemistry adviser, chemistry grade-point average above 3.00, and junior standing in chemistry.

Courses for Graduates Only

CHEM 502 Spectroscopic Methods of Structure Elucidation (4) A Theory and practice of spectroscopy as applied to the elucidation of organic structure, conformation and motional analysis, and reaction mechanisms. Spectroscopic methods include UV-visible absorption, circular dichroism, mass spectrometry, infrared and Raman, and pulse magnetic resonance. Prerequisites: three quarters of organic chemistry lectures and two quarters of laboratory; recommended: 455.

CHEM 508 Advanced Inorganic Chemistry (3, max. 9) Sp Discussion of selected applications of nuclear magnetic resonance spectrometry, electronic, infrared, and Raman spectroscopy, magnetic susceptibility measurements, Mossbauer spectrometry and isotope replacement studies in the understanding of structure and bonding in inorganic compounds.

CHEM 510 Current Problems in Inorganic Chemistry (3, max. 12) A For doctoral candidates in inorganic chemistry. Current topics (bioinorganic, advanced organometallic, materials and solid state, advanced inorganic spectroscopy).

CHEM 520 Current Problems in Analytical Chemistry (2, max. 12) AWSp For doctoral candidates in analytical chemistry. Current topics (e.g., electrochemistry, trace analysis, methods of data treatment, analytical instrumentation theory).

CHEM 521 Analytical Electrochemistry (3) Sp Theory and practice of modern electrochemistry with emphasis on instrumentation and applications in chemical analysis. (Offered alternate years.)

CHEM 522 Atomic and Molecular Analytical Spectroscopy (3) A Quantitative analysis of atomic and molecular species, using all forms of electromagnetic radiation, electrons, and gaseous ions. (Offered alternate years.)

CHEM 525 Process Analytical Chemistry (3) Sp Chemical sensors and systems approach to chemical analysis as integral part of monitoring and controlling chemical, biological, and medical processes. (Offered alternate years.)

CHEM 526 Chemometrics (3, max. 9) A Mathematical and statistical methods for experimental design, calibration, signal resolution, and instrument control and optimization. (Offered alternate years.)

CHEM 530 Advanced Organic Chemistry (3) A Fundamental aspects of organic structures and transformations. Structure and basicity of carbanions, substitution reactions, elimination reactions, nucleophilic addition and addition/elimination reactions, condensation reactions, structure and rearrangements of carbocations, electrophilic addition, electrophilic substitutions, neighboring group effects. Prerequisite: 337.

CHEM 531 Advanced Organic Chemistry (3) W Structure, mechanism, acidity and basicity, stereochemistry, kinetics and equilibria, reactive intermediates, and catalysis. Prerequisite: 530.

CHEM 532 Advanced Organic Chemistry (3) Sp Synthetic organic chemistry. Discussion of practical methods for the synthesis of complex organic molecules with an emphasis on synthetic strategy and the control of stereochemistry. Prerequisite: 531.

CHEM 533 Advanced Organic Chemistry (3) Sp Molecular orbital theory in organic chemistry. Woodward-Hoffman rules, aromaticity, concerted reactions, photochemical transformations, and reactions of electron-deficient species. Prerequisite: 530.

CHEM 540 Current Problems in Organic Chemistry (3, max. 18) AWSp For doctoral candidates in organic chemistry. Discussions of topics of current interest and importance. See the department for instructor and topic during any particular quarter.

CHEM 541 Mass Spectrometry in Life Sciences (3) Sp Principles of modern mass spectrometry: applications to problems in chemical, biological, and health sciences. Applications of mass spectrometric techniques to the structural determination and quantitative measurement of biologically important substances. Joint with MEDCH 541. Prerequisite: permission of instructor. (Offered alternate years.)

CHEM 550 Introduction to Quantum Chemistry (3) A Origins and basic postulates of quantum mechanics; solutions to single-particle problems; angular momentum and hydrogenic wave functions; matrix methods; perturbation theory; variational methods. Prerequisite: 455.

CHEM 551 Introduction to Quantum Chemistry (3) Sp Electronic structure of many-electron atoms and molecules; vibration and rotation levels of molecules; effects of particle exchange; angular momentum and group theory; spectroscopic selection rules. Prerequisite: 550.

CHEM 552, 553 Statistical Mechanics (3,3) A,W General theorems of statistical mechanics; relation of the equilibrium theory to classical thermodynamics; quantum statistics; theory of imperfect gases; lattice statistics and simple cooperative phenomena; lattice dynamics and theory of solids; liquids, solutions, and polymers; time-dependent phenomena and mechanisms of interaction. Prerequisites: 455 and 456 (concurrent registration permitted) or equivalent for 552; 552 for 553.

CHEM 559 Chemical Kinetics (3) Sp Modern experimental methods and fundamental theories of reaction rates. Role of vibrational excitation in unimolecular and bimolecular reactions. Energy transfer. Nonequilibrium systems and microscopic rate parameters. Prerequisite: 457 or 552.

CHEM 560 Current Problems in Physical Chemistry (3, max. 9) ASp For doctoral candidates in physical chemistry. A discussion of topics selected from active research fields. See the department for instructor and the topic during any particular quarter.

CHEM 581 Macromolecules (3, max. 9) Physical chemistry of macromolecules and biopolymers. Topics include solution thermodynamics, hydrodynamic properties, molecular weight distributions, optical and electro-optic techniques, chain configuration statistics, cooperative phenomena, theory of rubber elasticity, polyelectrolytes.

CHEM 582 Surface and Membrane Chemistry (3, max. 9) Advanced treatment of multiphase equilibrium; chemisorption and contact catalysis; micelles, theory of membrane formation, potentials, and action; physical adsorption and surface-area measurement. Prerequisites: 456 or other courses in basic thermodynamics and MATH 238; recommended: 552.

CHEM 583 Magnetic Resonance Methods in Chemistry (3, max. 9) Magnetic resonance phenomena in molecular systems. Topics include the chemical shift and spin-spin splitting in proton and ^{13}C NMR,

quadrupole interactions in NQR, hyperfine interaction and zero field splittings in ESR. Applications of magnetic resonance to the study of molecular structures and dynamics, including electronic properties of excited states as revealed by optical detection of magnetic resonance.

CHEM 581 Topics in Inorganic Chemistry (3, max. 18) AWSp Open only to students accepted for doctoral work in chemistry.

CHEM 582 Topics in Analytical Chemistry (3, max. 18) AWSp Open only to students accepted for doctoral work in chemistry.

CHEM 583 Topics in Organic Chemistry (3, max. 18) AWSp Open only to students accepted for doctoral work in chemistry.

CHEM 585 Topics in Physical Chemistry (3, max. 18) AWSp Open only to students accepted for doctoral work in chemistry.

CHEM 590 Seminar in General Chemistry (1, max. 18) AWSps For chemistry graduate students only.

CHEM 591 Seminar in Inorganic Chemistry (1, max. 18) AWSps For chemistry graduate students only.

CHEM 592 Seminar in Analytical Chemistry (1, max. 18) AWSps For chemistry graduate students only.

CHEM 593 Seminar in Organic Chemistry (1, max. 18) AWSps For chemistry graduate students only.

CHEM 595 Seminar in Physical Chemistry (1, max. 18) AWSps For chemistry graduate students only.

CHEM 600 Independent Study or Research (*) AWSps Prerequisite: permission of coordinator.

CHEM 700 Master's Thesis (*) AWSps Prerequisite: permission of coordinator.

CHEM 800 Doctoral Dissertation (*) AWSps Prerequisite: permission of coordinator.

Chicano Studies

See *American Ethnic Studies*.

Chinese Regional Studies

See *International Studies*.

Classics

218 Denny

Classics embraces the ancient Greek and Roman civilizations from prehistoric times to the Middle Ages. The department is concerned with both the Greek and Latin languages and their literatures, including poetry, drama, history, philosophy, rhetoric, and political theory, as well as with classical art and archaeology.

Classics in Rome Program: During Spring Quarter, the department offers instruction in classics for advanced undergraduate majors and graduate students at the University's Center for Italian Studies in Rome, located in the Palazzo Pio on the Campo De' Fiori.

Undergraduate Program

Bachelor of Arts Degree

Major Requirements: *Classical Studies:* Greek or Latin through 307 or the equivalent; 36 additional credits chosen with department approval from courses in Greek and Latin at the 300 or 400 level (excluding LAT 300, 301, or GRK 300, 301), classics in English, classical art and archaeology, ancient history, the history of ancient philosophy, and the history of ancient science. *Classical studies* is especially suited to students not preparing for graduate study in classics but wishing to explore the literature, history, art, archaeology, and philosophy of classical antiquity primarily through English translations.

Classics: 18 approved credits in Greek at the 400 level and 18 approved credits in Latin at the 400 level.

Greek: 27 approved credits in Greek at the 400 level plus 9 credits chosen with department approval from courses in Latin, Greek at the 400 level, classics in English, classical art and archaeology, ancient history, the history of ancient philosophy, and the history of ancient science.

Latin: 27 approved credits in Latin at the 400 level plus 9 credits chosen with department approval from courses in Greek, Latin at the 400 level, classics in English, classical art and archaeology, ancient history, the history of ancient philosophy, and the history of ancient science.

CLAS 101, 205, and HST 111 may not be offered in fulfillment of major requirements for baccalaureate degrees in the Department of Classics.

Graduate Program

Michael R. Halleran, Graduate Program Coordinator

The Department of Classics offers programs of graduate study leading to the Master of Arts and Doctor of Philosophy degrees. The M.A. degree may be in Greek, Latin, or Classics (a combination of Greek and Latin). The Ph.D. degree requires both Greek and Latin.

The program of formal instruction has been designed to ensure comprehensive and thorough training in the basic disciplines needed for teaching and research. The department offers courses in the major writers and periods of literature, philosophy, and history, in classical art and archaeology, and in Greek and Latin linguistics. The courses in Greek and Latin literature include most works on the Ph.D. degree reading list. Seminars introduce research techniques through the study of more specialized topics, which vary from quarter to quarter. Students may include in their programs courses and seminars given by other departments in such subjects as ancient philosophy, ancient and medieval history, comparative literature, and linguistics. A brochure, *The Graduate Program in Classics*, available from the department, gives additional information.

The Suzzallo Library has an extensive classics collection. The department's seminar room in Denny Hall, which is available to graduate students for their study and research, contains an excellent noncirculating library with such reference works as Pauly-Wissowa, *L'Année Philologique*, the *Thesaurus Linguae Latinae*, the *Müller Handbuch* series, the Teubner and Oxford texts, commentaries on the classical authors, standard collections of inscriptions and fragments, and a number of important serials. The department also possesses an Ibycus scholarly computer and a license for the *Thesaurus Linguae Graecae* data base.

Applicants for admission to the M.A. program should present an undergraduate major or its equivalent in Greek, Latin, or Classics. Prospective aspirants for the

Ph.D. degree should have had two years of upper-division study in both languages, but may be admitted with less preparation in one language if their preparation in the other language is exceptionally strong. Admission to the Ph.D. program may be granted after completion of the requirements for the M.A. degree.

M.A. degree requirements are a minimum of 27 credits in courses or seminars in Greek or Latin or both, and in related subjects approved by the department; a reading knowledge of French or German; either an acceptable thesis or 9 additional credits in approved graduate courses and seminars and a research paper.

Doctor of Philosophy degree requirements are a minimum of 72 credits in courses or seminars in Greek, Latin, and related subjects approved by the department; a reading knowledge of French and German; Greek and Latin prose composition; translation examinations on the Greek and Latin reading list; examinations in two special authors and one field of classical studies; an oral General Examination; dissertation and Final Examination. Graduate students must have teaching experience before completing requirements for their terminal degree.

A number of teaching assistantships are available. Assistants teach sections of an elementary course in Latin and Greek derivatives, hold discussion sections in classical literature in translation, or assist faculty members with other courses. The teaching load is four to five hours a week throughout the academic year.

Correspondence and Information

Graduate Program Coordinator
218 Denny, DH-10

Faculty

Chairperson

Daniel P. Harmon

Professors

Bliquez, Lawrence J., * 1970, (Art), † M.A., 1965, Ph.D., 1968, Stanford; Greek oratory, Greek historiography and historians, Greek and Roman medicine.

Grummel, William C., * 1950, (Emeritus), M.A., 1940, Washington (St. Louis); Ph.D., 1949, New York; Latin literature and philosophy, Roman historians.

Harmon, Daniel P., * 1967, (Comparative Literature), † M.A., 1965, Ph.D., 1968, Northwestern; Latin and Greek poetry, Greek and Roman religion, classical linguistics.

MacKay, Pierre A., * 1966, (Computer Science), (Near Eastern Languages and Civilization, Comparative Literature), † M.A., 1959, Ph.D., 1964, California (Berkeley); Greek literature, postclassical and Byzantine Greek literature, numismatics, computer typesetting and document preparation.

McDiarmid, John B., * 1949, (Emeritus), Ph.D., 1940, Johns Hopkins; Greek literature and philosophy.

Pascal, Paul, * 1953, (Art), Ph.D., 1953, North Carolina; Latin literature, Roman archaeology, medieval Latin.

Associate Professors

Halleran, Michael R., * 1983, A.M., 1978, Ph.D., 1981, Harvard; Greek tragedy, Greek epic, late republican and Augustan poetry.

Langdon, Merle K., * 1976, (Art), † Ph.D., 1972, Pennsylvania; Greek archaeology, epigraphy, topography, history.

Assistant Professors

Clauss, James J., * 1984, M.A., 1976, Fordham; Ph.D., 1983, California (Berkeley); Latin poetry, Hellenistic literature.

Gowing, Alain M., 1988, M.A., 1981, Bryn Mawr; Latin and Greek historiography, Latin literature of the empire.

Whitlock Blundell, Mary, * 1985, M.A., 1981, Oxford (England); Ph.D., 1984, California (Berkeley); Greek and Roman philosophy and literature.

Course Descriptions

Courses for Undergraduates

Classics Courses in English

Upper-division classics courses in English (300 and 400 level) in the Department of Classics do not generally have prerequisites. Most 400-level courses deal with a single genre of literature or with a limited area of classical studies. The 300-level courses deal with broader subjects at a relatively advanced level. Both are primarily for juniors and seniors, but they are open to freshmen and sophomores with an interest or background in the subject of the course.

CLAS 101 Latin and Greek in Current Use (2) AWSpS Designed to improve and increase English vocabulary through a study of the Latin and Greek elements in English, with emphasis on words in current literary and scientific use. No auditors. Knowledge of Latin or Greek is not required.

CLAS 205 Bioscientific Vocabulary Building From Latin and Greek (3) AWSpS Designed to help the student master the scientific vocabulary of his or her particular field by a study of the Latin and Greek roots that are used to create the majority of scientific terms. No auditors. Knowledge of Latin or Greek is not required.

CLAS 210 Greek and Roman Classics in English (5) AWSpS Bliquez, Clauss, Gowing, Halleran, Harmon, Langdon, MacKay, Pascal, Whitlock Blundell Introduction to classical literature through a study of the major Greek and Latin authors in modern translation.

CLAS 320 Greek and Roman Private and Public Life (3) A or Sp Bliquez Study of the civic and social practices and institutions of everyday Greek and Roman private and public life, including the family, social classes, the courts and legal systems, military service and war, technology and the trades, money and banking, agriculture and rural life. Many lectures illustrated by slides.

CLAS 322 Intellectual History of Classical Greece (5) Sp Whitlock Blundell Development of Greek thought from mythic and poetic formulations to description, analysis, and systematic abstraction; based on the study of a variety of poetic, historical, and philosophical texts, from Homer to the Hellenistic age.

CLAS 324 Greek and Roman Athletics (3) Langdon Greek and Roman athletic festivals and events, and the place of athletes and sport in ancient society.

CLAS 420 Roman Politics: The Rise and Fall of Political Freedom (3) Gowing The political theory of the Romans, the realities of republican power politics, and the tensions and conflicts that brought about the loss of political freedom. Special attention is given to contrasts and comparisons with our own political institutions as they were conceived by the framers of the Constitution and as they function today.

CLAS 422 Greek Historians and Philosophers in English (3) Readings, lectures, and discussion of select historical and philosophic texts in English translation.

CLAS 424 The Epic Tradition (5) A Clauss, Halleran, MacKay Ancient and medieval epic and heroic poetry of Europe in English: the *Iliad*, *Odyssey*, and *Aeneid*; the *Roland* or a comparable work from the medieval oral tradition; pre-Greek forerunners, other

Greco-Roman literary epics, and later medieval and Renaissance developments and adaptations of the genre. Choice of reading material varies according to instructor's preference. Joint with CLIT 424.

CLAS 427 Greek and Roman Tragedy in English (3) W Halleran Study of the development of Greek and Roman tragedy, with extensive readings in representative plays of Aeschylus, Sophocles, Euripides, and Seneca.

CLAS 428 Greek and Roman Comedy in English (3) A or Sp Pascal Readings from the comedies of Aristophanes, Plautus, and Terence.

CLAS 430 Greek and Roman Mythology (3) AWSp Clauss, Gowing, Halleran, Pascal Principal myths found in classical and later literature.

CLAS 435 The Ancient Novel (3) W Pascal Study of the origins and growth of fiction and the novel in the Latin tradition.

CLAS 440 Greek and Roman Critics in English (3) Literary theories of the Greeks and the Romans as seen in the writings of Plato, Aristotle, Longinus, and other major classical authors. Attention is given to their influence on modern literary critics.

CLAS 445 Greek and Roman Religion (3) A Harmon, Langdon Religion in the social life of the Greeks and Romans, with emphasis placed on their public rituals and festivals. Attention is given to the priesthoods, personal piety, rituals of purification and healing, and the conflict of religions in the early Roman Empire. Many lectures illustrated by slides. Joint with RELIG 445. Prerequisite: one course in ancient history, or classics, or religious studies; RELIG 201 preferred.

Classical Archaeology

CL AR 340 Pre-Classical Art and Archaeology (3) A Langdon Survey of the art and the other material remains of the civilizations in the Aegean from the Neolithic Age to the end of the Bronze Age, with special emphasis on Minoan Crete and the Mycenaean kingdoms of mainland Greece, illustrated by slides. The history, techniques, and results of significant excavations are examined. Joint with ART H 340.

CL AR 341 Greek Art and Archaeology (3) W Bliquez, Langdon Survey of the material remains and the developing styles in sculpture, vase painting, architecture, and the minor arts from the geometric to the Hellenistic periods, illustrated by slides. Principal sites and monuments, as well as techniques and methods of excavation, are examined in an attempt to reconstruct the material culture of antiquity. Joint with ART H 341.

CL AR 342 Roman Art and Archaeology (3) Sp Pascal Roman architecture and art, with emphasis on the innovations of the Romans; illustrated by slides. Joint with ART H 342.

CL AR 343 Hellenistic Art and Archaeology (3) Sp Langdon Survey of the art of Greece and the eastern Mediterranean from the time of Alexander the Great to the Roman conquest. Principal sites with their sculpture, painting, mosaics, and minor arts examined in lectures illustrated with slides. Joint with ART H 343.

CL AR 442 Greek and Roman Painting (3) A Langdon Study of painted decoration on Greek vases, and Roman wall painting, with emphasis on the historical and stylistic development of each. Joint with ART H 442. (Offered alternate years; offered 1988-89.)

CL AR 444 Greek and Roman Sculpture (3) W Langdon History and development of Greek sculpture and sculptors, their Roman copyists, and Roman portraits and sarcophagi. Emphasis on Greek sculpture of the fifth century B.C. Joint with ART H 444. (Offered alternate years; offered 1988-89.)

CL AR 446 Greek Architecture (3) Sp Langdon Detailed study of Greek architecture from its beginnings, with special emphasis on the Periclean building

program in fifth-century Athens. Joint with ARCH 454 and ART H 446. (Offered alternate years; offered 1988-89.)

Greek

GRK 101, 102, 103 Elementary Greek (5,5,5) A,W,Sp 101, 102: an intensive study of grammar, with reading and writing of simple Attic prose; 103: reading of selections from classical Greek literature. Prerequisites: 101 for 102, 102 for 103.

GRK 300, 301 Greek Language, Accelerated (5,5) W,Sp Intensive introduction to Attic Greek. Not accepted as upper-division credit toward a major in Greek or classics. Prerequisites: some previous experience in, or study of, a foreign language for 300; 300 for 301.

GRK 305, 306 Attic Prose (5,5) A Translation of selections from Attic prose; elementary exercises in Attic prose composition. Prerequisites: 103, 301, or equivalents.

GRK 307 Homer (5) Sp Translation of selections from the *Iliad* or the *Odyssey*; Attic prose composition, metrics. Prerequisite: 306 or equivalent.

GRK 308 Introduction to Koine Greek Texts (3) Sp Williams Reading and discussion of selected religious and philosophical texts from Koine Greek. Prerequisite: 306.

GRK 401, 402, 403 Elementary Modern Greek (5,5,5) Introduction to spoken modern Greek, with emphasis on conversational skills. Reading of contemporary writers of demotic Greek. The artificial literary language (Katharevousa) is introduced but not explored in depth. Some experience in language study desirable.

Prerequisite for the following 400-level Greek courses: four years of high school Greek or 307 or permission of undergraduate adviser.

GRK 413 The Pre-Socratic Philosophers (3) A Whitlock Blundell See above. (Offered alternate years; offered 1988-89.)

GRK 414 Plato (3) W MacKay, Whitlock Blundell See above. (Offered alternate years; offered 1988-89.)

GRK 415 Aristotle (3) Sp MacKay, Whitlock Blundell See above. (Offered alternate years; offered 1988-89.)

GRK 422 Herodotus and the Persian Wars (3) A Bliquez, Langdon See above. (Offered alternate years; offered 1989-90.)

GRK 424 Thucydides and the Peloponnesian War (3) W Bliquez, Langdon See above. (Offered alternate years; offered 1989-90.)

GRK 426 Attic Orators (3) Sp Bliquez, Langdon, MacKay See above. (Offered alternate years; offered 1989-90.)

GRK 442, 443, 444 Greek Drama (3,3,3) A,W,Sp Halleran See above. (Offered alternate years; offered 1989-90.)

GRK 449 Greek Epic (3) A Halleran, MacKay See above. (Offered alternate years; offered 1988-89.)

GRK 451 Lyric Poetry (3) W Halleran, Whitlock Blundell See above. (Offered alternate years; offered 1988-89.)

GRK 453 Pindar: The Epinician Odes (3) Sp Halleran See above. (Offered alternate years; offered 1988-89.)

GRK 461 Early Greek Literature (3-5, max. 15) S Readings and discussion of selected authors of the early Greek period.

GRK 462 Literature of Classical Athens (3-5, max. 15) S Readings and discussion of selected authors of the Hellenistic Age.

GRK 463 Hellenistic Greek Literature (3-5, max. 15) S Clauss Readings and discussion of selected authors of the Hellenistic Age.

GRK 490 Supervised Study (*, max. 18) AWSp Special work in literary and philosophical texts for graduates and undergraduates. Prerequisite: permission of undergraduate adviser.

GRK 499 Undergraduate Research (*, max. 18) AWSp Prerequisite: permission of undergraduate adviser.

Latin

LAT 101, 102, 103 Elementary Latin (5,5,5) A,W,Sp 101, 102: an intensive study of grammar, with reading and writing of simple Latin prose; 103: reading of selections from classical Latin literature. Prerequisites: 101 for 102, 102 for 103.

LAT 300, 301 Latin Language, Accelerated (5,5) W,Sp Intensive introduction to classical Latin. Not accepted as upper-division credit toward a major in Latin or classics. Prerequisites: some previous experience in, or study of, a foreign language for 300; 300 for 301.

LAT 305 Introduction to Latin Literature (5) A Readings in prose and poetry from various Latin authors; elementary exercises in Latin prose composition. Prerequisite: 103 or 301 or equivalent.

LAT 306 Cicero and Ovid (5) Readings from the orations of Cicero and the poetry of Ovid; elementary exercises in Latin prose composition. Prerequisite: 305 or equivalent.

LAT 307 Vergil (5) Sp Selections from the first six books of the *Aeneid*; elementary exercises in Latin prose composition or metrics. Prerequisite: 306 or equivalent.

LAT 401 Medieval Latin Prose (3) Pascal Readings and discussion of medieval Latin prose. Prerequisite: permission of instructor.

LAT 402 Medieval Latin Poetry (3) Pascal Readings and discussion of medieval Latin poetry. Prerequisite: permission of instructor.

Prerequisite for the following 400-level Latin courses: four years of high school Latin, or 307, or permission of undergraduate adviser.

LAT 412 Lucretius (3) A Whitlock Blundell See above. (Offered alternate years; offered 1989-90.)

LAT 414 Seneca (3) Sp Whitlock Blundell See above. (Offered alternate years; offered 1989-90.)

LAT 422 Livy (3) A Clauss, Gowing See above. (Offered alternate years; offered 1988-89.)

LAT 423 Cicero and Sallust (3) W Clauss, Gowing See above. (Offered alternate years; offered 1988-89.)

LAT 424 Tacitus (3) Sp Clauss, Gowing See above. (Offered alternate years; offered 1988-89.)

LAT 447 Roman Lyric (3) A Harmon See above. (Offered alternate years; offered 1989-90.)

LAT 449 Roman Elegy (3) W Harmon See above. (Offered alternate years; offered 1989-90.)

LAT 451 Roman Satire (3) Sp Pascal See above. (Offered alternate years; offered 1989-90.)

LAT 457 Roman Drama (3) A Pascal See above. (Offered alternate years; offered 1988-89.)

LAT 458 Roman Epic (3) W Clauss, Halleran, Harmon See above. (Offered alternate years; offered 1988-89.)

LAT 461 Latin Literature of the Republic (3-5, max. 15) S Readings and discussion of selected authors from the era of the Roman Republic.

LAT 462 Latin Literature of the Augustan Age (3-5, max. 15) S Readings and discussion of selected authors from the Augustan era.

LAT 463 Latin Literature of the Empire (3-5, max. 15) S Readings and discussion of selected authors from the Roman Empire.

LAT 465 Roman Topography and Monuments (5, max. 10) Sp Clauss, Harmon Study of the material remains of ancient Rome from the archaic period through the imperial age. Reading of source materials and inscriptions in Latin. Conducted in Rome.

LAT 475 Improvement of Teaching: Latin (3) S Pascal Examination and evaluation of the various methods of teaching Latin; audiovisual aids; testing materials; textbooks; relation of Latin to other languages; Latin derivatives in English vocabulary. Joint with EDC&I 438. (Offered Summer Quarter only.)

LAT 476 Caesar and Vergil for High School Teachers (3) S Clauss, Pascal Interpretation of the works of Caesar and Vergil, with special reference to the problems of high school teaching. Joint with EDC&I 439.

LAT 490 Supervised Study (*, max. 18) AWSp Special work in literary and philosophical texts for graduates and undergraduates. Prerequisite: permission of undergraduate adviser.

LAT 499 Undergraduate Research (*, max. 18) AWSp Prerequisite: permission of undergraduate adviser.

Courses for Graduates Only

Classics

CLAS 700 Master's Thesis (*)

CLAS 800 Doctoral Dissertation (*)

Greek

GRK 500 Grammar and Composition (3) MacKay, Whitlock Blundell Translation of passages from English to Greek for the purpose of acquiring advanced knowledge of the grammar and the style of the classical tongue.

GRK 501 Homer (3) Halleran, MacKay Readings from the *Iliad* or the *Odyssey*.

GRK 503 Aristophanes (3) Bliquez Select comedies.

GRK 504 Plato (3) MacKay, Whitlock Blundell The *Republic* or other dialogues.

GRK 506 Aristotle (3) MacKay, Whitlock Blundell *Politics* and/or *Ethics*.

GRK 508 Lysias and Demosthenes (3) Bliquez, MacKay Select speeches, oratorical theory, historical questions.

GRK 510 Greek Historians (3, max. 6) Bliquez, MacKay Selections from Herodotus, Thucydides, or Xenophon. May be repeated for credit with change in subject matter.

GRK 512 Greek Tragedy (3, max. 6) Halleran Aeschylus, Sophocles, and/or Euripides. May be repeated for credit with change in subject matter.

GRK 520 Seminar (3, max. 27) AWSp Bliquez, Halleran, Harmon, MacKay, Whitlock Blundell

GRK 590 Supervised Study (*, max. 18) AWSp Prerequisite: permission of graduate program coordinator.

GRK 600 Independent Study or Research (*) AWSp

Latin

LAT 500 Grammar and Composition (3) *Clauss, Gowing* Translation of passages from English to Latin for the purpose of acquiring advanced knowledge of the grammar and style of the classical tongue.

LAT 501 Vergil (3) *Clauss, Harmon* The *Aeneid*.

LAT 502 Horace (3) *Clauss, Harmon* *Odes* and/or *Epistles*.

LAT 503 Plautus and Terence: Early Republican Literature (3) *Pascal, Whitlock Blundell*

LAT 504 Philosophy at Rome (3) *Whitlock Blundell* Selected philosophical works of Cicero and other sources for Hellenistic and Roman philosophy.

LAT 506 Cicero (3) *Gowing* Select speeches, with attention to rhetorical theory and/or letters.

LAT 508 Silver Latin Literature (3) *Pascal* Selections from Martial, Lucan, and Petronius.

LAT 510 Roman Historians (3, max. 6) *Clauss, Gowing* Caesar, Livy, and/or Tacitus. May be repeated for credit with change in subject matter.

LAT 512 Augustan Poetry (3, max. 6) *Clauss, Harmon* Vergil's *Eclogues* and *Georgics*, Roman elegaic poetry, and/or Ovid's *Metamorphoses* and *Amores*. May be repeated for credit with change in subject matter.

LAT 520 Seminar (3, max. 27) AWSp *Clauss, Hal-leran, Harmon, Pascal, Whitlock Blundell*

LAT 565 Seminar in Rome (5, max. 10) Sp Study of selected topics and authors in Latin literature. Conducted in Rome.

LAT 590 Supervised Study (*, max. 18) AWSp Prerequisite: permission of graduate program coordinator.

LAT 600 Independent Study or Research (*) AWSP

Classical Archaeology

CL AR 511 Mycenaean Archaeology (3) The art, architecture, and culture of Greece in the late Bronze Age, with emphasis on recent archaeological and linguistic discoveries.

CL AR 513 Athenian Topography (3) *Langdon* Detailed consideration of the topography and monuments of ancient Athens from the beginning through the Roman period.

CL AR 515 Greek Epigraphy (3) *Langdon* Selected inscriptions from various Greek states and sanctuaries and evidence they provide for religious and social practices, literature, and political history. Classification and editing of inscriptions, and epigraphical techniques.

CL AR 541 Seminar in Greek and Roman Art (3) *Langdon* In-depth study of selected topics and problems of the art of ancient Greece and Rome. Joint with ART H 541.

Classical Linguistics

CL LI 501 Comparative Phonology of Greek and Latin (3) *Harmon* Phonological developments of Greek and Latin from Indo-European to the classical periods of both languages.

CL LI 503 History of the Greek Language (3) W Morphological and syntactical development of the Greek language from Homer through the New Testament; the development of prose and poetic style.

CL LI 505 History of the Latin Language (3) Sp *Harmon* Morphological and syntactical development of the Latin language; the development of Latin as a literary language.

CL LI 506 Italic Dialects (3) *Harmon* Principal remains of the non-Latin languages and dialects of ancient Italy.

CL LI 508 Greek Dialects (3) Non-Attic dialects of ancient Greek, based on a study of inscriptions and the literary remains.

CL LI 510 Mycenaean Greek (3) Study of the Linear-B tablets found in Crete and on the Greek mainland.

Communications

127 Communications

Undergraduate Program

Adviser

118 Communications

The School of Communications offers undergraduate professional preparation in advertising, broadcast journalism, communications, and editorial journalism. Undergraduate majors are given training in communication skills and opportunities for practical experience in their fields. The undergraduate program requires additional course work in social sciences and literature.

Admission Requirements: 65 graded college-level credits but not more than 120 college-level credits; CMU 201, 202, 203 (or equivalents); no more than 20 credits in School of Communications courses; at least 15 graded credits earned at the University prior to application; two courses from the College of Arts and Sciences English composition proficiency list; at least 20 credits in courses selected from the three distribution groups—humanities, natural sciences, and social sciences—with at least one course from each group; a grade-point average in the past three quarters (or 45 credits), either at the University or at any other collegiate institution, at least .20 of a point above the preceding Spring Quarter all-University grade-point average. Satisfaction of these minimum requirements ensures consideration; it does not guarantee acceptance.

Major Requirements: 10 credits from courses in literature; 35 credits in related social sciences (courses to be selected from anthropology, economics, geography, history, philosophy, political science, psychology, and sociology), including at least 20 credits in one department and 20 credits in courses at the 300 and 400 levels; core requirements of at least 50 credits within the school, to include the following: CMU 201, 202, 203, 315, 320; and three additional communications courses at the 400 level, one in each of these areas—theoretical, methodological, substantive (see adviser for specific listing for each category), with the exclusion of CMU 415, 449, 498; and one of the following sequences of study: Advertising—CMU 341, 344, 345; Broadcast Journalism—CMU 350, 354, 356, 358; Editorial Journalism—CMU 322, and one of the following: 323, 324, 325, 327, 328; Communications—This sequence provides four options: communication research, consumer behavior, international communication, public communication. Each option is organized into a sequence to allow a student to explore communication research and its application in a range of settings.

To continue as a major in the school, a student must maintain an acceptable grade-point average for all courses in the school and an average no more than .30 of a point below the all-University average for all course work outside the school.

Internship Programs: Internship credit does not fulfill any specific course requirements, nor does it apply to the 50 communications credits that must be earned for graduation. The internship is designed to augment, not replace, the formal course offerings.

Graduate Program

C. Anthony Giffard, Graduate Program Coordinator

The School of Communications offers programs leading to the degrees of Master of Arts, Master of Communications, and Doctor of Philosophy.

The Master of Communications degree program offers the practicing professional journalist an opportunity to develop a substantive reporting specialty in conjunction with the academic study of communication.

The Master of Arts degree program provides training in research and scholarship and can be either preparation for doctoral study or a terminal degree. A thesis is required.

The Doctor of Philosophy degree program is designed to develop conceptual and methodological capabilities in a substantive area of communication. (Substantive scholarly interests represented in the school may be found in the faculty listing below.) Doctoral students are expected to apply these capabilities as apprentice scholars in the teaching and research functions of the school.

A foreign language, if appropriate to the student's program of study, may be required in the M.A. and Ph.D. programs.

Special Requirements

Students are admitted to programs in the Autumn Quarter. February 15 is the deadline for all applicants who wish to be considered for financial support. The deadline for initiating applications for Autumn Quarter admission is April 1.

An applicant for a program must submit: transcripts of all previous study; results of required tests (the Graduate Record Examination for all programs, plus the Miller Analogies Test for the M.A. and Ph.D. programs); a letter of intent linking the applicant's vocational objectives to an available graduate program; three letters of recommendation and, where applicable, evidence of fluency in English.

Financial Aid

Applications for teaching and research assistantships should be submitted to the department by February 15. Notices of financial aid are sent in most cases on or about April 1.

Research Facilities

The International Communications Center facilitates research abroad, issues publications, and organizes international conferences.

The editorial laboratory offers word-processing, text-editing, and computing capabilities to facilitate research and computer-assisted instruction. A remote station links the school to the University's three main-frame computers for statistical analysis, data-base management, and document preparation. The school has its own closed-circuit television laboratory. Access also is available to the University's radio (KCMU-FM and KUOW-FM) and television (KCTS-TV) stations.

Correspondence and Information

Graduate Program Coordinator
235 Communications, DS-40

Faculty**Acting Director**

Don R. Pember

Professors

Ames, William E.,* 1957, M.S., 1952, Iowa State; Ph.D., 1962, Minnesota; communication history; early American history, historiography.

Carter, Richard F.,* 1967, M.S., 1954, Ph.D., 1957, Wisconsin; conceptual analysis, communication theory, new methods for communication research, scientific perspectives on behavioral analysis.

Edelstein, Alex S.,* 1955, M.A., 1948, Stanford; Ph.D., 1958, Minnesota; comparative communication research, public opinion, propaganda, international communication.

Giffard, C. Anthony,* 1978, M.A., 1964, Ph.D., 1968, Washington; international communication systems, media systems in South Africa, antecedents of the periodical press.

Lang, Gladys Engel,* 1984, (Political Science, Sociology),† M.A., 1942, Washington; Ph.D., 1954, Chicago; public opinion, politics and the press, mass communication research.

Lang, Kurt,* 1984, M.A., 1952, Ph.D., 1953, Chicago; mass media and politics, international conflict, social movements.

Pember, Don R.,* 1969, M.A., 1966, Michigan State; Ph.D., 1969, Wisconsin; contemporary law and mass communication, First Amendment history, regulation of mass communication, press-government relations, contemporary media performance.

Shadel, Willard F., 1963, (Emeritus), M.A., 1935, Michigan; broadcasting.

Smith, Henry Ladd, 1955, (Emeritus), M.A., 1936, Ph.D., 1946, Wisconsin; history/editorial journalism.

Stamm, Keith R.,* 1973, M.S., 1965, Ph.D., 1968, Wisconsin; communities and newspapers, new media technology, dynamic models of communication behavior.

Yerxa, Fendall W.,* 1965, (Emeritus), A.B., 1936, Hamilton; journalism.

Associate Professors

Baldasty, Gerald J.,* 1978, M.A., 1974, Wisconsin (Madison); Ph.D., 1978, Washington; communications history and law, government-press relations, First Amendment philosophy and theory.

Bowen, Lawrence,* 1973, M.A., 1971, Ph.D., 1974, Wisconsin; advertising, media research, consumer information-seeking and -processing behaviors.

Bowes, John E.,* 1974, M.S., 1965, Syracuse; Ph.D., 1971, Michigan; man-machine communication, public opinion, international communication.

Cranston, Pat,* 1954, (Environmental Studies), M.A., 1954, Texas (Austin); broadcast journalism; history, writing, and production of docudramas.

Jackson, Kenneth M.,* 1974, M.A., 1968, Ph.D., 1970, Washington; institutional communications, media research, mass media and public policy.

Johnston, William F., 1969, (Emeritus), B.A., 1941, Idaho; editorial journalism.

Roller, J. Reid, 1970, (Emeritus), M.B.A., 1940, Ohio; advertising.

Samuelson, Merrill,* 1962, M.S., 1955, Oregon; Ph.D., 1960, Stanford; research methods, processes of reading, patterns in reader selection of news stories.

Simpson, Roger A.,* 1971, M.S., 1961, Wisconsin; Ph.D., 1973, Washington; communication history, law of communication, media economics, editorial journalism.

Assistant Professors

Kleibowicz, Richard B.,* 1984, M.A., 1978, Ph.D., 1984, Minnesota; communications history/law, impact of technology on press and society.

Labunski, Richard,* 1984, M.A., 1977, Ph.D., 1979, California (Santa Barbara); communications law, broadcast journalism.

Larson, James F.,* 1984, A.M., 1976, Ph.D., 1978, Stanford; advertising, international communication.

Taylor, Gabriela A., 1986, M.A., 1976, Leicester (England); Ph.D., 1985, Brandeis; mass media, popular culture.

Lecturer

Foote, Patricia L., 1986, B.A., 1971, Washington; editorial journalism.

Course Descriptions

Courses for Undergraduates

CMU 201 History and Development of Communication and Journalism (5) History and development of communication from prehistoric times: social and technical inventions; political and economic contexts.

CMU 202 The Phenomena of Communicating (5) Types of communicating behaviors in progressively more complex situations, from individual cognition through interpersonal interactions to mass communicating.

CMU 203 Mass Communications and Society (5) Structure and functions of mass media communication systems; audiences and content; alternative structures; implications of new technologies.

CMU 300 Fundamentals of Applied Communication (5) Practice in communicating in variety of social relationships: intimate; employer-employee; instructor-student; client-helper; public organization. Problem areas include: cooperation, competition, instruction, and invention. Prerequisite: 202 or permission of instructor.

Journalism

CMU 304 The Press and Politics in the United States (5) Journalists' role in elections and public policy. Relationship between news coverage and political campaigns. Study and analysis of local political newswriting, reporting, and response by local and state political figures. Joint with POL S 304.

CMU 315 Information Processing for Mass Media (5) Training in gathering information through interviews and observation, and from written records and other public sources. Practice in organizing and writing this information for presentation in a mass medium such as a newspaper or radio or television broadcast. Open only to majors. Prerequisite: ability to type.

CMU 320 Legal Aspects of Communications (5) Regulations governing publication and broadcast in the mass media. Open to nonmajors.

CMU 322 Reporting (4) News gathering and writing. Open only to majors. Prerequisite: 315.

CMU 323 Special Reporting Topics (4, max. 12) Topics vary with instructor. Open only to majors. Prerequisite: 322.

CMU 324 Critical Writing for the Mass Media (4) Editorials, commentaries, reviews. Prerequisite: 315.

CMU 327 Legislative Reporting (12) W Full-time coverage of Washington legislature for a daily newspaper. Selected students live in Olympia, interview legislative delegations, report committee and floor sessions, gubernatorial and other press conferences. Open only to majors. Prerequisites: 315, 322, POL S 382, and permission of instructor.

CMU 328 King County News Bureau (8 or 12) Consists of full-time work in school's King County News Laboratory, reporting for area's newspapers and radio stations, covering all county offices/services. Involves heavy writing schedule, deadlines, advanced reporting. Prerequisites: 315, 322, 323, or 327 for editorial journalism majors; 350 or 356 for broadcast journalism majors; permission of instructor.

CMU 391 Photography (3) Basic photojournalism, black-and-white processing and 35-mm. camera techniques, picture editing and layout, field assignments.

CMU 392 Advanced Still Photography (3) Photojournalism, introduction to color for publication, extensive field assignments for news and documentary, advertising, and free-lance photography.

CMU 399 Editorial Practicum Seminar (2-6, max. 6) Supervised academic work done in connection with editorial internship. Designed to extend the student's knowledge of professional perspectives. Does not apply to required 50 credits in communications. Open only to majors. Prerequisites: 315, 320, 322, and permission of instructor.

CMU 425 Advanced Journalism Methods (5, max. 10) Reporting regional trends; analyzing and using aggregate data; news planning. Prerequisite: 322 and 328 or permission of instructor.

Public Relations

CMU 339 Problems in Public Relations (3) Group practice in applying techniques to problems of local businesses and agencies.

Advertising

CMU 341 Beginning Advertising Copy and Layout (5) Writing effective copy; developing creative approaches. Specific approaches and strategies. Open only to majors. Prerequisite: 315.

CMU 342 Advanced Advertising Copy and Layout (3) Multimedia creative and writing experience. Open to majors only. Prerequisite: 341.

CMU 344 Advertising Media Planning (3) Characteristics of the media. Demographic, geographic, and psychographic factors in developing a target audience. Writing of local and national media plans. Open only to majors. Prerequisite: 315.

CMU 345 Advertising Campaigns (5) Preparation of an advertising plan for a product or service. Open only to majors. Prerequisites: 341, 344.

CMU 347 Advertising Internship (2-5, max. 6) Internships are assigned to qualified students through the cooperation of the industry working with the school. Open only to majors. Does not apply to required 50 credits in communications. Prerequisites: 341 or 344, depending on nature of internship; 120 credits completed.

CMU 348 Advertising Research (3) Problems relevant to advertisers, agencies, media, and syndicated services. Conceptualization in mass communication context. Review of literature. Open only to majors. Prerequisite: 315.

Broadcast Journalism

CMU 350 Writing and Reporting Broadcast News (5) Writing and producing news stories and newscasts for broadcasting. Open to majors only. Prerequisite: 315.

CMU 354 Basic Visual Communication (3) Basics common to all visual media, plus motion. Use of electronic and film materials in news and public affairs programming; emphasis on visual continuity and editorial judgment. Open only to majors.

CMU 356 News Broadcasting (3) Preparation and presentation of news broadcasts; editing radio news program; use of visuals; television newscast performance. Open only to majors. Prerequisites: 315, 350.

CMU 358 TV News Reporting and Editing (5) Preparation and presentation of news broadcasts, including reporting, scripting, and use of visuals. Prerequisites: 315, 350, 354.

CMU 367 Broadcast Internship (2-5, max. 6) Experience in the day-to-day operation of a broadcast station. Internship credit may not be applied to fulfill specific course requirements or to 50-credit requirement for a communications major. For majors only. Prerequisites: 315, 320, 350, and courses determined by faculty coordinator.

CMU 373 Television Writing (3) Practice in writing programs; camera, direction, and production problems.

CMU 377 The Documentary (3) History, background, aims, creative aspects. Function in mass media. Open to nonmajors.

Courses for Undergraduate and Graduate Students

CMU 400 Communications Theory (3) Applicability of theory. Important communication phenomena and principles of communicating. Nature of communicating. Useful perspectives on communicating. Analysis of communicating and its effects. Prerequisite: 202 or permission of instructor.

CMU 407 Content Analysis (3) Techniques used in the systematic study of messages.

CMU 408 Survey Research Methods in Communication (3) Practical exercises, readings, and discussion of survey research applications, including sampling theory, survey designs, measurement and questionnaire design, data collection and processing, data presentation and interpretation. Prerequisite: 411 or equivalent.

CMU 409 Experimentation in Communication (3) Techniques of experimentation in the study of communicating. Prerequisite: elementary statistics.

CMU 411 Mass Communications Research (5) Sample surveys, content analysis, or experimental techniques, depending upon interests of class and instructor. Recommended: relevant courses in the social sciences.

CMU 417 History and Communications (5) Development of mass communication in the United States. Journalism and its response to change in social, political, and ethical patterns. Individual research project. Prerequisite: 201.

CMU 418 Issues in Mass Communication (5) Topics vary. Recommended: background in social sciences.

CMU 419 Government and Mass Communications (5) The Anglo-American concept of freedom of communication; its evolution under federal and state constitutions. Tension areas, judicial decisions, statutes, and administrative regulations affecting publishing, broadcasting, etc. Individual research project.

CMU 420 Mass Communication and Popular Culture (5) Major theoretical and empirical approaches. History, institutions, textual analysis, and audiences for new network television in the United States. Comparative material from film, fiction, and music in the United States and the United Kingdom. Recommended: some background in social sciences and humanities.

CMU 421 Structure and Process of the Mass Media (5) Organization for information and enforcement. Consequences of public policy. Place in American political economy. Individual research project. Prerequisite: 201 or 203 or permission of instructor.

CMU 423 Journalism Ethics (5) Ethical issues in journalism; philosophical positions; historical context. Prerequisites: 315, 322.

CMU 446 Communication in International Markets (5) Advertising and closely related promotional practices used in international market development. Economic, social, and political aspects of such activities in different industries.

CMU 447 Communication and Consumer Behavior (3) Consumer information processing and buying behavior. Review of research. Prerequisite: 202 or permission of instructor.

CMU 463 Television Production Workshop for Teachers (5) Presentation of instruction through television. Joint with EDC&I 489. Open only to nonmajors.

CMU 470 Theory and Criticism of Broadcasting (3) Application of critical standards to the sociological functions and esthetic elements of broadcast media. Recommended: relevant courses in the social sciences or humanities.

CMU 471 National Systems of Broadcasting (3) Each quarter the course focuses on a broadcast system of a different country, comparing origins, development, and present operation with the U.S. system. Consult advising office for schedule of topical offerings each quarter. Open to nonmajors. Prerequisites: 201 and 203 or permission of instructor.

CMU 479 Propaganda (5) Analysis of selective information techniques and involuntary exposure of audience. Role of propaganda in countries other than the United States. Individual research project.

CMU 481 Public Opinion and Communication (5) Collective behavior and its methodology. Polls evaluated as referendums on government policies, as manipulative instruments, and as expressions of the commonality of thought. Role of the mass media. Individual research project. Recommended: relevant courses in political science, sociology, psychology, or communications.

CMU 483 International Communication Systems (5) Patterns, institutions, cultural influences, functions of the media in particular foreign areas. Problems of cultural compatibility and structural linkage.

CMU 484 Comparative Communication Research (5) Point of view and conceptual and methodological approaches to comparative communication research. Analyzes a large body of substantive research as a means of assessing its generality and utility for theory and practice.

CMU 485 History and Impact of Communications Technologies (5) Study of the power of select communication technologies from printing to computers and their interaction with societal institutions. Develops a framework for analyzing technology and change. Prerequisite: some background in social sciences and humanities.

CMU 486 Telecommunications Policy and Research (5) Considers new telecommunications technologies as they influence, and are influenced by, behavioral, social, economic, and policy matters. Discussion in lay terms of technologies *per se*. Prerequisite: major standing or permission of instructor.

CMU 498 Problems of Communications (1-5, max. 10) Research and individual study. Prerequisite: permission of instructor.

Courses for Graduates Only

CMU 500 Seminar in Theory of Communication (5) Procedures for analyzing concepts and theoretical material to provide basis for one's research. How to make productive use of the literature. Procedures for theorizing about empirical findings and generalizations. Typologies, models, theories, laws, and working hypotheses. Prerequisite: permission of instructor.

CMU 501 Development of Mass Communication (5) Institutions of mass communication. Political and social roles.

CMU 502 Mass Communication Process and Its Effects (5) Analytic approach to conceptualization and research in the field since 1900.

CMU 503 Research Methods (5) Introduces and compares basic methods of research in communications.

CMU 505 Communication and Politics (3) Primary literature dealing with communication and American political behavior. Prerequisite: 421.

CMU 506 Critical Theory Applications in Mass Communication (5) Major approaches in critical theory: Marxism, psychoanalysis, structuralism, and semiotics. Synthesizes these approaches by viewing the "cultural studies" tradition. Assesses critical theory through empirical study of network television in the United States and the United Kingdom.

CMU 507 Computer Applications in Communication Research (3) Potential of the computer for use in behavioral science. Prerequisites: elementary programming, elementary statistics.

CMU 508, 509 Communication Research (5,5) Basic methodological questions in communication research. Foundations in history and philosophy of science. Prerequisite: permission of instructor.

CMU 511 Seminar in Communication Research (3, max. 15) Individual research projects undertaken collectively within a given area of study, under direction of faculty member. Prerequisite: permission of instructor.

CMU 515 Field Seminar in Communication Historiography (5) Readings in communications history.

CMU 516 Communications History Research Methods (5) Development of the historical approach to communications research. Study of historical methods, bibliography, and criticism.

CMU 517 Seminar in Communications History (5) Topical research seminar in communications history.

CMU 519 Seminar in Government and Mass Communications (5) Legal problems of mass communication, institutions, and media operations.

CMU 521 Seminar in Media Structure (5) Directed independent research into structural aspects of American mass communications. Prerequisite: graduate standing.

CMU 543 Seminar in Advertising in Society (3) Interacting historical, social, economic, and legal influences shaping institutional character. Prerequisite: permission of instructor.

CMU 547 Seminar in Communication and Consumer Behavior (3) Directed reading and research in communication and consumer behavior. Emphasis on conceptualization and original research. Prerequisite: permission of instructor.

CMU 550 Advanced Communication Methods (1-3, max. 3) Directed individual projects at a level acceptable by print or broadcast media. Advanced techniques of research and production analyzed and applied. Open only to students seeking the Master in Communications degree.

CMU 570 Seminar in the Theory and Criticism of Broadcasting (3) Criticism of the function and performance of broadcasting. Use of primary sources, including systematic data gathering and analysis. Prerequisite: 470.

CMU 580 Seminar in Propaganda (5) Analysis of propaganda as historical and behavioral phenomena. United States and international perspectives. Interdisciplinary focus.

CMU 581 Seminar in Public Opinion and Communication (5) Conceptual and methodological approaches to public opinion and communication as historical and behavioral phenomena. United States and international perspectives. Recommended: appropriate background in the social sciences.

CMU 583 Seminar in International Communication Systems (3) International communications and contemporary issues that affect the functioning of global communication systems. Interdisciplinary focus.

CMU 584 Seminar in Regional Communication Systems (3, max. 6) Communication as a factor in economic, sociocultural, and political relations among nations of a region. Focus varies with specialization of instructor. Consult graduate secretary for details. Interdisciplinary focus.

CMU 585 Seminar in Comparative Methodologies (3) Conceptual and methodological approaches to comparative studies of international communication systems. Recommended: appropriate background in the social sciences.

CMU 586 Telecommunications Structure and Policies (3) Structures and policies governing the functioning of communication technologies and data flow: U.S. and international perspectives. Interdisciplinary approach.

CMU 597 Practicum in Communication Research (1-3, max. 6) Student participation in faculty-directed research projects.

CMU 598 Selected Readings (1-5, max. 10) Prerequisite: permission of supervisory committee chairperson.

CMU 600 Independent Study or Research (*) Prerequisite: permission of supervisory committee chairperson.

CMU 700 Master's Thesis (*)

CMU 800 Doctoral Dissertation (*)

Comparative History of Ideas

B531 Padelford

Comparative History of Ideas provides for the interdisciplinary study of intellectual history by bringing together thematically related courses from such fields as literature, history, anthropology, philosophy, the arts, and religious studies. Courses within the program have been chosen and designed to explore the history of specific ideas or themes, to examine the history of particular intellectual cultures (Western and non-Western), or to study comparatively the underlying assumptions and attitudes of different intellectual worlds. As a unique approach to liberal humanistic studies, the program provides a solid basis for postgraduate study in, for example, law, administration, medicine, education, journalism, or area studies.

Undergraduate Program

A Bachelor of Arts degree in the Comparative History of Ideas is offered through the Comparative Literature major.

Major Requirements: 55 credits with a 2.50 grade-point average, including colloquium in the history of ideas, six core courses distributed in three areas, and the remaining credits chosen among approved electives. At least half the credits presented for the major must be at the upper-division level. An optional senior thesis requiring an additional 15 credits is available.

Faculty Executive Committee

Chairperson

John E. Toews

Professors

Behler, Ernst H.,* 1965, (Comparative Literature, Germanics), Ph.D., 1951, Munich (Germany); romanticism, literary theory, history of criticism.

Collins, Douglas P.,* 1980, (Comparative Literature, Romance Languages and Literature), M.A., 1972, Ph.D., 1978, Missouri; nineteenth- and twentieth-century literature.

Opperman, Hal N.,* 1967, (Art History), M.A., 1963, Ph.D., 1972, Chicago; history of art.

Peck, Jeffrey M., 1979, (Comparative Literature, Germanics), M.A., 1974, Chicago; Ph.D., 1979, California (Berkeley); literary criticism and history, nineteenth- and twentieth-century literature.

Searle, Leroy F.,* 1977, (English), M.A., 1968, Ph.D., 1970, Iowa; twentieth-century literature, critical theory, American studies.

Toews, John E.,* 1979, (History), A.M., 1968, Ph.D., 1973, Harvard; modern intellectual history.

Webb, Eugene,* 1966, (Comparative Literature, English, International Studies), M.A., 1962, Ph.D., 1965, Columbia; modern English, French, and German literature, comparative religion.

Associate Professor

Mish'alani, James K.,* 1963, (Philosophy), M.A., 1958, Ph.D., 1961, Brown; ethics, philosophical psychology.

Assistant Professor

Whitlock Blundell, Mary,* 1985, (Classics), M.A., 1981, Oxford (England); Ph.D., 1984, California (Berkeley); Greek and Roman philosophy and literature.

Course Descriptions

Courses for Undergraduates

CHID 390 Colloquium in the History of Ideas (5) Basic theoretical issues in the comparative history of ideas as a disciplined mode of inquiry; examination of representative historical figures and problems. Primarily for majors; open to nonmajors by permission of program adviser.

CHID 491-492-493 Senior Thesis (5-5-5) 491: critical and methodological issues. 492-493: research and writing of thesis under supervision of a faculty member. Required of candidates for an honors degree; available to others with permission of program adviser. Prerequisite: 390.

CHID 499 Undergraduate Independent Study or Research (1-5, max. 10) AWSP Supervised independent study for students who wish to pursue topics not available in regular course offerings. Prerequisite: permission of program adviser.

Comparative Literature

B531 Padelford

The Comparative Literature program transcends the confines of a national literature and explores the relationships among several literatures. In addition, the program is concerned with the relationship of literature to the arts and to such fields of knowledge as philosophy, religion, and political thought. Typical areas of inquiry include literary traditions and periods, motifs, genres; patterns of influence and reception of literary works among national cultures; and the general principles of literary theory and criticism.

Undergraduate Program

Willis Konick, Adviser
B524 Padelford

Bachelor of Arts Degree

Major Requirements: 50 credits, including the following courses: CLAS 210 or any upper-division literature

course in classics; C LIT 300, 301, 302, and two additional courses in comparative literature at the 300 or 400 level; and at least one course in a literature, studied in the original tongue, other than the student's native literature. Remaining credits are to be earned, with few exceptions, in 300- and 400-level courses from among the offerings of Comparative Literature and the eight participating departments: Asian Languages and Literature, Classics, English, Germanics, Near Eastern Languages and Civilization, Romance Languages and Literature, Scandinavian Languages and Literature, and Slavic Languages and Literature. Departmental courses in foreign literature in translation are listed under the respective departments.

Graduate Program

Breda Kapetanac, Graduate Program Coordinator

The Department of Comparative Literature offers a program of study with faculty members from the following participating departments: Asian Languages and Literature, Classics, English, Germanics, Near Eastern Languages and Civilization, Romance Languages and Literature, Scandinavian Languages and Literature, and Slavic Languages and Literature. Study in this program leads to a Master of Arts or Doctor of Philosophy degree. Students concentrate on graduate courses in comparative literature and specialize in two or more national literatures of major interest to them, studied in the original language. With permission, a Ph.D. aspirant may choose as a third area of study a field outside of literature (e.g., philosophy, religion, art, political thought). On receiving the advanced degree, the student is qualified for teaching and research in comparative and general literature, as well as the language and literature of his or her specialization.

Special Requirements

Applicants for the M.A. program are required to have a B.A. degree in comparative literature, English, or any foreign literature, or an equivalent background; applicants for the Ph.D. program are required to have an M.A. in one of the above. M.A. students are required to demonstrate advanced competence in one foreign language and a basic reading knowledge of a second. Ph.D. students are required to demonstrate advanced competence in two foreign languages and a basic reading knowledge of a third. Advanced competence usually must be demonstrated upon admission to the program, and the reading knowledge is required before M.A. or Ph.D. examinations are administered. Language competence is evaluated by Comparative Literature faculty through departmental examinations or by evidence of completion of satisfactory advanced (400- or 500-level) course work in the language.

Financial Aid

Students working for advanced degrees in comparative literature are eligible to apply for teaching assistantships in the department(s) of language and literature relevant to their specialization. Comparative Literature has a very limited number of teaching assistantships available and they are usually awarded to advanced students.

Correspondence and Information

Graduate Program Coordinator
B531 Padelford, GN-32

Faculty

Chairperson

Ernst H. Behler

Professors

Adams, Hazard S.,* 1977, (English),† M.A., 1949, Ph.D., 1953, Washington; literary theory, history of criticism.

Altieri, Charles F.,* 1975, (English),† Ph.D., 1969, North Carolina; nineteenth- and twentieth-century literature, literary theory.

Behler, Diana I.,* 1969, (Germanics),† M.A., 1966, Ph.D., 1970, Washington; romanticism, the novel, nineteenth century.

Behler, Ernst H.,* 1966, (Germanics),† Ph.D., 1951, Munich (Germany); romanticism, literary theory, history of criticism.

Christofides, Constantine G.,* 1966, (Drama), (Art, Romance Languages and Literature),† M.A., 1949, Ph.D., 1956, Michigan; seventeenth-century French literature, literature and art.

Harmon, Daniel P.,* 1967, (Classics),† M.A., 1965, Ph.D., 1968, Northwestern; Greek and Roman religion, Latin poetry, Greek tragedy.

Hruby, Antonin,* 1961, (Emeritus), (Germanics),† Ph.D., 1946, Prague; medieval European literature.

Jaeger, C. Stephen,* 1985, (Germanics),† Ph.D., 1970, California (Berkeley); German and Latin literatures of the Middle Ages, cinema studies.

Jones, Frank W., 1955, (Emeritus), (English, Drama),† M.A., 1955, Oxford (England); Ph.D., 1941, Wisconsin; translation, twentieth-century theatre, poetry.

Leiner, Jacqueline, 1963, (Emeritus), (Romance Languages and Literature),† Dr. es Lettres, 1969, Strasbourg (Germany); nineteenth- and twentieth-century French, African literature.

Leiner, Wolfgang,* 1965, (Emeritus), M.A., 1951, Saarbrücken (West Germany); D.Phil., 1955, University de la Sarre; seventeenth- and twentieth-century French and Italian literature.

Mackay, Pierre A.,* 1966, (Computer Science), (Classics, Near Eastern Languages and Civilization),† M.A., 1959, Ph.D., 1964, California (Berkeley); Greek and Arabic literature.

McKinnon, Richard N.,* 1951, (Emeritus), M.A., 1949, Ph.D., 1951, Harvard; Japanese literature.

Modiano, Raimonda,* 1973, (English),† Ph.D., 1973, California (San Diego); romanticism.

Reinert, Otto,* 1956, (Drama), (English),† M.A., 1948, Ph.D., 1952, Yale; modern European drama.

Rossel, Sven H.,* 1974, (Scandinavian Languages and Literature),† Magister, 1968, Copenhagen (Denmark); medieval literature, European preromanticism and romanticism, European symbolism, Danish.

Steene, Birgitta K.,* 1973, (Drama), (Scandinavian Languages and Literature),† M.A., 1955, Ph.D., 1960, Washington; Ph.D., 1966, Uppsala (Sweden); modern Scandinavian drama, Scandinavian film, comparative literature.

Wang, Ching-Hsien,* 1971, (Asian Languages and Literature),† M.F.A., 1966, Iowa; M.A., 1969, Ph.D., 1971, California (Berkeley); Chinese poetry, East-West literary relations.

Webb, Eugene,* 1966, (English), (International Studies),† M.A., 1962, Ph.D., 1965, Columbia; modern English and French, and German literature, comparative religion.

Ziadeh, Farhat J.,* 1966, (Emeritus), (Near Eastern Languages and Civilization),† LL.B., 1940, London; Arabic language and literature, Islamic law, Islamic institutions.

Associate Professors

Ammerlahn, Hellmut H.,* 1963, (Germanics),† M.A., 1960, Vermont; Ph.D., 1965, Texas; the age of Goethe, literary symbolism and psychology, West European literature and culture from seventeenth century to twentieth century.

Collins, Douglas P.,* 1980, (Romance Languages and Literature),† M.A., 1972, Ph.D., 1978, Missouri; nineteenth- and twentieth-century literature.

Ellrich, Robert J.,* 1964, (Romance Languages and Literature),† M.A., 1953, Ph.D., 1960, Harvard; eighteenth-century European literature.

Kogo-Kapetanovic, Breda,* 1973, Litt.D., 1966, Zagreb (Yugoslavia); theories of comparative literature, theory of the novel, nineteenth- and twentieth-century European literature.

Konick, Willis A.,* 1961, (Slavic Languages and Literature, International Studies),† M.A., 1954, Ph.D., 1964, Washington; Russian literature, nineteenth-century European literature.

Kramer, Karl D.,* 1971, (International Studies, Slavic Languages and Literature),† M.A., 1957, Ph.D., 1964, Washington; late nineteenth-century Russian, American, and French literature, short story.

Levine, Suzanne J.,* 1984, (Romance Languages and Literature),† M.A., 1969, Columbia; Ph.D., 1977, New York; Latin American literature, translation.

McLean, Sammy K.,* 1967, (Germanics),† M.A., 1957, Ph.D., 1963, Michigan; Western drama, twentieth-century poetry, psychoanalysis and literature, translation.

Peck, Jeffrey M.,* 1979, (Germanics),† M.A., 1974, Chicago; Ph.D., 1979, California (Berkeley); literary criticism and history, nineteenth- and twentieth-century literature.

Sehmsdorf, Henning K.,* 1967, (Scandinavian Languages and Literature),† M.A., 1964, Ph.D., 1968, Chicago; mythology and folklore, European romanticism.

Vaughan, Miceal F.,* 1973, (English),† M.A., 1973, Ph.D., 1973, Cornell; medieval English literature.

Willeford, William O.,* 1967, (English),† M.A., 1953, California (Berkeley); Ph.D., 1966, Zurich (Switzerland); Renaissance and modern English literature, literature and psychology and mythology.

Yarbro-Bejarano, Yvonne M.,* 1974, (Romance Languages and Literature),† M.A., 1971, Ph.D., 1976, Harvard; sixteenth- and seventeenth-century literature of Spain, Chicano theater.

Assistant Professor

Dornbush, Jean M.,* 1980, M.A., 1974, Ph.D., 1976, Princeton; medieval period, symbolist poetry, modern literary theory.

Course Descriptions

All Comparative Literature courses are taught in English unless otherwise indicated. It is recommended that students enrolling in 300- or 400-level courses have taken 10-15 credits in literature or general humanities courses. Content of many courses varies from quarter to quarter.

Courses for Undergraduates

C LIT 200 Introduction to Comparative Literature (3 or 5) Reading, understanding, and enjoying literature from various countries, in different forms of expression (e.g., dramatic, lyric, narrative, rhetorical) and of representative periods. Emphasis on the comparative study of themes and motifs common to many literatures of the world.

C LIT 240 Writing in Comparative Literature (5) Comparative approach to literature and a workshop in writing comparative papers. Emphasis on cross-cultural comparison of literary masterpieces. Readings in English with an option to read selected texts in the original languages (French, German, Italian, Russian, Spanish, or a Scandinavian language—varies each quarter). Writing in English. Basic reading knowledge of one of the above languages recommended.

C LIT 260 Interpretation as a Human Activity (5) Introduction to the interpretive nature of all human activity, ways in which students participate in interpretation in their daily lives. Critical skills developed for not only "reading" the world around them, but also reflecting on what constitutes an interpretation and how their own perspectives shape understanding.

C LIT 270 The Visual Text: How to Read a Film (5) Introduction to film form, style, and techniques. Examples from silent film and from contemporary film. 270, 271, 272 are designed to be taken as a sequence, but may be taken individually.

C LIT 271 The Visual Text: Authors of Film (5) Introduction to authorship in the cinema. The work of a major director or directors. 270, 271, 272 are designed to be taken as a sequence, but may be taken individually.

C LIT 272 The Visual Text: Genre in Film (5) Introduction to study of film genre. Literary, mythic, and historic aspects of film genre. 270, 271, 272 are designed to be taken as a sequence, but may be taken individually.

C LIT 300 Comparative Literature: Genres (5) Major genres of world literature: poetry, fiction, drama. Readings, in English, from a wide selection of national literatures.

C LIT 301 Comparative Literature: Periods (5) Major periods of world literature. Readings, in English, from a wide selection of national literatures.

C LIT 302 Comparative Literature: Themes (5) Major themes of world literature. Readings, in English, from a wide selection of national literatures.

C LIT 310 The Concept of Revolution in Modern Literature and Thought (5) The idea of revolution, as it evolved in the wake of the American and French revolutions, in major works of Western literature and thought from the Enlightenment and the period of romanticism to contemporary treatments of the revolutionary theme.

C LIT 315 Literature of Absurdity (5) French, German, British, and American absurd novels and plays, 1940-65, including Sartre, Camus, Ionesco, Beckett, Albee, Pinter, and others. Background lectures in philosophy and literature.

C LIT 350 Themes in World Literature: Parents and Children (5) World literature, from the Renaissance to modern times, based upon the theme of "parents and children." Selections drawn from European, English, and American literature, not limited to period and genre. Focus upon the motive of generational conflict.

C LIT 351 Themes in World Literature: Love, Sex, and Murder (5) World literature, from the Renaissance to modern times, based upon the theme of "love, sex, and murder." Selections drawn from European, English, and American literature, not limited to period and genre. Focus upon the human potential for both great violence and extraordinary compassion.

C LIT 352 Themes in World Literature: Death and Transfiguration (5) Theme of death, transfiguration, and new life in world literature. Selections from Tolstoy, D. H. Lawrence, Celine, E. M. Forster, and other major writers.

C LIT 357 Literature and Film (3-5, max. 10) The film as an art form, with particular reference to the literary dimension of film and to the interaction of literature with the other artistic media employed in the form. Films are shown as an integral part of the course. Content varies.

C LIT 360 Interpretation in Culture and Community (5) How particular political, social, and cultural events, interests, and ideologies have constituted interpretive communities as well as the interpretations themselves.

C LIT 370 The Scope of Literary History (5) Raises the issue of literary history by discussing, through historical examples and theoretical issues, such questions as: What is the scope of written literary history? How do we set up the canon of literary history? How do we account for periodization and epochal change?

C LIT 375 Images of Women in Literature (5, max. 15) Comparative study of the ways women's image, social role, and psychology have been portrayed by writers of various nationalities and literary periods. Selection of theme varies from quarter to quarter. Works are read in English translation. Recommended: sophomore standing.

C LIT 396 Special Studies in Comparative Literature (3-5, max. 10) Offered by visitors or resident faculty. Content varies.

C LIT 400 Introduction to the Theory of Literature (5) A selection of major theoretical statements in the history of literary theory, with emphasis on fundamental issues of lasting concern and with attention to some recent emphases.

C LIT 401 Modern European Drama (5) Selected plays, read in English, by Ibsen, Strindberg, Chekhov, Pirandello, Brecht, Camus, Durrenmatt, the absurdist, and others, representing naturalism, expressionism, theatricalism, and other movements that have shaped the modern European theater.

C LIT 405 Romanticism (5) Literature, philosophy, esthetics, and culture of Western romanticism. Emphasis on literature and criticism and on historical and philosophical aspects of the romantic movement in Europe and the United States.

C LIT 407 Literary Impressionism (5) Selected novels, stories, poems, and plays by Fét, Garshin, Chekhov, Crane, Conrad, James, Bunin, and Proust, which are frequently identified with the impressionist trend in Western literature from 1850 to 1920.

C LIT 410 Literary Motifs (3-5, max. 10) Important fictional figures, situations, and plots that, through their repeated recurrence in world literature, appear to have a profound and universal significance for the human imagination. Content varies.

C LIT 415 The Comic in Literature (5) Masterpieces of comic literature emphasizing various modes and uses of the comic.

C LIT 424 The Epic Tradition (5) A Ancient and medieval epic and heroic poetry of Europe in English: the *Iliad*, *Odyssey*, and *Aeneid*; the *Roland* or a comparable work from the medieval oral tradition; pre-Greek forerunners, other Greco-Roman literary epics, and later medieval and Renaissance developments and adaptations of the genre. Choice of reading material varies. Joint with CLAS 424. Literary background recommended.

C LIT 440 The Novel (3-5, max. 10) The novel as a genre. Material varies with individual faculty members who offer it, but, normally, the larger technical, social, and philosophical questions are illustrated through intensive study of novels by two or more writers from different national cultures.

C LIT 460 Interpretation in the Humanistic Disciplines in the University (5) How interpretation is shaped by the academic practices of research, learning, and pedagogy in which students participate but upon which they often do not reflect consciously. How different disciplines organize, disseminate, and validate knowledge; how particular disciplines define objects of inquiry and develop appropriate questions.

C LIT 472 Studies in Narrative (3-5, max. 10) Narrative styles and developments from antiquity to the present. Content varies.

C LIT 476 Comparative Approaches to Chinese Poetry and Poetics (5) Chinese poetry and poetics in context of world literature; emphasis on lyrical tradition. Investigation of essence, modes, conventions, imagery, and symbolism defined in three thousand years of continued, prolific developments. Relevant Western works are compared with Chinese subjects. All readings in English.

C LIT 480 Modern European Poetry (5) Selected works read, in English, by French, German, Italian, and Spanish poets from the romantic period to the present.

C LIT 480 Directed Study or Research (1-5, max. 10) AWSpS Individual study of topics in comparative literature by arrangement with the instructor and the Comparative Literature office.

C LIT 493 Comparative Literature Honors Seminar (5) Special topics in comparative literature. Required of honors students in comparative literature. Prerequisite: permission of honors adviser.

C LIT 495 Honors Thesis (4) Preparation of an honors thesis under the direction and supervision of a faculty member. Prerequisites: 493 and permission of honors adviser.

C LIT 496 Special Studies in Comparative Literature (3-5, max. 15) Offered occasionally by visitors or resident faculty.

Courses for Graduates Only

Consult the Comparative Literature office for information on the quarter and year the courses below will be offered. Graduate-level course numbers merely distinguish courses and do not indicate ascending level of knowledge required to take the course. Reading knowledge of at least one foreign language recommended.

C LIT 510 Theories and Methods of Comparative Literary History (5) Lectures on comparative theory and practice from Vico to the present; seminar papers on comparative topics relevant to the students' fields of concentration.

C LIT 511 Literary Translation (5) Lectures on principles of translating literary works into readable English. Students present and comment on translations made by them and write seminar papers on problems of translation in theory and practice.

C LIT 513, 514 History of European Literary Theory and Criticism I, II (5,5) Main concepts of literary theory and literary criticism in the Western world as they have developed from the Middle Ages to the present. Emphasis on the philosophical background from which the literary ideas emerged.

C LIT 515 Recent Trends in Theory of Literature (3-5, max. 15) Structural and philosophical approaches emphasized.

C LIT 516 Colloquium in Criticism (5) Recent trends in literary criticism, taught by representatives from various literature departments, covering critical trends such as structuralism, poststructuralism, hermeneutics, reception theory, and sociological approaches to literature.

C LIT 517 Colloquium in Folklore (5) Recent trends in folklore studies, taught by representatives from various literature departments and disciplines in the social sciences.

C LIT 518 Colloquium in Medieval Studies (5) Salient literary aspects of the European Middle Ages, taught by representatives from various literature departments as well as from related disciplines, such as philosophy, art history, history, and comparative religion.

C LIT 519 Lectura Dantis (3-5) Selected aspects of Dante's *Divina Commedia* (in English), conducted as a faculty-graduate student colloquium with representatives from various literature departments.

C LIT 522 Twentieth-Century Literature (3-5) Selected movements, schools, and trends of significance in twentieth-century literature of Europe and the Americas. Symbolism, surrealism, dada, expressionism, neorealism, existentialism, the *nouveau roman*, and the absurd may be considered. Texts in English, French, and German figure most prominently, but Spanish, Italian, Russian, and other materials may also be examined. Content and emphasis vary.

C LIT 525 The Baroque in Criticism and Literature (3-5, max. 15) Origins and history of the term as used in literary criticism, accompanied by a study of representative Baroque literature in various countries. Included are such works as *Don Quixote*, *Phedre*, and French, Spanish, Italian, and German poetry available in translation, but preferably to be read in the original.

C LIT 545 Studies in the Middle Ages (3 or 5, max. 15) Literature, intellectual history, and sociology of the Middle Ages, 500-1200. Topics may include "renaissance" of the twelfth century; the educational ideal; rise of universities; philosophical concepts.

C LIT 546 Studies in the Renaissance (3-5, max. 10) Aspects of Western European literature during the Renaissance. Course content varies.

C LIT 547 Classical Tradition in Medieval and Renaissance Europe (3-5, max. 15) Intensive study of a single topic or genre. Course content varies.

C LIT 548 The Romantic Movement (3-5, max. 10) Chief authors, works, and/or themes of the romantic movement in Europe and America. Course content may vary.

C LIT 550 European Realism (3-5) European realism (Balzac, Flaubert, Turgenev, Dostoevsky, Tolstoy, the representative Victorians, and the writers of "poetic realism") in connection with various esthetic doctrines and subsequent critical appraisals.

C LIT 551 The Symbolist Movement (3-5, max. 10) The symbolist movement from its beginnings in nineteenth-century French poetry through later developments in European poetry, fiction, and drama. Related developments in philosophy, critical theory, and the other arts. Reading knowledge of French required.

C LIT 555 Studies in Irony (3-5) Irony in literary, philosophical, and satirical masterpieces from the classical period to contemporary literature.

C LIT 560 Classical Rhetoric and Literature (3-5) Influence and importance of classical rhetoric in European literary works of the seventeenth and eighteenth centuries. Texts and examples chosen in English, French, Italian, and German literatures.

C LIT 570 The Novel: Theory and Practice (3-5, max. 15) Study of the novel as a genre, examining two or more novels of varying national literatures. Course content varies.

C LIT 571 The Lyric: Theory and Practice (3-5, max. 15) Examination of central questions in the study of the lyric genre as approached from an international point of view. Course content varies.

C LIT 572 The Epic: Theory and Practice (3-5, max. 15) Examination of epic literature as exemplified by selected works chosen from various cultures and periods (e.g., French and German medieval courtly epic, the epic in Renaissance and baroque Europe, traditions of the mock epic). Course content varies.

C LIT 573 The Drama: Theory and Practice (3-5, max. 15) Examination of various aspects of the drama as a major literary genre, as approached from international and multilingual points of view. Course content varies.

C LIT 574 Literary Motifs (3-5, max. 10) Examination of important fictional figures, situations, and plots that, through their repeated recurrence in world literature, appear to have a profound and universal significance for the human imagination. Course content varies.

C LIT 576 Seminar in East-West Literary Relations (3-5, max. 15) Comparative investigation of literary topics requiring the study of both Eastern and Western documents. Explores parallels and contradictions between the two, in concepts, ideas, and specific topics. A comparative paper on a chosen topic with qualified conclusions is required. Emphasis varies. Prerequisite: at least one East Asian language.

C LIT 580 Literature and Other Disciplines (3-5, max. 15) Seminar examining relationships or parallels between literature and other disciplines such as philosophy, psychology, sociology, anthropology, or political science. Course content varies.

C LIT 596 Special Studies in Comparative Literature (3-5, max. 15) Offered occasionally by visiting or resident faculty. Course content varies.

C LIT 600 Independent Study or Research (*) AWSps

C LIT 700 Master's Thesis (*) AWSps

C LIT 800 Doctoral Dissertation (*) AWSps

Comparative Religion

See *International Studies*.

Computer Science

114 Sieg

Computer science is the study of information and algorithms in the context of real and abstract computing devices. Computer scientists study: the representation and storage of information; algorithms to access, examine, and transform information; programming and mathematical languages to express algorithms; and hardware and software processors to execute algorithms. These concerns lead both to theoretical investigations and to practical developments in computer technology and applications.

The objective of computer science undergraduate education is to develop broadly educated and competent computer scientists for professional careers or graduate studies. Especially important is a foundation that will endure as technology advances and changes.

The computer field has a broad base of industrial and governmental jobs suitable for the Bachelor of Science graduate: systems analyst, systems programmer, technical salesperson, and hardware or software specialist. In addition, there are jobs for which graduate education may be appropriate: producers and developers of computer systems, and teachers and researchers.

Instructional and Special Research Facilities

The computer science laboratory provides powerful, state-of-the-art facilities for undergraduate, graduate, and faculty research and instruction, including a VAX 8550, a VAX 785, numerous Sun, MicroVAX, and IBM RT workstations, and more-specialized processors for research on artificial intelligence, graphics, image processing, and symbolic and parallel computing. These machines are connected to the Arpanet, CSnet, and Usenet networks. Other facilities also are available on campus.

Undergraduate Program

Alice Schwartz, Adviser
114F Sieg

Bachelor of Science Degree

Admission Requirements: 45 credits completed, including MATH 124, 125, 126, PHYS 121, 122, 123, C SCI 210, 211; minimum 3.00 grade-point average for all courses at this university (3.00 guarantees consideration, but not acceptance).

Major Requirements: (1) Preparatory Component (39 credits): MATH 124, 125, 126; PHYS 121, 122, 123;

three of MATH 238, 239, 301, 302, 303, 304, any mathematics or statistics course in the elective component (below), or STAT 311; and one from PHYS 334, E E 306, 310, or 355. (2) Inner Core Component (31 credits): 210, 211, 321, 322, 326, 341, 378. (3) Outer Core Component (minimum of 12 credits): 401, 421, 431, 451, 470, 473. (4) Elective Component (minimum of 8 credits): computer science courses from the Outer Core not used to satisfy the Outer Core, or up to 6 credits of 498, or any other 400-level computer science course that may be introduced, or other courses chosen from a senior electives list available in the department. (5) Recommended: 10 credits of natural science, business, or engineering beyond the requirements in (1) through (4), above.

Graduate Program

Walter Ruzzo, Graduate Program Coordinator

The Department of Computer Science offers programs of study leading to the degrees of Master of Science and Doctor of Philosophy. Individual programs can be designed to provide considerable breadth of knowledge, as well as depth in an area of specialization. An M.S. degree can usually be completed in one to two years, and a Ph.D. degree can be completed in four to five years. It is not necessary to complete an M.S. program before entering the Ph.D. program. Degree requirements are outlined in the *Computer Science Graduate Program Brochure*, available from the department.

The department has twenty-one faculty members with appointments in Computer Science and eight affiliated faculty members from other disciplines. Research opportunities exist for graduate students in the following ongoing projects and in other areas: local networks and distributed processing, VLSI design, computer architecture, operating systems, programming languages, compilers, design and analysis of algorithms, computational complexity, performance evaluation, analytic modeling, simulation, artificial intelligence, computer graphics, document preparation systems, parallel computing, and data bases.

Application Requirements

Most entering graduate students are expected to have a solid background in computer science, including programming, machine organization, data structures, discrete mathematics, automata theory, and programming systems (e.g., the equivalent of 378, 326, 321, 322, and either 401 or 451). Some exceptions to these requirements are made for otherwise-promising students. Graduate Record Examination scores are required; GRE subject test score (not necessarily in computer science) is recommended. Scores should be earned within the preceding five years. The computer science graduate program brochure gives full details of application procedures.

Complete applications must be received by February 1 for Autumn Quarter admission.

Assistantships

Some research assistantships are available in the Computer Science Laboratory and through faculty research grants. Teaching assistantships are also available. In general, this support is allocated on the basis of scholastic excellence and potential. Students who are applying for assistantships to start in Autumn Quarter should have all applications to the Graduate School and the department completed by February 1.

The application packet contains all the necessary forms for applying to the Graduate School and to the Graduate Program in Computer Science and for consideration for assistantships.

Correspondence and Information

Graduate Program Coordinator
Department of Computer Science, FR-35

Faculty

Chairperson

Paul Young

Professors

Baer, Jean-Loup,* 1969, (Electrical Engineering), Doctorat 3e Cycle, 1963, Grenoble; Ph.D., 1968, California (Los Angeles); parallel processing, systems architecture, data structures.

Golde, Hellmut,* 1959, (Electrical Engineering), M.S., 1955, Ph.D., 1959, Stanford; programming languages, programming systems, compilers.

Haralick, Robert M.* 1968, ‡(Electrical Engineering), M.S.E.E., 1967, Ph.D., 1969, Kansas (Lawrence); computer vision, artificial intelligence, image processing, pattern recognition, expert systems, parallel computer architecture.

Holden, Alistair D. C.* 1958, ‡(Electrical Engineering), M.Eng., 1958, Yale; Ph.D., 1964, Washington; artificial intelligence and applications to speech understanding, vision and computer-aided design.

Kehl, Theodore H.,* 1963, (Physiology and Biophysics), † M.S., 1958, Ph.D., 1961, Wisconsin; real-time hardware and software systems, computer design, VLSI.

Klee, Victor,* 1953, ‡(Mathematics), Ph.D., 1949, Virginia; Dr.Lic., 1984, Liege; convex sets, functional analysis, analysis of algorithms, linear programming, combinatorics.

Ladner, Richard E.,* 1971, Ph.D., 1971, California (Berkeley); theory of computation, computational complexity, design and analysis of algorithms, computer communication theory, computers to aid the handicapped.

Lazowska, Edward D.* 1977, M.Sc., 1974, Ph.D., 1977, Toronto; computer systems: modeling and analysis, design and implementation, distributed and parallel systems.

MacKay, Pierre A.* 1968, ‡(Classics, Comparative Literature, Near Eastern Languages and Civilization), M.A., 1959, Ph.D., 1964, California (Berkeley); multilingual text editing and typesetting (especially Arabic script), graphics, peripheral design.

Noe, Jerre D.* 1968, (Electrical Engineering), Ph.D., 1948, Stanford; distributed computer systems, operating systems, simulation and performance evaluation.

Porter, Robert P.* 1985, ‡(Electrical Engineering), M.S.E.E., 1965, E.E., 1966, Massachusetts Institute of Technology; Ph.D., 1970, Northeastern; signal processing, underwater acoustics, electromagnetic and acoustic wave propagation, inverse scattering.

Shaw, Alan C.* 1971, M.S., 1962, Ph.D., 1968, Stanford; computer graphics, document preparation systems, operating systems, software specifications, real-time systems.

Snyder, Lawrence,* 1983, Ph.D., 1973, Carnegie-Mellon; parallel computation, VLSI.

Tanimoto, Steven L.* 1977, (Electrical Engineering), M.S.E., 1973, M.A., 1974, Ph.D., 1975, Princeton; image analysis, computer graphics, artificial intelligence.

Young, Paul,* 1983, Ph.D., 1963, Massachusetts Institute of Technology; computational complexity, computability, and connections with mathematical logic.

Zick, Gregory L.* 1974, ‡(Electrical Engineering), M.S., 1972, Ph.D., 1974, Michigan; computer engineering, sorting, I/O subsystems.

Associate Professors

Borning, Alan H.* 1980, M.S., 1974, Ph.D., 1979, Stanford; programming languages and environments, user interfaces, computers and society.

Dekker, David B., 1948, (Emeritus), (Mathematics), † M.S., 1943, Illinois Institute of Technology; Ph.D., 1948, California (Berkeley); numerical analysis, curve fitting, numerical solution of differential equations.

Ruzzo, Walter L., 1977, Ph.D., 1978, California (Berkeley); design and analysis of algorithms, computational complexity, parallel computation.

Shapiro, Linda G., 1986, ‡(Electrical Engineering), M.S., 1972, Ph.D., 1974, Iowa; computer vision, artificial intelligence, robotics, pattern recognition, database systems.

Sobolewski, John S., 1973, (Research), (Medical Education), † M.E., 1966, Adelaide (Australia); Ph.D., 1970, Washington State; data communication, database management systems, management of computing, medical applications of computing.

Stuetzle, Werner, 1984, ‡(Statistics), Ph.D., 1977, Eidgenössische Technische Hochschule (Switzerland); nonparametric methods in multivariate analysis, statistical applications of computer graphics, programming environments.

Zahorjan, John, 1980, M.Sc., 1976, Ph.D., 1980, Toronto; design and performance of parallel and distributed computer systems.

Assistant Professors

Adams, Loyce M., 1985, ‡(Applied Mathematics), M.S., 1978, Ph.D., 1983, Virginia; numerical algorithms for parallel computers.

Anderson, Richard J., 1986, Ph.D., 1986, Stanford; theory, parallel computation, analysis of algorithms, combinatorial optimization.

Beame, Paul W., 1987, M.S., 1982, Ph.D., 1986, Toronto; computational complexity, parallel computation, circuit-based complexity, cryptography.

Borriello, Gaetano, 1987, M.S., 1981, Stanford; Ph.D., 1987, California (Berkeley); computer-aided design for VLSI systems.

DeRose, Anthony D., 1985, Ph.D., 1985, California (Berkeley); computer-aided geometric design and modeling, graphic user interfaces, high-resolution computer graphics.

Ebeling, W. H. Carl, 1986, M.S., 1976, Southern Illinois; Ph.D., 1986, Carnegie-Mellon; special-purpose computer architecture, VLSI.

Henry, Robert R., 1984, M.S., 1981, Ph.D., 1984, California (Berkeley); tree pattern matching, retargetable compilers, algorithm animation.

Kalet, Ira J., 1982, ‡(Radiation Oncology), M.A., 1966, Ph.D., 1968, Princeton; medical applications of artificial intelligence, computer graphics, interface design.

Levy, Henry M., 1983, (Research), M.S., 1981, Washington; computer architecture, operating systems, distributed and parallel systems, object-oriented systems.

Notkin, David S., 1984, Ph.D., 1984, Carnegie-Mellon; programming systems, software engineering, software development environments, structure-oriented editing systems.

Pattis, Richard, 1984, (Acting), M.S., 1984, Stanford; understanding programming through formal and heuristic methods, debugging.

Schlag, Martine D. F., 1986, M.S., 1982, Ph.D., 1986, California (Los Angeles); theoretical computer science, computational geometry, VLSI design and complexity, functional languages.

Sloan, Kenneth R., 1984, M.S., 1973, Stevens Institute of Technology; Ph.D., 1977, Pennsylvania; vision, graphics, artificial intelligence, networks, personal computing.

Emphasis on four areas: (1) introductory programming as a serious discipline; (2) elementary data structures and algorithms; (3) reasoning about the correctness and efficiency of programs; and (4) the structure of computer systems. A modern programming language, such as Modula-2, is introduced and used. Prerequisites: MATH 124 for 210, 210 for 211.

Courses for Nonmajors

The following courses are intended to give a technical introduction to fundamental topics in computer science to non-computer science majors who are likely to use computers as tools in their own disciplines.

C SCI 373 Data Structures and Algorithms (3) Fundamental algorithms and data structures for implementation. Techniques for solving problems by programming. Linked lists, stacks, queues, directed graphs. Trees: representations, traversals. Searching (hashing, binary search trees, multiway trees). Garbage collection, memory management. Internal and external sorting. Not open for credit to students who have completed 326 or E E 374. Prerequisite: 211.

C SCI 410 Computer Systems (3) Structure and components of hardware and software systems. Machine organization, including central processor and input-output architectures; assembly language programming; operating systems, including process, storage, and file management. Not open for credit to students who have completed 378 or 451. Prerequisite: 373.

C SCI 413 Programming Languages and Their Implementation (3) Concepts and implementation strategies for ALGOL-class languages, including Pascal, Modula, ALGOL 60, Ada. Compilers for ALGOL-class languages. Languages with late binding times, including LISP, APL, Smalltalk. Not open for credit to students who have completed 341 or 401. Prerequisite: 373.

C SCI 415 Introduction to Artificial Intelligence (5) Principles and programming techniques of artificial intelligence: LISP, symbol manipulation, knowledge representation, logical and probabilistic reasoning, learning, language understanding, vision, expert systems, and social issues. Not open for credit to students who have completed 473. Prerequisites: 373, or 211 and permission of instructor.

Courses for Majors

All 300- and 400-level courses below are for majors. Nonmajors may petition for entry cards.

C SCI 321 Discrete Structures (4) Fundamentals of set theory, graph theory, enumeration, and algebraic structures, with applications in computing. Prerequisites: 211 and MATH 126.

C SCI 322 Introduction to Formal Models in Computer Science (3) Finite automata and regular expressions; context-free grammars and pushdown automata; nondeterminism; Turing machines and the halting problem. Emphasis on understanding models and their applications and on rigorous use of basic techniques of analysis. Induction proofs, simulation, diagonalization, and reduction arguments. Prerequisite: 321.

C SCI 326 Data Structures (4) Data types, abstract data types, and data structures. Efficiency of algorithms. Sequential and linked implementation of lists. Binary tree representations and traversals. Searching: dictionaries, priority queues, hashing. Directed graphs, depth-first algorithms. Garbage collection. Dynamic storage allocation. Internal and external sorting. Not open for credit to students who have completed 373 or E E 374. Prerequisite: 321.

C SCI 341 Programming Languages (5) Designed to make the student reasonably fluent in several radically different languages, such as LISP, ICON, PROLOG, Smalltalk-80. Not open for credit to students who have completed 413. Prerequisite: 211.

C SCI 378 Machine Organization and Assembly Language (5) Differences and similarities in machine organization. Central processors. Fundamentals of machine language and addressing. Assembly language programming, including macros. Operating system interfaces. Not open for credit to students who have completed 410. Prerequisite: 211.

C SCI 401 Introduction to Compiler Construction (3) Fundamentals of compilers and interpreters. Symbol tables, lexical analysis, syntax analysis, semantic analysis, code generation and optimization for general-purpose programming languages. Not open for credit to students who have completed 413. Prerequisites: 322, 326, and 378.

C SCI 421 Introduction to the Analysis of Algorithms (3) Techniques for design and analysis of efficient algorithms. Methods for showing lower bounds on computational complexity. Particular algorithms for sorting, searching, set manipulation, arithmetic, graph problems, pattern matching, etc. Prerequisites: 322, 326.

C SCI 431 Introduction to Theory of Computation (3) Models of computation, computable and noncomputable functions, space and time complexity, tractable and intractable functions. Prerequisite: 322.

C SCI 440 Computer Based Simulation (3) Monte Carlo, continuous time, and discrete-event simulations. Design of appropriate simulation experiments and interpretation of their results. Students implement simulations using Pascal, DYNAMO, and GPSS. Prerequisites: 326 and familiarity with basic concepts of probability theory.

C SCI 444 Introduction to Data-base Systems (3) Fundamental concepts, system organization, and implementation of data-base systems. Relational, hierarchical, and network data models; file organizations and data structures; query languages; query optimization; data-base design; concurrency control; security; issues involving distributed data-base systems. Prerequisite: 326.

C SCI 451 Introduction to Operating Systems (3) Principles of operating systems. Process management, memory management, auxiliary storage management, resource allocation. Not open for credit to students who have completed 410 or E E 474. Prerequisites: 326, 378.

C SCI 457 Computer Graphics (3) Techniques of computer image synthesis, including both hardware and software. Line drawing and color raster graphics. Homogeneous coordinates, hidden surface, and smooth shading algorithms. Prerequisite: 326.

C SCI 470 Computer Design (4) Fundamental gating circuits are developed into large-logic gating structures. The use of these structures in the design of central processing units, memories, and peripheral equipment is illustrated. Prerequisite: 378.

C SCI 473 Introduction to Artificial Intelligence (3) Principal ideas and developments in artificial intelligence: theorem proving, problem-solving methods, representation of knowledge, natural language analysis and synthesis, programming languages for artificial intelligence. Prerequisite: 326; recommended: 341.

C SCI 498- Senior Project (1-9, max. 9) A report (and perhaps demonstration) describing a development, survey, or small research project completed by the student in an area in computer science or an application to another field. Objectives are: (1) integrating material from several courses, (2) introducing the professional literature, (3) gaining experience in writing a technical document, and (4) showing evidence of independent work. The work normally extends over more than one quarter, for a maximum of 6 credits for 498- and a maximum of 9 credits for 498H-. Prerequisite: senior standing in computer science major.

Course Descriptions

Courses for Undergraduates

C SCI 210, 211 Computer Science I, II (5,5) Integrated two-quarter introduction to computer science.

C SCI 499 Reading and Research (1-24, max. 24) Available in special cases for advanced computer science majors to do reading and research in the field. Offered on credit/no credit basis only. Usable as a free elective, but not in place of a core course or computer science elective. Prerequisites: senior standing and permission of instructor.

Courses for Graduates Only

All graduate courses are primarily for computer science graduate students. Others must petition for entry cards.

C SCI 500 Computers and Society (2) Study of the impact of computer technology on present and future society, including political, economic, cultural, social, and moral issues. Seminar includes frequent guest lecturers and discussion leaders. Each student is required to complete a term project. Prerequisite: graduate standing in computer science or permission of instructor. (Offered alternate years.)

C SCI 501 Compiler Construction (3) Design of compilers for block-structured general-purpose programming languages. Automatic generation of lexical analyzers and parsers. Error detection and correction. Code optimization. Prerequisites: 401, 505.

C SCI 503 Software Engineering (3) Specification, implementation, and testing of large, multiperson, software systems. Topics include abstraction, information hiding, software development environments, and formal specifications. Prerequisites: 322, 326, 378, or equivalents. (Offered alternate years.)

C SCI 505 Concepts of Programming Languages (3) Data structures, types, control structures. Languages in the ALGOL family; functional, object-oriented, and logic programming languages. Prerequisites: 401 and a working knowledge of Pascal and LISP.

C SCI 506 Advanced Topics in Programming Languages (3) May include functional, object-oriented, parallel, and logic programming languages; semantics for languages of these kinds; type declaration, inference, and checking (including polymorphic types); implementation issues, such as compilation, lazy evaluation, combinators, parallelism, and various optimization techniques. Implementation project required. Prerequisites: 501, which may be taken concurrently, and 505.

C SCI 519 Computer Science Research Seminar (1, max. 3) Weekly presentations on current research activities by members of the department. Only computer science graduate students may register, although others are encouraged to attend.

C SCI 520 Computer Science Colloquium (1, max. 9) Weekly public presentations on topics of current interest by visiting computer scientists.

C SCI 521 Design and Analysis of Algorithms I (3) Principles of design of efficient algorithms: recursion, divide and conquer, balancing, dynamic programming, greedy method, data structure selection. Correctness and analysis of algorithms. Examples drawn from problems in sorting, searching, set manipulation, pattern matching, graphs, matrices, polynomials, and integers. Prerequisite: 326 or equivalent.

C SCI 522 Design and Analysis of Algorithms II (3) Analysis of algorithms more sophisticated than those treated in 521. Content varies and may include such topics as algebraic algorithms, combinatorial algorithms, techniques for proving lower bounds on complexity, and algorithms for special computing devices such as networks or formulas. Prerequisite: 521.

C SCI 531 Formal Languages and Automata (3) Formal models in computer science, including finite automata, regular expressions, context free grammars, pushdown automata, Turing machines, and techniques for analyzing them. Nondeterminism, undecidability.

C SCI 532 Complexity Theory (3) Models of computation, such as Turing machines and random access machines; nondeterminism and alternation. Computable and noncomputable functions. Time and space complexity, complexity hierarchies, NP-completeness, and provably difficult problems. Proof techniques, such as simulation, diagonalization, and reducibility.

C SCI 533 Advanced Topics in Complexity Theory (3) Topics in computational complexity more sophisticated than those treated in 532. Topics are expected to vary from year to year, but might typically focus on such areas as parallel complexity, probabilistic complexity, circuit- or automaton-based complexity, or logic.

C SCI 540 Discrete System Simulation (3) Principles of simulation of discrete, event-oriented systems. Model construction, simulation and validation; relationship to other techniques for system analysis and design. Use of SIMULA, a programming language with special features for simulation. Prior familiarity with some statistical tools desirable.

C SCI 542 Central Processor Architecture (3) Several central processing units are examined at the gate level. Included are the logic structures of: I/O bus, memory bus, ALU, address modification, control logic, combinatorial and multiphase instructions, access priority, cycle stealing, etc. Prerequisite: 470.

C SCI 543 Computer System Performance Modeling (3) Use of queueing network models as tools to evaluate the performance of centralized and distributed computer systems. Prerequisite: 451.

C SCI 544 Fundamentals of Stochastic Models of Computer Systems (3) Mathematical and computational properties of analytic performance models of computer systems. Markov stochastic processes, single congestion point queueing theory, separable and nonseparable networks, and formal and heuristic approaches to the analysis of these models. Prerequisites: 543 and some familiarity with concepts from basic probability theory. (Offered alternate years.)

C SCI 548 Computer Systems Architecture (3) Notations for computer systems. Processor design (single chip, look-ahead, pipelined, data flow). Memory hierarchy organization and management (virtual memory and caches). Microprogramming. I/O processing. Multiprocessors (SIMD and MIMD). Prerequisites: 451 and 470, which may be taken concurrently.

C SCI 549 High-Performance Computer Architectures (3) Algorithm design, software techniques, and computer organizations for high-performance computing systems. Selected topics from: VLSI complexity for parallel algorithms, compiling techniques for parallel and vector machines, large MIMD machines, interconnection networks, reconfigurable systems, memory hierarchies in multiprocessors, algorithmically specialized processors, data-flow architectures. Prerequisite: 548 or permission of instructor.

C SCI 551 Operating Systems (3) Operating systems design and construction techniques. Concurrent programming, correctness, deadlock, protection, transaction processing, design methodologies, and other topics. Structure of different kinds of operating systems. Prerequisite: 451.

C SCI 557 Computer Graphics (3) Generation and interpretation of pictures by computer with or without human interaction. Graphics hardware. Display programming. Picture transformation. Representations of pictures and their attributes. Curve and surface design and generation. Input methods. Graphics programming languages and systems. Laboratory project required.

C SCI 561 Computer Communications and Networks (3) Fundamentals of data transmission: coding, message formats, and protocols; organization of computer networks. Examples of existing network implementations. Term paper or laboratory project required.

C SCI 567 Introduction to VLSI Systems (3) Generic MOS technology, transistor as switch, inverter, NAND, NOR, circuit characteristics and ratio logic, driving large capacitive loads, PLAs, fabrication, design methodologies, layout tools, checking and simulation tools, single-chip systems including microprocessors, architectural issues of VLSI, and modeling VLSI systems. Prerequisite: 470 or permission of instructor.

C SCI 568 Advanced VLSI Laboratory (3) W. Borriello, Ebeling Advanced topics on MOS technology and CAD software; students design a large chip (more than 104 transistors) to be fabricated at end of term; laboratory activities include circuit and logic design, graphic layout of a chip, extraction, checking, and simulation. Prerequisite: 567 or permission of instructor.

C SCI 573 Artificial Intelligence I (3) Introduction to the use of the computer in nonnumerical problem solving. Survey of theorem proving, symbol manipulation, pattern recognition, and inductive problem-solving techniques. Computer models of human thought. Prerequisites: knowledge of LISP and data structures or permission of instructor.

C SCI 574 Artificial Intelligence II (3) Continuation of studies of artificial intelligence systems, emphasizing theorem proving, symbolic problem solving, pattern recognition, and natural language data processing. Students are required to do projects. Prerequisite: 573.

C SCI 576 Image Understanding (3) Overview of computer vision, emphasizing the middle ground between image processing and artificial intelligence. Image formation, preattentive image processing, boundary and region representations, and case studies of vision architectures. Joint with E E 576. Prerequisites: 573 or E E 562, 557, or permission of instructor.

C SCI 590 Special Topics in Computer Science (*) Several offerings each quarter, on topics of current interest. Prerequisite: permission of instructor.

C SCI 600 Independent Study or Research (*) AWSps Offered on credit/no credit basis only.

C SCI 700 Master's Thesis (*) AWSps Offered on credit/no credit basis only.

C SCI 800 Doctoral Dissertation (*) AWSps Offered on credit/no credit basis only.

Dance

258 Meany

The dance program trains dancers for professional careers and provides a foundation for future advanced work in the areas of choreography, historical research and writing, movement analysis, performing, and teaching.

Students have an opportunity to perform and/or choreograph in quarterly performances.

Undergraduate Program

Cathy Schwartz, Adviser
258 Meany

Bachelor of Arts Degree

Admission Requirement: Students must complete a minimum of one quarter of basic dance technique at the University before acceptance into the major program. Transfer applicants may audition or submit videotape for consideration.

Major Requirements: Minimum of 70 credits in dance and 10 credits in related courses: 207, 208, 209, 242, 304, 305, 306, 344, 345, 351, 354, 360, 361, 365, 366, 367, 390, 420, 493; 3 credits of ballet technique; 1 credit of ethnic dance; 4 credits from 322, 371, 470, 471; 6 credits of music; 4 credits, DRAMA 212.

An overall grade-point average of 3.00 in dance courses is required to maintain major status. Students must demonstrate consistent and acceptable progress in technique, performance, and academic areas toward the attainment of a degree.

Faculty

Professors

Boris, Ruthanna, 1965, (Emeritus), D.T.R., 1946; ballet technique and dance therapy.

Skinner, Joan,* 1967, M.A., 1964, Illinois; dance composition, improvisation, and kinesthetic training.

Wiley, Hannah, 1987, M.A., 1981, New York; ballet, pointe, scientific aspects of dance, choreography.

Associate Professors

Green, Eva, 1967, (Emeritus), B.A., 1940, Barnard; ballet technique.

Hackney, Peggy J., 1979, M.F.A., 1971, Sarah Lawrence; contemporary dance technique, Laban Movement Analysis, notation, composition, improvisation, and repertory.

Lecturers

Grizzell, Terrence C., 1986; classical ballet studies, choreography.

Matthiessen, Erin, 1984; contemporary technique, repertory, composition, dance history.

Part-time faculty members drawn from professionals in the community.

Course Descriptions

Courses for Undergraduates

DANCE 107, 108, 109 Introduction to Dance (4, max. 8; 4, max. 8; 4, max. 8) Contemporary dance technique, ballet, and new approaches to movement training.

DANCE 133 Summer Dance Intensive I (1-4, max. 12) Dance technique, modern and ballet repertory, composition, and performance. Three weeks of day-long study.

DANCE 201, 202, 203 Ballet Technique II (*, max. 8; *, max. 8; *, max. 8) Continued development of all beginning areas. Expansion of ballet vocabulary. Prerequisites: permission of instructor for 201; 201 or permission of instructor for 202; 202 or permission of instructor for 203.

DANCE 204, 205, 206 Contemporary Technique II (*, max. 8; *, max. 8; *, max. 8) Intermediate. Expansion of movement vocabulary. Prerequisites: 109 or permission of instructor for 204; 204 or permission of instructor for 205; 205 or permission of instructor for 206.

DANCE 207, 208, 209 Dance Synthesis (4,4,4) Orientation to a broad experience of dance. Integration of the study of technique with improvisation and composition. Prerequisite: dance major or permission of instructor.

DANCE 223 Men's Special Techniques (1, max. 6) AWSp. Specific areas of technique that emphasize strength, stamina, elevation, and all other elements in which the masculine principle prevails. Prerequisite: permission of instructor.

DANCE 231 Folk/Ethnic Dances of Western Cultures (1, max. 6) Folk dances of Western cultures (i.e., Irish, American square, Spanish, Scandinavian, or Scottish). See quarterly *Time Schedule* for specific offering.

DANCE 232 Folk/Ethnic Dances of Eastern Europe and Middle East (1, max. 6) Folk dances of Eastern Europe and the Middle East (i.e., Greek, Balkan, Russian, African). See quarterly *Time Schedule* for specific offering.

DANCE 233 Folk/Ethnic Dances of Eastern Cultures (1, max. 6) Folk dances of Eastern cultures (i.e., Korean, Japanese, East Indian, Cambodian). See quarterly *Time Schedule* for specific offering.

DANCE 242 Music in Relation to Dance (3) Practicum in percussion techniques. Relationship of music to dance in major dance works. Splicing tapes and creating sound scores.

DANCE 301, 302, 303 Ballet Technique III (*, max. 8; *, max. 8; *, max. 8) Advanced-intermediate level: continued development and expansion in all areas of technique. Prerequisites: permission of instructor for 301; 301 or permission of instructor for 302; 302 or permission of instructor for 303.

DANCE 304, 305, 306 Contemporary Dance Technique III (4, max. 8; 4, max. 8; 4, max. 8) Intermediate-advanced. Dance sequences of greater complexity. Prerequisites: 209 or permission of instructor for 304; 304 or permission of instructor for 305; 305 or permission of instructor for 306.

DANCE 322 Repertory (2, max. 8) Learning and performing pieces from professional dance repertoire, including reconstructions from notated scores. Prerequisites: permission of instructor and concurrent registration in a dance technique course.

DANCE 330 Kinesthetic Training I (3) Skinner Knowledge gained through direct perceptual experience. Uses imagery to facilitate efficient functioning of the mind/body complex in an artistic task.

DANCE 333 Summer Dance Intensive II (4-10, max. 18) Dance technique, modern and ballet repertory, composition, and performance. Concentrated daylong study.

DANCE 340, 341, 342 Movement for Actors and Singers (2,2,2) Freedom of movement and voice through the release of excess tension-coordination, finding a natural grace. Assimilation of style and development of mood and character. Uses dynamic approach to energy and space to help enrich the theatrical statement. Prerequisites: 340 for 341; 341 for 342.

DANCE 344 Dance History (3) Study of the evolution of dance from ritual to a theatre art form.

DANCE 345 History of Dance (3) Roots of contemporary dance as an art form and its relationship to developments in ballet since the turn of the century.

DANCE 346 Twentieth-Century Dance History Through Style Analysis (3) Historical trends of dance in the twentieth century. A perspective for looking at movement concerns of choreographers through style analysis. Prerequisite: 354 or permission of instructor.

DANCE 350 Exploring the Articulate Body I (3) Hackney Basic body connections and joint articulations. Principles of dynamic body alignment, patterning efficient lines of muscular use, weight initiation, connections from lower-body support to upper-body freedom. Based on the Bartenieff fundamentals as developed by the Laban Institute of Movement.

DANCE 351 Dance/Movement Notation (3) Hackney Analyzing and recording the structural elements of movement as developed by Rudolph Laban.

DANCE 354 Laban Movement Analysis I (3) Hackney Laban's effort/shape concepts. What makes movement expressive, how to see movement textures clearly, how to broaden the dynamic range of one's movements.

DANCE 360, 361, 362 Improvisation (2,2,2) Spontaneous composition as an art and skill.

DANCE 365, 366, 367 Dance Composition (3,3,3) Study of dynamic forms that arise out of juxtaposition of movement elements in time and space; counterpoint.

DANCE 371 Choreographic Workshop (2) Performing experience for students in pieces choreographed by faculty members.

DANCE 390 Dance Teaching Methodologies (3) Introduction to dance pedagogy. Practical teaching experience. Prerequisite: dance major status or permission of instructor.

DANCE 401, 402, 403 Ballet Technique IV (*, max. 8; *, max. 8; *, max. 8) Advanced level. Prerequisites: 303 or permission of instructor for 401; 401 or permission of instructor for 402; 402 or permission of instructor for 403.

DANCE 404, 405, 406 Contemporary Dance Technique IV (4, max. 8; 4, max. 8; 4, max. 8) Advanced technical skills applied to longer dance sequences. Prerequisites: 306 or permission of instructor for 404; 404 or permission of instructor for 405; 405 or permission of instructor for 406.

DANCE 407, 408, 409 Advanced Dance Synthesis (2,2,2) Assessment of training and development in skills, kinesthetic perception, creative process, and performance. Prerequisite: senior dance major.

DANCE 420 Dance Esthetics (3) Reading and discussion of writings pertaining to the esthetics of dance.

DANCE 430 Kinesthetic Training II (3) Skinner Continuation of 330. Language of imagery developed to a more sophisticated level. Designed to enable the student to experience integration of the mind/body complex in the creative process. Prerequisite: 330 or permission of instructor.

DANCE 450 Exploring the Articulate Body II (3) Hackney Movement fundamentals; further development of 350 course work. Prerequisites: 350 and permission of instructor.

DANCE 451 Advanced Dance/Movement Notation (3) Further development of 351 course work. Prerequisites: 351 and permission of instructor.

DANCE 454 Laban Movement Analysis II (3) Hackney Includes in-depth work in combinations of effort qualities (states and drives), space harmony, and phrasing of effort, shape, space, and body. Prerequisites: 354 and permission of instructor.

DANCE 455 Movement Observation (3) Hackney Practical techniques for developing skill in the use of Laban movement analysis for observing and describing movement. Overview of work of observers in various fields of research. Extensive work on location and in the studio observing movement, live and on film/video. Focuses on particular applications for diverse research needs. Prerequisites: 354 and permission of instructor.

DANCE 456 Seminar in LMA Applications (3) Hackney Theory, movement, and observation experiences integrated with an understanding of the history and applications of Laban movement analysis. Prerequisites: 454, 455, and permission of instructor.

DANCE 460 Advanced Improvisation (3) Improvisation as a performance form. Spontaneous composition of movement ideas and phrases shaped into a coherent whole by group ensemble work. Prerequisites: 360, 361, 362, or permission of instructor.

DANCE 466 Advanced Dance Composition (3) Explores a variety of approaches to personal creative process in dance composition. Prerequisites: 365, 366, 367, or permission of instructor.

DANCE 470 Dance Production Activities (1-3, max. 12) Participation in dance productions, either studio showings or public performances, conducted under faculty direction or supervision. Prerequisite: permission of instructor.

DANCE 472 Choreographic Workshop (2) Further development of 371 course work. Prerequisite: permission of instructor.

DANCE 480-481-482 Bartenieff Fundamentals® (3-3-3) SW,SW,SW Hackney Principles of movement initiation, weight shift, movement sequencing, spatial tensions, and breath support. Relationship of these principles to the understanding of anatomical concepts in body patterning for mobility and stability. Prerequisites: admission to the LMA program and 350, 354, and 493 or equivalents for 480-; 480- for 481-; 481- for 482; recommended: 351 or equivalent for 480-.

DANCE 483-484-485 Seminar in Laban Movement Analysis (3-3-3) SW,SW,SW Implications, applications, and historical development of the Laban Movement Analysis system. Comparison of the LMA system to other research tools in nonverbal communication. Prerequisites: admission to the intensive LMA program and 350, 354, and 493 or equivalents for 483-; 483- for 484-; 484- for 485; recommended: 351 or equivalent for 483-.

DANCE 486-487-488 Laban Movement Analysis Theory (3-3-3) SW,SW,SW Hackney The Laban Movement Analysis system as a framework for understanding the structural/body, spatial/shape, and dynamic concepts of movement. Exploration and broadening of one's own movement repertoire. Interrelationship of LMA vocabulary to the expressive and emotional nature of human movement experience. Prerequisites: admission to the intensive LMA program and 350, 354, and 493 or equivalents for 486-; 486- for 487-; 487- for 488; recommended: 351 or equivalent for 486-.

DANCE 490 Special Studies in Dance (1-3, max. 10) Special studies designed to address contemporary and historical concerns in the field of dance. Prerequisite: permission of instructor.

DANCE 493 Anatomy for Dance (4) Anatomy of the musculoskeletal system and its applications in dance movement.

DANCE 494-495-496 Movement Observation and Analysis (3-3-3) SW,SW,SW Hackney Observation and notation, both on location and in the studio, of structural and qualitative aspects of movement, utilizing effort, shape, and Laban notation symbols. Focuses on specific applications for students' research projects. Prerequisites: admission to the intensive LMA program and 350, 354, and 493 or equivalents for 494-; 494- for 495-; 495- for 496; recommended: 351 or equivalent for 494-.

DANCE 499 Undergraduate Independent Study (*, max. 6)

Drama

101 Hutchinson

The School of Drama is concerned with the whole continuum of acting, directing, designing, theatre history, and dramatic forms through which the human dramatic imagination finds expression.

The school uses four theatres including the Glenn Hughes Playhouse, with a thrust stage; and the Penthouse Theatre, first theatre-in-the-round built in America. Faculty- and student-directed plays drawn from the full range of world dramatic literature are presented throughout the year. Additional productions are mounted in the two theatres of Meany Hall. Technical

and design support is provided for opera productions of the School of Music and for programs of the dance division.

Undergraduate Program

Adviser
105A Hutchinson

Bachelor of Arts Degree

Major Requirements: A minimum of 61 credits in drama courses. Three quarters of acting: DRAMA 251, 252, 253 or 351, 352, 353 (with 350 series, 3 credits of DRAMA 298 or 498 also required). One quarter of child drama: DRAMA 432. Three quarters of technical theatre: DRAMA 210, 211, 212, 290, 291, 292. 25 credits in theatre history, dramatic literature, and criticism: DRAMA 302, 371. One of DRAMA 372, 374, 377, 378, 472; one of DRAMA 473, 475, 476; one of DRAMA 416, 494 (or substitution of additional course from two previously listed series). Electives at the 300-400 level to complete the balance. Majors are required to register for DRAMA 401 each quarter they are in residence.

Bachelor of Fine Arts Degree

A minimum of 243 credits is required for graduation with a Bachelor of Fine Arts degree. The Professional Actor Training Program course of study is for three years of intensive studio and performance work in acting, movement, voice, and speech.

Admission Requirements: Complete, or be in the process of final completion of, two years of general college study (90 credits). Entrance determined primarily by audition and interview. Students may enter only in Autumn Quarter. Application deadline is January 15 for auditions held in the winter. The student should contact the school for information about additional material required for application.

Major Requirements: In addition to the 90 credits required for admission, 45 credits in elective courses, plus three quarters each of DRAMA 457, 458, 459, and 555.

Graduate Program

The School of Drama offers programs of graduate study leading to the Master of Fine Arts and Doctor of Philosophy degrees. Areas of study for the M.F.A. degree are acting, playwrighting, stage direction, scene design, lighting design, costume design, and technical direction. Most students should expect to spend three years to complete requirements for the M.F.A. degree.

The Ph.D. program provides students with training for scholarly research in theatre history, dramatic literature, theory, and criticism. The traditionally interdisciplinary nature of the degree program encourages students to conduct research in tutorial with faculty members in drama as well as with adjunct faculty from such disciplines as architecture, art, Asian languages and literature, Romance languages and literature, comparative literature, English, music, and Scandinavian languages and literature.

Admission Procedure

In the M.F.A. degree program, the Graduate Record Examination is required only for the directing option.

Acting: Application deadline is January 15. An audition is required; three letters of recommendation, statement of purpose, résumé, and picture.

Design (Costume, Lighting, and Scenery) or Technical Direction: Three letters of recommendation, résumé, statement of purpose for seeking the degree and career objectives, and a portfolio of designs, technical plots, or working drawings.

Directing: Three letters of recommendation, résumé, statement of purpose for acquiring a graduate degree, and a directorial analysis (not to exceed ten typewritten pages, double spaced) to be chosen from the following list of plays: *The Sea Gull*, by Chekhov; *The Crucible*, by Miller; *The Good Person of Szechwan*, by Brecht (Arthur Willett, translator); *Major Barbara*, by Shaw; *The Matchmaker*, by Wilder; *The Mad Woman of Chailiot*, by Giradoux (Maurice Voleney, translator); *Cat on a Hot Tin Roof*, by Williams; *Macbeth*, by Shakespeare; *The Father*, by Strindberg; *Hedda Gabler*, by Ibsen (Eva Le Gallienne, translator); *Curse of the Starving Class*, by Shepard; *Comedy of Errors*, by Shakespeare. The analysis should include interpretation of thematic and stylistic elements of the play; discussion of directorial problems involved in preparing the play for production; possibilities for solution of problems; ideas for style or scheme of production.

Playwriting: One full-length or three one-act plays, a résumé, a statement of purpose, and three letters of recommendation.

Doctor of Philosophy Degree: Three letters of recommendation; résumé, Graduate Record Examination scores, statement of purpose (educational and professional objectives), a piece of written work that represents the applicant's best. Students who enter the program are expected to have had some theatre experience, both practical and academic.

Faculty

Director

Mary E. Comtols

Professors

Christofides, Constantine G.* 1968, ‡(Art, Comparative Literature, Romance Languages and Literature), M.A., 1949, Ph.D., 1956, Michigan; Romanesque.

Clay, Jack D.* 1986, M.A., 1956, Northwestern; acting.

Comtols, Mary E.* 1985, M.A., 1962, San Francisco State; Ph.D., 1970, Colorado; playwrighting.

Crider, James R.* 1952, (Emeritus), M.A., 1950, Washington; costume design.

Dahlstrom, Robert A.* 1971, M.A., 1967, Illinois; design.

Devin, Richard M.* 1975, M.F.A., 1969, Yale; lighting design.

Haaga, Agnes M., 1952, (Emeritus), M.A., 1952, Northwestern; child drama.

Harrington, Donald, 1938, (Emeritus), M.A., 1933, Columbia; directing.

Hildebrand, Grant* 1964, ‡(Architecture, Art), M.Arch., 1964, Michigan; architectural history, preservation design.

Hostetler, Paul S.* 1974, A.M., 1949, Stanford; Ph.D., 1964, Louisiana State; theatre history, directing.

Loper, Robert B.* 1967, M.A., 1950, Colorado; Ph.D., 1957, Birmingham (England); acting, directing.

Reinert, Otto* 1956, ‡(Comparative Literature, English, Scandinavian Languages and Literature), M.A., 1948, Ph.D., 1952, Yale; modern European drama.

Siks, Geraldine B., 1951, (Emeritus), M.A., 1940, Northwestern; child drama.

Stæene, Birgitta K.* 1973, ‡(Comparative Literature, Scandinavian Languages and Literature), M.A., 1955, Ph.D., 1960, Washington; Ph.D., 1966, Uppsala (Sweden); modern Scandinavian drama, Scandinavian film, comparative literature.

Sydow, John D.* 1970, (Emeritus), M.F.A., 1950, Yale; directing.

Associate Professors

Case, Sue-Ellen,* 1981, (Women Studies), M.A., 1968, California State (San Francisco); Ph.D., 1981, California (Berkeley); dramatic criticism.

Forrester, William D.,* 1972, M.F.A., 1969, Yale; design.

Lorenzen, Richard L.,* 1970, M.A., 1966, Ph.D., 1968, Ohio State; theatre history.

Lounsbury, Warren D., 1948, (Emeritus), M.A., 1953, Washington; technical direction.

Valentinetti, Aurora S.,* 1961, M.A., 1949, Washington; puppetry.

Witham, Barry B.,* 1979, M.A., 1964, Iowa; Ph.D., 1968, Ohio State; theatre history.

Assistant Professors

Gates, Sarah Nash,* 1983, M.A., 1974, California (Santa Barbara); M.F.A., 1983, Boston; costume design.

Wolcott, John R.,* 1967, M.F.A., 1964, Carnegie; Ph.D., 1967, Ohio State; theatre history.

Lecturers

Dickerson, Judith A., 1986, M.F.A., 1981, Southern Methodist; voice and speech.

Dixon, Max W., 1986, M.A., 1961, Colorado; movement.

Glerum, Jay O.,* 1986, M.A., 1969, Washington; theatre technology.

Course Descriptions**Courses for Undergraduates**

DRAMA 101 Introduction to the Theatre (5) AWSp The theatre as an art form with emphasis on the play in production. The role of the various theatre artists: actors, directors, designers, and playwrights. Required attendance at one or more performances. Lecture and discussion groups. For nonmajors.

DRAMA 102 Text and Performance (5) Analysis of plays. Introduction to genre and form in drama, both for the reader and practitioner. Illustrates historically the relationship between dramatic forms and theatrical production. For nonmajors.

DRAMA 200 Drama and the Child (3) Introduction to the use of drama and its related arts as a means of developing the processes of self-expression and communication basic to a child's general education.

DRAMA 201 Dramatic Action (5) Play structure through analysis of one-act plays in all genres, with special attention to plotting and the various means used to achieve a unity of action as the basis of all drama.

DRAMA 210, 211, 212 Theatre Technical Practice (4,4,4) Devin, Gates, Glerum Intensive lecture-laboratory in basic theories, techniques, and equipment of the stage. 210: technical procedures; 211: costumes; 212: stage lighting.

DRAMA 230 Introduction to Children's Drama (2) Valentinetti Survey of children's drama with an emphasis on philosophies and practices. Includes children's theatre, creative dramatics, and puppetry. Open to nonmajors.

DRAMA 250 Acting Skills for Everyday Life (4) S Introduction to acting techniques as tools for nonactors. Effective communication, relaxation, and stress reduction. Role playing, goal identification and achievement in public speaking, marketing presentations, courtroom persuasion, teaching situations. Skill development through theatre games, role playing, improvisation.

DRAMA 251, 252, 253 Acting (4,4,4) A,W,Sp Theory and practice of fundamentals. 251: development of fundamental aptitudes in acting (focus, recall, sense memory) through improvisation and basic scene work. 252: analysis and development of characterization. 253: advanced analysis, character rhythm, extended scene work. Prerequisites: 251 for 252; 252 for 253.

DRAMA 290, 291, 292 Theatre Technical Practices Laboratory (1,1,1) AWSp,AWSp,AWSp Laboratory course involving specific production assignment, either in-shop or in-theatre or both. Prerequisites: 210 for 290 or concurrent registration; 211 for 291 or concurrent registration; 212 for 292 or concurrent registration.

DRAMA 298 Theatre Production (1-2, max. 9) AWSp Laboratory course for students participating in School of Drama minor productions and projects. Prerequisite: being cast in a production or receiving a crew assignment.

DRAMA 302 Play Analysis (5) Analyses of plays, based on leading critical traditions. Illustrates variety of approaches to a play, criteria for choosing best approach for a given play, and ways in which criticism aids in understanding dramatic effect, for both reader and practitioner. Prerequisite: some theatre background. (Formerly 102.)

DRAMA 313 Scenery Construction (3) Glerum

DRAMA 316 Theatrical Makeup (2) AWSp Galstaun Basic principles, with intensive practice in application of makeup for use on proscenium and arena stages. Open to nonmajors.

DRAMA 331 Puppetry (3) AWSp Valentinetti Introduction to puppetry; construction and use of simple puppets as a visual aid in education, recreation, and therapy.

DRAMA 351, 352, 353 Advanced Acting (3,3,3) A,W,Sp Intensive course sequence in acting with integrated laboratory work in movement and voice. Improvisation, mime, scene analysis, and emphasis on realistic acting with introduction to styles and genres. Prerequisites: audition for 351; 351 for 352; 352 for 353.

DRAMA 371 Theatre and Society (5) Introduction to the history of the theatre from the Greeks to the present day. Development of the theatre as a social institution. Reading of major texts from each period.

DRAMA 372 Actors, Scenes, and Machines (5) Examines past and present productions of plays, musicals, operas, and related performances to understand the relationship between the performer, the playhouse, and scenic spectacle. Readings include selected plays and theoretical works. Recommended: 371.

DRAMA 374 History of the Greek Theatre and Its Drama (5) Wolcott Examination of the relationship of the physical theatre and the productions that took place within that theatre, with particular emphasis on the text performed, styles of acting, scenic elements, and the critical theories that influenced the theatre of the period. Prerequisite: 371 or permission of instructor.

DRAMA 377 History of the European Renaissance Theatre and Its Drama (5) Wolcott See 374 for course description. Prerequisite: 371 or permission of instructor.

DRAMA 378 History of the English Theatre and Its Drama: 1500-1700 (5) See 374 for course description. Prerequisite: 371 or permission of instructor.

DRAMA 391 Beginning Technical Practices (1-3, max. 9) Laboratory course involving specific production assignments, either in-shop or in-theatre, or both. Prerequisites: 290, 291, 292 or receiving a production assignment.

DRAMA 401 Drama Colloquium (0-0-1, max. 3) AWSp Weekly lectures by guest artists, presentations by faculty or students of works in progress. Required of all undergraduate and graduate drama majors each quarter in residence.

DRAMA 410 Advanced Theatre Technical Practices (2-4, max. 20) Production-related apprenticeship, in the areas of scene construction, scene painting, costume, or lighting. Prerequisites: 210, 211, 212, 418, or permission of instructor.

DRAMA 413 Advanced Scene Construction (3) A Special problems in scene construction materials and rigging. Prerequisites: 210, 212, 290, 292, 410 or equivalent practical experience, and 420.

DRAMA 414 Scene Design (3, max. 6) Dahlstrom, Forrester Theory, practice, and rendering of scene designs. Repeat of course involves intermediate designs, models, etc. Prerequisites: 210, ART H 203, or equivalent.

DRAMA 415 Stage Costume Design (3, max. 6) W Gates Theory, practice, and rendering of costume designs for the theatre. Repeat of course involves intermediate designs. Prerequisites: 211, ART 109 and ART H 203 or equivalent or permission of instructor; 416 for repeat of course.

DRAMA 416 History of Clothing and Costume (5) A Crider Survey history of Western clothing and theatrical costume; emphasis on civil dress with attention to the distinctions in clothing for the stage. Open to nonmajors. Prerequisite: junior standing.

DRAMA 417 Stage Costume Patterning and Construction (3, max. 6) W Techniques of costume construction, including study of fabrics; emphasis on creating patterns by draping. Prerequisites: 211, 416, or permission of instructor.

DRAMA 418 Scene Painting (3, max. 6) Sp Forrester Lecture-laboratory with focus on techniques and principles of scene painting. Uses of various media and types of equipment as applicable to varied scenic pieces. Prerequisite: 210 or permission of instructor.

DRAMA 419 Stage Lighting (3) W Devin Theories and methods of lighting with emphasis on the design process and lighting plots. Laboratories consist of analysis of lighting instruments and control, color experiments, and basic circuitries. Prerequisite: 212 or equivalent.

DRAMA 420 Design and Technical Drafting (2, max. 4) A Laboratory and project critique covering stage design graphics and technical drawing; specifically: designer's elevations, ground plans, sections, detail drawing, transposition of design drawing information to technical drawings. Prerequisite: 210.

DRAMA 421 Drawing and Rendering Techniques for the Theatre (2) AWSp Forrester Weekly figure-drawing laboratories with live model and weekly field trips for laboratories in drawing natural phenomena and architectural detail. Studies in historical drawing styles. Practice in use of several media and techniques of expression. Prerequisites: 210, 211.

DRAMA 430 Improvisation Performance Practicum (3) Developing performance through improvisation in small ensembles. Creation of short plays for performance in local schools, emphasizing story theatre, participation-play formats, and the demands of child audiences. Improvement of improvisation skills. Prerequisite: 253 or permission of instructor.

DRAMA 431 Fundamentals of Puppetry (3, max. 9) Valentinetti Puppetry as a theatre art; construction and use of puppets and marionettes for formal presentations; basic principles of playwriting and staging. Prerequisite: 331 or permission of instructor.

DRAMA 432 Child Drama (3) History and development, processes and products, and the place of child

drama—including children's theatre, creative dramatics, film-radio-television, and puppetry—in contemporary society.

DRAMA 441 Beginning Playwriting (5, max. 10) *Comtois* Writing exercises and drafts of a one-act play provide first experience in writing for performance. Readings of representative one-act plays introduce genres and writing styles. Prerequisites: 253 or 353; 210, 211, 212; or practical theatre experience.

DRAMA 442 Intermediate Playwriting (5, max. 10) *Comtois* Two one-act plays rewritten for rehearsed reading. Readings of selected one-act plays address specific problems of playwright's craft. Prerequisite: 441 or practical theatre experience.

DRAMA 450 Rehearsal Laboratory (2, max. 6) Acting in projects directed by graduate directing students. Prerequisite: one year of acting and audition.

DRAMA 454 Projects in Acting (3, max. 9) Rehearsal and classroom performance of dramatic literature of various periods and styles. Prerequisite: audition.

DRAMA 457 Studio I (12, max. 36) AWSp *Clay, Dixon* Skill development in acting, voice, speech, and movement necessary for professional training in acting. Prerequisite: admission to the Professional Actor Training Program.

DRAMA 458 Studio II (12, max. 36) AWSp *Clay, Dixon* Continuation of 457. Prerequisites: 457 and completion of the first year of the Professional Actor Training Program.

DRAMA 459 Studio III (6, max. 18) AWSp *Clay, Dixon* Specialized and individualized work relating to the main curriculum of the third year of the Professional Actor Training Program. Prerequisites: 458 and completion of the second year of the Professional Actor Training Program.

DRAMA 460 Introduction to Directing (3) A *Hostetler, Loper* Student is introduced to the art of the stage director. Prerequisites: 302; 253 or 353; 210, 211, 212; and permission of instructor.

DRAMA 461, 462 Elementary Directing (3,3) W,Sp *Hostetler, Loper* Elementary study of the art of the stage director. Prerequisites: 460 and permission of instructor for 461; 461 and permission of instructor for 462.

DRAMA 466 Stage Management (2-5, max. 15) AWSp *Devin* Study and practice of stage management. Prerequisites: 210, 211, 212, 290, 291, 292, or permission of instructor.

DRAMA 472 History of the English Theatre and its Drama: 1700-1900 (5) *Witham* Examination of the relationship of the physical theatre and the productions that took place within that theatre. Particular emphasis on the text performed, styles of acting, scenic elements, and the critical theories that influenced the theatre of the period. Prerequisite: 371 or permission of instructor.

DRAMA 473 Modern European Theatre and Drama (5) Sp *Case, Witham* See 472 for course description. Prerequisite: 371 or permission of instructor.

DRAMA 475 Modern English Theatre and Drama (5) *Case, Witham* Major trends in contemporary English theatre, post-World War II to the present. Performers, dramatists, and designers who shaped the course of the theatre following the "angry young rebellion" of the 1950s. Prerequisite: 371 or permission of instructor.

DRAMA 476 Modern American Theatre and Drama (5) *Case, Witham* Major forces shaping modern American theatre, Eugene O'Neill to the present. Leading dramatists, directors, and designers of the

post-World War II era. Experiments such as the federal theatre project, group theatre, and living theatre. Prerequisite: 371 or permission of instructor.

DRAMA 490 Special Studies in Acting-Directing (1-6, max. 6) AWSp Prerequisite: permission of instructor.

DRAMA 491 Special Studies in Design-Technical (1-6, max. 6) AWSp Prerequisite: permission of instructor.

DRAMA 492 Special Studies in Children's Drama (1-6, max. 6) AWSp Prerequisite: permission of instructor.

DRAMA 494 Special Studies in Theatre and Drama (5, max. 20) AWSp *Case, Hostetler, Loper, Witham, Wolcott* Topics in drama, history, and criticism. See the quarterly *Time Schedule* for specific topic to be offered in a given quarter. Prerequisites: 302, 473, 476, or permission of instructor.

DRAMA 496 Stage Costume Problems (2, max. 8) Specific research problems of stage costume design and execution: accessories, masks, wigs, fabric modification, millinery or construction analysis for specialized costumes. Topics vary. Prerequisites: 211, 416, and permission of instructor.

DRAMA 497 Theatre Organization and Management (3) Sp *Devin* Theoretical and practical examination of the professional theatre organization and management: legal structures, funding, business practice, unions, and operational procedures. Open to non-majors.

DRAMA 498 Theatre Production (1-2, max. 9) AWSp Laboratory course for students participating in School of Drama major productions. Prerequisite: being cast in a production or receiving a crew assignment.

DRAMA 499 Undergraduate Research (1-5, max. 15) AWSp Prerequisite: permission of instructor.

Courses for Graduates Only

DRAMA 502 Designer-Director Analysis (4) A *Dahlstrom, Loper* Methods of examining plays to make the collaboration of director and designer productive. Attempts to create a structural whole from visual and verbal approaches to analysis. Prerequisite: graduate standing in drama.

DRAMA 510 Design Studio I (3, max. 9) AWSp *Dahlstrom, Forrester, Gates* Three-quarter sequential investigation of space, light, texture, and color in total theatre design, concurrently stressing mastery of the media and methods of presentation and execution. Prerequisites: concurrent registration in 518 or 519 and permission of instructor.

DRAMA 511 Design Studio II (3, max. 9) AWSp *Dahlstrom, Forrester, Gates* Artistic principles and techniques as a basis for creative work in theatre design. Studio work in composition, color, line, space, and light and shade. Reports and outside reading may be required. Prerequisites: 510, 518, 519, and permission of instructor.

DRAMA 512 Advanced Stage Lighting Design (3, max. 6) A *Devin* Advanced work in design of lighting for drama, opera, and dance; color theory; laboratory experimentation with color, fabric, paint, texture, and light; discussion of School of Drama production lighting. Prerequisites: 419 and 420 or permission of instructor.

DRAMA 513 Technical Direction (3, max. 9) AWSp *Glerum* Practical experience in mounting scenery for a current production; study of materials, techniques, management, and equipment of technical theatre; theatre planning and programming. Prerequisites: 413 and permission of instructor.

DRAMA 514 Design and Technical Theatre Colloquium (1, max. 9) AWSp Discussion of work in progress or completed in production, centering on the conceptual work of the designer/director on the production and the methods of execution in the shops and on stage.

DRAMA 515 Structures Analysis for the Theatre (3) *Glerum* Principles of engineering statics as applied to scenery construction problems.

DRAMA 516 Stage Rigging (3) *Glerum* Theory and practice of hemp, counterweight, and motorized rigging systems for the stage.

DRAMA 518, 519 Studies in Historic Design (3,3) *Dahlstrom, Forrester, Gates* Investigation of artistic principles and modes that influenced the art, architecture, furniture, and decor of selected historic periods. Prerequisite: 518 for 519, or permission of instructor.

DRAMA 520 Advanced Theatre Practicum (1-5, max. 15) AWSp Professional student internship with professional theatres: scenery, lighting, scene painting, costume, acting, directing, stage management, theatre management. Prerequisite: permission of instructor.

DRAMA 541 Graduate Playwriting Seminar I (3-6, max. 18) *Comtois* Workshop for development of new plays. Playwriting students develop one-act and full-length plays, which continue through rewriting until ready for public reading. Readings of representative contemporary full-length plays address specific problems of playwright's craft.

DRAMA 542 Graduate Playwriting Seminar II (3-6, max. 18) *Comtois* Continuation of play development through classroom critique, rehearsed readings, and twenty-hour rehearsal workshop productions. Readings address more complex craft problems. Regular rewriting of each student's work.

DRAMA 551, 552, 553 Teaching of Acting (3,3,3) Seminar discussion on problems in teaching acting to undergraduate students in 251, 252, and 253. Prerequisites: permission of instructor and being a teaching assistant in acting.

DRAMA 555 Special Problems in Acting (6, max. 18) AWSp *Clay, Dixon* Audition techniques, style problems, popular entertainment techniques. Prerequisites: 458 and completion of the second year of the Professional Actor Training Program.

DRAMA 560 Directing Apprenticeship (4, max. 12) Student works in close association with faculty and visiting directors for the entire rehearsal period in major productions of the School of Drama. Prerequisites: admission to the graduate directing program and permission of the instructor.

DRAMA 561 Directing Projects (4, max. 24) Directing practicum. One-act plays, scenes, or acts from full-length plays. Contemporary, experimental American and European drama. Prerequisite: graduate standing in the directing program.

DRAMA 563 Seminar in Directing (2, max. 18) AWSp *Loper* Seminar discussion of current productions; examination of problems of the stage director at the advanced level. Prerequisites: graduate standing in drama and permission of instructor.

DRAMA 564 Advanced Directing—Rehearsal (2, max. 6) Rehearsal techniques that can be used in defining style in a variety of contemporary and historical plays. Prerequisite: completion of first year of graduate directing program.

DRAMA 571, 572, 573 Problems in Theatre History Research (3,3,3) A,W,Sp *Witham, Wolcott* Methods and techniques of research in theatre history. Relationship of theatre arts to other arts and society in major periods of theatre history. Prerequisites: 571 for 572; 572 for 573.

DRAMA 575, 576, 577 Seminar in Theatre History (3,3,3) A,W,Sp *Witham, Wolcott* Prerequisites: 571, 572, 573.

DRAMA 581, 582, 583 Analysis of Dramatic Literature (3,3,3) A,W,Sp *Case* Modes of analysis intended for graduate students in drama (design, directing, and theatre history). Intensive analytical work on a limited number of play texts selected from the classical Greek period to the present.

DRAMA 585, 586, 587 Seminar in Drama (3,3,3) A,W,Sp *Case* Seminar in the historical development of dramatic criticism and theory.

DRAMA 599 Advanced Studies in Theatre Arts (1-5, max. 10) AWSp Independent projects or group study of specialized aspects of theatre arts. Prerequisite: permission of instructor.

DRAMA 600 Independent Study or Research (*) AWSp

DRAMA 700 Master's Thesis (*) AWSp

DRAMA 800 Doctoral Dissertation (*) AWSp

East Asian Studies

See *International Studies*.

Economics

301 Savery

The Department of Economics is concerned with the analysis of the ways in which societies organize the production of goods and services and the distribution of these among groups and individuals. Applied fields of study available to the student include: money and banking, industrial organization, natural resource economics, labor economics, public finance, economic history, comparative systems and development, international trade, and econometrics.

Undergraduate Program

John Burke, Adviser
304G Savery

Bachelor of Arts Degree

Admission Requirements: (1) A minimum of 45 transferable credits, including ECON 200, 201, 311 (or STAT 311), MATH 124 (or MATH 157), and at least 5 graded credits in English composition; (2) a cumulative grade-point average for all prior college work of at least 2.80; (3) grade-point average for the five courses required for entrance must average at least 2.80 with a minimum of 2.0 for each course (students who have repeated any of these five courses starting Winter Quarter 1983 must include both grades in the average); (4) transfer students must be enrolled at the University before they may apply.

Major Requirements: (1) Admission to the major; (2) a minimum of 50 credits in economics, including ECON 200, 201, 300, 301, 311 (or STAT 311), and at least five other upper-division courses in economics. At least three of these upper-division courses must be at the 400 level; (3) grades of 2.0 or better in ECON 300 and 301; (4) one calculus course (MATH 124, 134, 157, or equivalent) and any two courses from the following: MATH 125, 126, 135, 136; MATH 305; STAT 361, 362, 363; PHIL 120, 370, 470; and ACCTG 210 or equivalent (only one accounting course may be used for this requirement); (5) transfer students are required to complete a minimum of 25 upper-division credits in economics in residence at this university.

Graduate Program

The department offers programs of study leading to the Master of Arts and the Doctor of Philosophy degrees. The academic programs in economics are designed to develop trained economists for a variety of stimulating careers in teaching, in private industry, in government, and with international agencies at home and abroad. Frequent seminars—led by distinguished visitors from around the United States and from abroad, as well as by resident faculty and students—are conducted as an integral part of the department's broad agenda.

Special Requirements

Students need not have a full economics major as an undergraduate in order to apply, but should have taken intermediate-level courses in microeconomics and macroeconomics. Applicants should also have taken at least one year of calculus, one term of linear algebra, and one term of statistics. Applicants are required to take the Graduate Record Examination General Test and are encouraged to take the Subject Test in Economics.

Graduate requirements for the M.A. degree include ECON 500, 501, 502, 503, 517, 580, 581, and 582. In addition to this core program, M.A. students must take at least seven elective courses in economics at the graduate level. At least two of these courses must be in the same area (the field of specialization), and at least three of the courses must be in applied areas. M.A. students also must complete 6 credits of a supervised internship. Well-prepared students should be able to complete the M.A. program in two years.

Graduate requirements for the Ph.D. degree include ECON 500, 501, 502, 503, 509, 517, 580, 581, and 582. Ph.D. students are required to pass core examinations in microeconomics and macroeconomics. In addition to this core program, Ph.D. students must take eight other courses in economics at the graduate level. Each Ph.D. student must satisfy the requirements for two fields of specialization. The fields of specialization include advanced macroeconomic theory, advanced microeconomic theory, comparative systems and development, econometrics, industrial organization, international trade, labor economics, natural resource economics, and public finance.

Doctoral students must complete a doctoral dissertation. A foreign language is not required. A student with the recommended background can complete the doctoral program in four years, but most students take about five years.

Financial Aid

A number of teaching assistantships are awarded each year to incoming and continuing graduate students.

Research Facilities

The Institute for Economic Research provides support for graduate student and faculty research. The Center for Social Science Computation and Research maintains an extensive set of computer programs specifically designed for economic research, and the Data-bank service maintains a comprehensive economics data bank.

Correspondence and Information

Graduate Program Coordinator
304G Savery, DK-30

Faculty

Chairperson

Gardner M. Brown, Jr.

Professors

Barzel, Yoram,* 1961, M.A., 1956, Hebrew; Ph.D., 1961, Chicago; price theory.

Brown, Gardner M., Jr.,* 1965, (Environmental Studies), Ph.D., 1964, California (Berkeley); resource economics.

Cartwright, Philip W., 1947, (Emeritus), M.A., 1942, Ph.D., 1950, Stanford; macroeconomics, state and local fiscal policy.

Crutchfield, James A., 1949, (Emeritus), (Marine Studies, Public Affairs),† M.A., 1942, California (Los Angeles); Ph.D., 1954, California (Berkeley); economics.

Dowdle, Barney,* 1962, ‡(Forest Resources), M.F., 1958, Ph.D., 1962, Yale; growth and development of forest products industries, public forest land management.

Gillingham, J. Benton, 1947, (Emeritus), M.A., 1941, Wisconsin; economics.

Halvorsen, Robert,* 1972, M.B.A., 1965, M.P.A., 1968, Ph.D., 1973, Harvard; natural resources, public finance.

Lardy, Nicholas R.,* 1983, ‡(International Studies), Ph.D., 1975, Michigan; economics, Chinese economy.

Mah, Feng-Hwa,* 1961, (Emeritus), (International Studies),† A.M., 1956, Ph.D., 1959, Michigan; Chinese economy and foreign trade.

McCaffree, Kenneth M., 1949, (Emeritus), M.A., 1942, Denver; Ph.D., 1950, Chicago; labor economics and the economics of medicine.

McGee, John S.,* 1968, Ph.D., 1952, Vanderbilt; industrial organization.

Morris, Morris D., 1949, (Emeritus), Ph.D., 1954, California (Berkeley); economic history and the economy of India.

Mund, Vernon A., 1932, (Emeritus), M.B.A., 1929, Washington; Ph.D., 1932, Princeton; economics.

Nelson, Charles R.,* 1975, (Statistics), M.A., 1967, Ph.D., 1969, Wisconsin; time series analysis, economic statistical analysis, macroeconomics.

North, Douglass C., 1950, (Emeritus), Ph.D., 1952, California (Berkeley); economic history.

Parks, Richard W.,* 1970, M.A., 1964, Ph.D., 1966, California (Berkeley); econometrics.

Silberberg, Eugene,* 1967, Ph.D., 1964, Purdue; price theory.

Thornton, Judith A.,* 1961, M.A., 1958, Ph.D., 1960, Radcliffe; comparative systems, Soviet economics.

Turnovsky, Stephen J.,* 1988, M.A., 1963, Ph.D., 1968, Harvard; macroeconomics, international economics.

Worcester, Dean A., Jr., 1946, (Emeritus), M.A., 1940, Nebraska; Ph.D., 1943, Minnesota; comparative systems, policy related to income distribution.

Yamamura, Kozo,* 1970, ‡(International Studies, Marketing and International Business), M.A., 1962, Ph.D., 1964, Northwestern; economic development and economic history of Japan, comparative economic history.

Associate Professors

Bassett, Lowell R.,* 1966, M.S., 1964, Ph.D., 1966, Purdue; mathematical economics.

Hadjimichalakis, Michael G.,* 1969, M.A., 1967, Ph.D., 1969, Rochester; monetary theory and policy, macroeconomics, growth.

Hartman, Richard C.,* 1971, M.A., 1971, Ph.D., 1971, California (Berkeley); economic theory.

Kochin, Levis A.,* 1972, Ph.D., 1975, Chicago; macroeconomics, industrial organization.

Leffler, Keith B.,* 1978, M.A., 1974, Ph.D., 1977, California (Los Angeles); industrial organization, microeconomics.

Madden, Carolyn J. Watts,* 1975, ‡(Health Services, Public Affairs), M.A., 1974, Ph.D., 1976, Johns Hopkins; regulation insurance, health policy.

Rao, Potturi M.,* 1971, M.A., 1963, Delhi (India); Ph.D., 1969, Chicago; econometrics, statistics.

Startz, Richard,* 1984, Ph.D., 1978, Massachusetts Institute of Technology; macroeconomics, econometrics.
 Thomas, Robert P.,* 1963, (Environmental Studies), Ph.D., 1984, Northwestern; economic history.

Assistant Professors

Farrow, Raymond J., 1987, (Acting), M.A., 1980, Ph.D., 1988, Princeton; microeconomic theory, games and incentives, finance.

Gritz, Robert M., 1987, Ph.D., 1987, Stanford; labor economics, public finance, econometrics.

Lundberg, Shelly J.,* 1984, Ph.D., 1981, Northwestern; labor and applied microeconomics.

Mariger, Randall P.,* 1984, Ph.D., 1983, Harvard; consumption behavior, public economics.

Miyagiwa, Kaz F.,* 1987, Ph.D., 1985, Texas; international trade theory.

Swierzbinski, Joseph E.,* 1981, (Environmental Studies),† Ph.D., 1981, Harvard; resource economics, applied mathematics.

Wong, Kar-Yiu,* 1983, M.Phil., 1979, Chinese University of Hong Kong; M.Phil., 1981, Ph.D., 1983, Columbia; international trade and commercial policy..

Lecturers

Heyne, Paul T., 1976, M.A., 1957, Washington (St. Louis); Ph.D., 1963, Chicago; introductory economics, history of economic thought.

Turnovsky, Michelle H. L., 1988, M.B.A., 1965, Ph.D., 1978, Australia National; microeconomics, international and environmental economics, industrial organization.

Course Descriptions

Courses for Undergraduates

ECON 100 Principles of Economics (5) Fundamental concepts of economic analysis with application to contemporary problems. No credit if 200 or 201 have been taken.

ECON 200 Introduction to Microeconomics (5) AWSpS Analysis of markets: consumer demand, production, exchange, the price system, resource allocation, government intervention. Recommended: 1½ years of high school algebra and passing score on placement test for MATH 105, or equivalent.

ECON 201 Introduction to Macroeconomics (5) AWSpS Analysis of the aggregate economy: national income, inflation, business fluctuations, unemployment, monetary system, federal budget, international trade and finance. Prerequisite: 200; recommended: 1½ years of high school algebra and passing score on placement test for MATH 105 or equivalent.

ECON 260 Economic History of the Western World (5) Analysis of the sources of long-run economic change from Neolithic times to the present. Develops basic analytical concepts of economic change and applies them to human history. First half of the course deals with economic development up to settlement of the American colonies; last half deals with American economic development.

ECON 299 Study Abroad: Economics (5, max. 10) For participants in the Study Abroad program. Specific course content determined by assigned faculty member and announced in Study Abroad bulletins.

ECON 300 Intermediate Price Theory (5) AWSpS Choice decisions of individuals and firms: consequences of these decisions in product and factor markets. Consumption production and cost, exchange. Prerequisites: 200 and MATH 157 or 124, or equivalent.

ECON 301 National Income Analysis (5) AWSpS Analysis of the determinants of the aggregate level of employment, output, prices, and income of an economy. Prerequisite: 300.

ECON 306 Development of Economic Thought (5) From the early modern period to the present, with some discussion of its relation to natural science and other social sciences. The main subjects treated are Adam Smith and the classical school, Karl Marx, the neoclassical reformulation and its critics, and the impact of J. M. Keynes. Prerequisites: 200, 201, or equivalent.

ECON 311 Introduction to Economic Statistics (5) Statistical concepts and their application in economics. Students may receive credit for only one of 311 and STAT 220, 301, 311. Prerequisites: 200, MATH 105 or 156.

ECON 316 Urban Economics (5) Application of economic analysis to urban trends, problems, and prescriptions, such as changing urban form and function, urban public finance, housing and renewal, poverty and race, transportation, and environmental problems. Joint with GEOG 316. Prerequisite: 200 or equivalent.

ECON 340 Labor Economics (5) AWSp Analysis of labor markets; factors determining size and composition of the labor force, demand for labor services, job search and unemployment, wage differences including discrimination, impact of labor unions on wages and resource allocations. Analysis of public policy. Prerequisites: 200, 201.

ECON 346 Economics of Health Care (3) Economic analysis of the health-care sector of economy: organization, demand and supply factors, pricing practices, financing mechanisms—public versus private, impact of third party, insurance and prepayment, health and economic development. Prerequisite: 200 or equivalent.

ECON 347 Introduction to Population and Economic Dynamics (5) Relationship between population and economics. Historical record, focusing on Europe and Japan and developing countries since World War II; consequences of population growth with respect to income per capita and other measures of economic welfare; ways in which economic factors affect fertility, migration, and mortality; population policy. Prerequisites: 200, 201.

ECON 350 Public Finance (5) Elementary treatment of the theory of public finance. Theory of social welfare maximization, externalities and public goods, benefit-cost analysis, and evaluation of the distributional and allocational effects of alternative types of taxes. Prerequisites: 200 and 201 or equivalent.

ECON 370 Introduction to International Economics (5) AWSp The theory of international trade, commercial policy, balance of payments, and foreign exchange notes with applications. Prerequisites: 200 and 201. Highly recommended: 301.

ECON 390 Comparative Economic Systems (5) Study of resource allocation, growth, and income distribution in capitalist, market socialist, and centrally planned economies. The theoretical models of these systems are developed and then illustrated by case studies and selected countries. Prerequisites: 200 and 201 or equivalent.

ECON 391 Economic Development (5) Critical appraisal of theories and problems of growth with emphasis on the less-developed countries of the world today. Prerequisites: 200, 201.

ECON 400 Fundamentals of Microtheory (5) Application of elementary mathematical methods to microeconomics. Development of comparative statics relations used in production and consumption theory, including derivation of the Slutsky equation and duality results. Prerequisites: 300, MATH 124; recommended: MATH 126.

ECON 401 Fundamentals of Macrotheory (3) Emphasis on applications to public policy. Designed primarily for graduate students majoring in fields other than economics. No credit if 301 has been taken. Prerequisite: permission of undergraduate adviser. Recommended: 200 or equivalent.

ECON 403 The Economics of Property Rights (5) Property rights as constraints for individual competition and interaction in society. Implications of different property rights for affecting economic behavior and for resource allocation and income distribution. Costs of transactions as determinants of contractual and institutional arrangements in light of the recent advancement of the theory of economic organization. Prerequisite: 300.

ECON 404 Industrial Organization and Price Analysis (5) Competition, collusion, monopoly, and oligopoly in regulated and unregulated markets. Economics of firm management, market organization, sales practices, and the antitrust laws. Prerequisite: 300 or equivalent.

ECON 406 Undergraduate Seminar in Economics (5) Provides undergraduate student an opportunity to apply the tools of economic analysis in a critical examination of theoretical and empirical work. A list of topics is available in the departmental office. Enrollment preference is given to majors in their junior or sophomore year. Prerequisites: 200 and permission of instructor.

ECON 409 Undergraduate Seminar in Political Economy (5) Marxian and public choice approaches to political economy. Explores the questions raised by each approach, the assumption(s) and testability of hypotheses, and applies these approaches to a number of problems in political economy. Joint with POL S 409. Prerequisites: 300, POL S 270 and permission of instructor.

ECON 421 Money, Credit, and the Economy (5) Role of money and the banking system in the U.S. economy. Relation of money to inflation, interest rates, and business fluctuations. Monetary policy and Federal Reserve System. Prerequisites: 300, 301 or B ECON 300, 301; or equivalent.

ECON 422 Investment, Capital, and Finance (5) Accumulation and allocation of wealth by individuals; investment in producer and consumer durables by firms and households; separation of ownership from operating decisions via corporations; determination of market value; dividend policies and optimal investment criteria; introduction to financial decisions under uncertainty; elements of portfolio theory and the capital asset pricing model. Prerequisite: 300.

ECON 430 The Mixed Economy of Modern America (5) Study of interrelated economic, social, political, legal, and demographic factors in contemporary America. Attempt to comprehend synthetically the nature of the modern economy, with special attention given to governments, large corporations, and socioeconomic problems. Prerequisites: 300, 301, or permission of instructor.

ECON 431 Government and Business (5) AWSp Economic effects of various governmental regulatory agencies and policies. Antitrust legislation as a means of promoting desired market performance. Observed economic effects of policies intended to regulate business practices, control prices, conserve resources, or promote competition. Prerequisite: 300 or equivalent.

ECON 435 Natural Resource Utilization and Public Policy (5) AWSp Special emphasis on elements of economic theory relating to resource-oriented industries. Case studies in the theory and practice of resource management dealing with both stock and flow resources. Benefit-cost analysis and the evaluation of multipurpose resource projects. Prerequisite: 200 or permission of instructor.

ECON 443 Labor Market Analysis (5) Alternate course to 340. Basic subject matter is the same, but the analysis is more rigorous. Prerequisites: 300 or equivalent and a statistics course.

ECON 445 Income Distribution and Public Policy (5) Income distribution implications and economic effects of public policies toward unemployment, illness, industrial accidents, old age, poverty, and discrimination from age, sex, or race. Prerequisites: 200, 201.

ECON 450 Public Finance I (5) Economic analysis of governmental activity: public goods and externalities, collective choice, cost-benefit analysis, public welfare programs. Prerequisite: 300.

ECON 451 Public Finance II (5) Microeconomics of taxation: efficiency, incidence, effect on distribution of income, personal and corporate income taxes, sales and consumption taxes, taxation of property and estates. Prerequisite: 300.

ECON 452 Economic Theory as Applied to the Political System (5) Explanation and evaluation of political system, using elementary economics theory. Alternative voting rules, political effectiveness of various types of groups, causes and consequences of logrolling, and bureaucratic organizations. Joint with POL S 416. Prerequisite: 200 or equivalent.

ECON 453 State and Local Public Finance (5) Analysis of Washington state taxes. Considers equity and efficiency in recent tax changes. Examines major budgeted Washington state programs to determine beneficiaries, who bears the costs, and the income transfers that occur in these programs.

ECON 460 Economic History of Europe (5) Origins of the modern European economy; historical analysis of economic change and growth from medieval times that stresses the preconditions and consequences of industrialization. Joint with HST 481. Recommended: 200, 201.

ECON 482 Economic History of the United States to the Civil War (5) Systematic study of the changing pre-Civil War economic conditions and the consequences of these changes for the American society. Prerequisites: 200, 201, or equivalent.

ECON 483 Economic History of the United States From the Civil War to the Present (5) Systematic study of the changing economic conditions since the Civil War and the consequences of these changes for the American society. Prerequisites: 200, 201, or equivalent.

ECON 486 Economic History of China: 1840-1949 (5) Study of the post-1840 Chinese economy, with a brief introduction to the socioeconomic background of the earlier period. Explanations of China's long economic stagnation, and analyses of the impact of external factors and the role of the government in China's economic development before 1949. Recommended: 200, 201.

ECON 488 China's Economic Reforms—Integration Into World Economy (5) Systematic survey of China's economic reforms since 1978, including China's increasing integration into the world economy. Joint with SISEA 468. Prerequisite: 390 or 493 or permission of instructor.

ECON 471 International Trade (5) AWSp Theory of comparative advantage and different models of international trade. Trade and welfare; the theory and practice of commercial policy. Economic integration. Factor mobility and trade flows. The North-South debate. Prerequisites: 300, 301.

ECON 472 International Finance (5) AWSp Monetary problems in international trade and macroeconomics of the open economy. Features of different exchange-rate systems and their adjustment mechanisms. Money and international capital movements. Policies for internal and external balance. Prerequisites: 300, 301.

ECON 481 Introduction to Mathematical Statistics (5) Probability, generating functions, δ method, Jacobians, Bayes theorem, maximum likelihoods, Neyman-Pearson efficiency, decision theory, regression, correlation, bivariate normal. Joint with STAT 481. Students receiving credit for either STAT 341 or 390 may not receive credit for 481. Prerequisites: 311, STAT 311, or equivalent; MATH 124, 125, 126; and a course in linear algebra, which may be taken concurrently.

ECON 482 Introduction to Regression Analysis (5) Specification and estimation of economic models, using regression analysis. Prerequisites: 300, 311, or STAT 311.

ECON 483 Econometric Modeling (5) Availability of Washington State economic statistics, processing techniques, and econometric models. Build econometric models to meet stated assumptions to forecast regional economic variables. Prerequisites: 481, 482.

ECON 483 Economy of Modern China (5) Analytical survey of economic development of modern China, with special emphasis on the objectives, performance, and problems of the mainland Chinese economy under communism. Prerequisites: 200, 201, or permission of instructor.

ECON 494 Economic Growth of Japan Since 1850 (5) Analysis of the economic growth of Japan since about 1850 to the present. The reasons for rapid industrialization, various effects of sustained economic growth, and significant contemporary issues are investigated. Prerequisites: 200 and 201, or permission of instructor.

ECON 495 The Economy of Soviet Russia (5) Analytical survey of techniques of planning and resource allocation in the Soviet economy. Criteria for evaluating economic performance, growth, and efficiency. Prerequisite: 300 or equivalent or permission of instructor.

ECON 496 Honors Seminar (5) W Honors and other superior students are given opportunity to develop research techniques, to pursue topics in breadth and depth, and to apply their tools of economic analysis to selected topics in economic theory and current issues of national and international economic policy. For seniors only. Prerequisite: permission of undergraduate adviser.

ECON 497 Honors Directed Study (5) Sp Students individually arrange for independent study of selected topics in economic theory and its application under the direction of a member of the economics faculty. The research paper, if accepted, is the student's senior thesis. Prerequisite: permission of undergraduate adviser.

ECON 499 Undergraduate Research (1-5, max. 10) AWSpS May not be applied toward an advanced degree. Prerequisite: permission of undergraduate adviser.

Courses for Graduates Only

ECON 500 Microeconomic Analysis I (4) Consumer demand, cost, and supply and the theory of markets. Prerequisites: 300, 517, or permission of instructor.

ECON 501 Microeconomic Analysis II (4) Production and factor demands, the supply factor. Factor markets and distribution of income. Capital theory and resource allocation over time. Prerequisite: 500.

ECON 502 Macroeconomic Analysis I (4) Analysis of theories of income, employment, and output under static conditions; quantity theory of money; relation of monetary and "real" theories; stability and instability of income over time; growth of the economy. Prerequisites: 300 and 301; 517 or permission of instructor.

ECON 503 Macroeconomic Analysis II (4) Recent developments. Prerequisite: 502.

ECON 504 Economic History and Economic Development (3) Analysis of determinants of long-run development, emphasizing institutional, demographic, and technological changes; consideration of both theoretical and empirical studies. Prerequisite: 300 or equivalent.

ECON 505 Microeconomic Theory: Problems and Applications (3) Seminar for graduate students who have completed the basic core sequence in price theory. Designed to extend the student's analytic and problem-solving abilities by working systematically through a programmed set of readings and problems. The material includes both formal analytical techniques and applications of economic theory. Prerequisite: 501.

ECON 507 History of Economic Thought (3) Classical and neoclassical economics with emphasis on alternative conceptions of the nature and significance of economic science.

ECON 509 Macroeconomics III (4) Modern macroeconomic research models. Prerequisite: 503.

ECON 511 Advanced Microeconomic Theory: Selected Topics (3, max. 12) Seminar in advanced microtheory. Selected topics of special interest and significance. Prerequisites: 500, 501.

ECON 512 Advanced Macroeconomic Theory: Selected Topics (3, max. 12) Seminar in advanced macrotheory. Selected topics of special interest and significance.

ECON 513 Mathematical Economics: Linear Analysis (5) Theory and application of linear algebra and linear economic models. Prerequisites: 300, MATH 124, 125, 126.

ECON 514 General Equilibrium Analysis (3) Study of the existence, uniqueness, and stability of general equilibrium models under the assumptions of competition. Emphasis is on recent developments in the literature with consideration given to both positive and normative economics.

ECON 515 Special Topics in Mathematical Economics (3, max. 12)

ECON 517 Foundations of Economic Analysis (5) Sources of meaningful comparative status theorems in economics, with special emphasis on extremum problems and qualitative analysis. Necessary mathematical concepts are developed. Prerequisites: 300, MATH 124, 125, 126.

ECON 520 The Economics of Property Rights (3) Application of standard economic theory to analyze various forms of property rights as constraints of competition; the costs associated with delineation and enforcement of rights; the costs of negotiating and enforcing contracts for right transfers; resource allocation and income distribution implied by different property right and transaction cost constraints. Prerequisites: 500 and 501, or permission of instructor.

ECON 530 Government Regulation of Business (3) Public policy in the United States with respect to industrial organization and business conduct. Economic issues in antitrust policy emphasized. Prerequisites: 500, 501.

ECON 532 Economic Theory of Regulation (3) Develops a political-economy framework for analyzing regulations and regulatory reform. Influence of legal history. Theories of regulation and regulatory behavior. Joint with PB AF 532. Prerequisite: PB AF 516 or permission of instructor.

ECON 533 Price Policy and Industrial Organization (3) Advanced analysis of pricing, market structure, and industry performance. Recent empirical and theoretical literature emphasized. Prerequisites: 500, 501.

ECON 535 Economics of Natural Resources I (3) Pricing, allocation, and utilization of nonrenewable natural resources. Dynamic optimization, exploration, and technological relationships. Benefit-cost analysis and public investment criteria. Prerequisites: 500, 501, or permission of instructor.

ECON 536 Economics of Natural Resources II (3) The second of two-course sequence. Renewable resources, including fisheries and forestry. Externality theory and pollution-control policies. Prerequisite: 535.

ECON 537 Economic Aspects of Marine Policy I (3) Development of pertinent economic concepts and their application to selected topics in marine policy decision making. Joint with IMS 537. Prerequisite: IMS 500 or permission of instructor.

ECON 538 Economic Aspects of Marine Policy II (3) Development of pertinent economic concepts and their application to selected topics in marine policy. Joint with IMS 538. Prerequisite: 537 or permission of instructor.

ECON 539 Economics of Natural Resources Seminar III (3) Selected advanced topics in the economics of natural resources. Recent empirical and theoretical research. Active participation in ongoing research projects by students is essential. Prerequisites: 535, 536.

ECON 541, 542 Labor Economics (3,3) Selected topics in labor economics.

ECON 543 Population Economics (3) Economic determinants and consequences of population growth; emphasis on formal theoretical models and on empirical analysis. Introduction to: formal demography; welfare economics of population change, including analyses of population effects on consumption, savings, investment, and technical change; and determinants of mortality, fertility, and migration. Prerequisites: 500, 501, or permission of instructor.

ECON 546 Health Economics (3) Theoretical and empirical models of the demand for health and health care; supply of health care from physicians and hospitals; government programs that subsidize health care; occupational health; cost-benefit analyses of preventive health care and new medical technologies. Prerequisites: graduate-level microeconomics, HSERV 550, or permission of instructor.

ECON 547 Advanced Seminar in Health Economics (3) Selected topics in health economics, including risk and insurance, medical malpractice, the market for physician services, and industry regulation. Joint with HSERV 560. Prerequisites: 546 or HSERV 550, advanced-level microeconomic theory, or permission of instructor.

ECON 548 Economics of Labor and Human Resources (3) Economic analysis of policy-related topics in human resources. Topics include labor demand and supply, education and occupation, wage structures and income inequality, discrimination, and poverty. Joint with PB AF 548. Not open to economics majors.

ECON 550 Public Finance I (3) Theory of public finance with emphasis on public expenditures. Social welfare maximization, public goods and externalities, decreasing cost industries, theory of collective choice, second-best analysis, and benefit-cost analysis. Prerequisite: 500, 501, or permission of instructor.

ECON 551 Public Finance II (3) Theory of public finance with emphasis on taxation. Second-best analysis, optimal taxation, general equilibrium incidence analysis, issues in personal income taxation and corporate income taxation. Prerequisite: 500, 501, or permission of instructor.

ECON 553 Economic Analysis and Government Programs (3) Applications of economic analysis to public enterprises and programs.

ECON 554 Advanced Seminar in Cost-Benefit Analysis (3) Techniques of, and theoretical foundation for, cost-benefit analysis as applied to the public sector. Joint with PB AF 554. Prerequisite: PB AF 553.

ECON 556 Seminar in Urban Economics (3) Use of economic theory to explain land-use trends, transportation, housing and renewal, the ghetto, and the public economy in urban areas. Joint with GEOG 556. Prerequisites: 300, 301, or equivalent.

ECON 561 European Economic History (3) Economic growth of the Western world since the decline of the Roman Empire. Prerequisite: 504.

ECON 562 American Economic History (3) Analytical methods; sources and reliability of data; consideration of some major issues in current research. Prerequisites: 500, 504.

ECON 571 International Trade Theory (3) Application to international trade and investment of microeconomics, general equilibrium theory, and welfare economics. Prerequisites: 500, 501.

ECON 572 International Finance (3) Analysis of open economy macro models with emphasis on exchange rates and balance of payments determination. Prerequisites: 502, 503.

ECON 573 International Commercial Policy (3) Analysis of welfare aspects of international trade and factor mobility. Costs and benefits of protection; implications of different government policies. Important competition and response. Prerequisite: 571 or permission of instructor.

ECON 580, 581, 582 Econometrics I, II, III (5,3,3) Methods, tools, and theory of econometrics as the basis for empirical investigation in economics. Specification, testing, and use of econometric models with reference to examples in the literature. Prerequisite: 580 for 581; 581 for 582.

ECON 583 Econometric Theory I (3) Estimation and testing in the classical linear regression model. Extensions of the model and applications to the analysis of economic data. Prerequisites: 580, 581, 582 or equivalent.

ECON 584 Econometric Theory II (3) Continuation of 583. Topics include serial correlation, distributed lag models, multiple equation models. Prerequisite: 583.

ECON 585 Topics in Econometric Theory (3) Explores advanced econometric problems that arise in current research and the techniques to handle them. Seminar format; examples from recent econometric literature. Topics vary. Prerequisite: 584.

ECON 590 Theory and Practice of Economic Planning (3) Analysis of incentives for, and methods of, government intervention in socialist and developing countries, with a focus on microeconomic issues.

ECON 591 Theoretical Issues in Economic Development (3) Analysis of issues in economic development with application to the less-developed countries of the world today. Prerequisites: 500, 501, or permission of instructor.

ECON 595 Analysis of Socialist Economies (3) Analysis of economic planning, resource allocation, and the performance of economic units in centralized and decentralized socialist economies. Prerequisite: permission of instructor.

ECON 600 Independent Study or Research (*)

ECON 601 Internship (3-9, max. 9)

ECON 600 Doctoral Dissertation (*)

English

A101 Padelford

Undergraduate Program

Advisers
A2B Padelford

The Department of English offers courses in English, American, and related literature; literary history and criticism; expository and creative writing; and related subjects. Courses in the English curriculum cover a wide range of interests in the study of cultural and intellectual history, pertinent to many vocations and careers, on the premise that a knowledge of language and literature is fundamental to a university education. The department offers a study abroad program in London each Spring Quarter.

Bachelor of Arts Degree

MAJOR REQUIREMENTS

No credits in 100-level courses and only 15 credits in 200-level courses may be counted toward the major. Lists of approved courses referred to in the following descriptions are available from the English Advising Office, A2B Padelford.

Language and Literature: A minimum of 58 credits; 30 credits in approved literary period courses [including at least 5 credits in each of the following five periods and an additional 5 credits in period (1) or (2)]. (1) early period; (2) seventeenth- and eighteenth-century English literature; (3) nineteenth-century English literature; (4) American literature to 1917; (5) twentieth-century British and American literature; one approved course in other literature (a literature course taught in another department, not jointly listed with English, either in English translation or in the original language); and 25 elective credits in English courses. No more than 5 credits in expository or creative writing courses may be counted toward the major.

Creative Writing: A minimum of 63 credits; 25 credits in creative or expository writing courses, at least 15 of which must be at the 300-400 levels and must include course work in at least two forms (i.e., poetry, drama, short story, novel, expository writing); 30 credits distributed in approved literary period courses (see above under Language and Literature); one approved course in other literature (a literature course taught in another department, not jointly listed with English, either in English translation or in the original language); and one approved course in language study, literary theory, or practical criticism.

Teacher Certification: For major requirements for prospective elementary and secondary school teachers, see the College of Education section of this catalog. Detailed information on major requirements is available in the Department of English advising office, A2B Padelford.

Graduate Program

Miceal F. Vaughan, Graduate Program Coordinator

The Department of English offers a complete program of graduate courses and seminars designed to provide aspirants for the Master of Arts, Master of Fine Arts, and Doctor of Philosophy degrees with a knowledge of literature and the necessary scholarship for training in literary criticism and theory, literary history, language study, and rhetoric and composition theory. The M.F.A. program in creative writing emphasizes projects in imaginative writing, supported by courses in criticism and literary periods and types. A special degree program, the Master of Arts for Teachers, is offered for En-

English teachers in secondary schools and community colleges and for those interested in teaching English as a second language. The graduate program permits completion of master's degree requirements in four quarters and doctoral degree requirements in five years. In a typical five-year program, a student is encouraged to complete course requirements (normally 75 credits) during the first three years, the General Examination for the doctorate in the fourth year, and the dissertation in the fifth year.

Financial Aid

The department annually awards approximately twenty new teaching assistantships. To be considered for the following autumn, applicants must submit an assistantship application and supporting materials and be admitted to the graduate program by February 15. A statement of purpose, three recommendations, the GRE general test, and the GRE subject test (literature in English) are required.

Master of Arts Degree

Admission Requirements: Bachelor of Arts degree. Major in English equivalent to that awarded by the University of Washington preferred. Graduate Record Examination general test and subject test (literature in English). Two letters of recommendation.

Graduation Requirements: Intermediate-level proficiency in a language other than English. 40 credits, including 30 credits in graduate English seminars. For students continuing to the doctoral program, a 10-credit master's essay. For a terminal master's degree, students may substitute 10 additional credits in graduate English seminars for the master's essay. A maximum of 5 credits may be transferred from an accredited graduate program elsewhere.

Master of Fine Arts Degree

Admission Requirements: Bachelor of Arts degree, Graduate Record Examination general test, two letters of recommendation, writing sample (must be received by November 1 for Winter Quarter, February 1 for Spring Quarter, May 15 for Summer and Autumn quarters, and January 15 if applying for a teaching assistantship).

Graduation Requirements: Intermediate-level proficiency in a language other than English. 55 credits, including 20 credits in creative writing, 15 credits in graduate English seminars (5 credits must be from a seminar numbered 506-509), 5 elective credits, 15 thesis credits, annotated reading list. Final oral examination.

Master of Arts for Teachers Degree

Admission Requirements: Same as for the Master of Arts degree, but usually including prior teaching experience.

Graduation Requirements: 40 credits, of which 25 must be in courses numbered 500 or above; 15 of these may be taken outside the department in courses related to the teaching of English, subject to approval. A maximum of 5 credits may be transferred from an accredited graduate program elsewhere. Intermediate-level proficiency in a language other than English. A final comprehensive written examination.

Master of Arts for Teachers Degree (English as a Second Language)

Admission Requirements: Bachelor of Arts degree, Graduate Record Examination general test, statement of purpose, two letters of recommendation. Students without training in linguistic method and theory must take LING 400 as a prerequisite for 400-level linguistics courses.

Graduation Requirements: 46-49 credits, including ENGL 555, 556, 557, 558; 15-16 credits from LING 451, 452, 461, 462, 447, 445, 449; 5 credits from ENGL 441, 444, 504, 533, 535, 553; one course from

approved list of electives; 3-6 credits of ENGL 560. Intermediate-level proficiency in a language other than English.

Doctor of Philosophy Degree

Admission Requirements: By petition to Graduate Studies Committee upon completion of the M.A. degree option in literature. Students with recent master's degrees from other institutions are admitted at the post-master's level following the guidelines for admission to the M.A. option in literature and must complete two quarters before petitioning the Graduate Studies Committee for admission to the doctoral program. Students transferring with a master's degree from other institutions may be required to submit an equivalent to the master's essay. Students with creative writing M.F.A. or M.A.T. degrees from the University must complete course work and language requirements for the M.A. degree option in literature.

Graduation Requirements: 75 graded credits of electives in graduate English seminars as advised by the student's Supervisory Committee. Students with a recent master's degree from another university may count up to 30 credits from the master's program, upon approval of the director of graduate studies. Students with a master's degree from the University of Washington may count up to 40 credits in courses taken before admission to the doctoral program. Doctoral students may count up to three courses (400 level and above) taken in other departments toward fulfilling degree requirements. Fluency in at least one language other than English, plus whatever additional language study the Supervisory Committee advises. Written examinations in (1) historical period, (2) specialized field of study, (3) genre or second period; an oral General Examination on an individualized topic; 27 credits of ENGL 800 (Dissertation) and a Final Examination based on the dissertation.

Faculty

Chairperson

Richard J. Dunn

Professors

Adams, Hazard S.,* 1977, (Comparative Literature),† M.A., 1949, Ph.D., 1953, Washington; romanticism, history of literary theory, Anglo-Irish literature.

Adams, Robert P., 1947, (Emeritus), Ph.D., 1937, Chicago; Renaissance literature.

Alexander, Edward,* 1962, M.A., 1959, Ph.D., 1963, Minnesota; Victorian literature.

Altieri, Charles F.,* 1975, (Comparative Literature),† Ph.D., 1969, North Carolina; twentieth-century literature, critical theory, history of criticism.

Bentley, G. Nelson,* 1952, M.A., 1945, Michigan; poetry writing.

Blake, Kathleen A.,* 1971, (Women Studies) M.A., 1967, California (Los Angeles); Ph.D., 1971, California (San Diego); Victorian literature, children's literature, women's studies.

Brown, Malcolm J., 1944, (Emeritus), Ph.D., 1946, Washington; Anglo-Irish literature (nineteenth and twentieth centuries).

Burns, Wayne, 1948, (Emeritus), A.M., 1940, Harvard; Ph.D., 1946, Cornell; Victorian literature.

Dillon, George L.,* 1986, M.A., 1966, Ph.D., 1969, California (Berkeley); rhetoric, composition.

Dunn, Richard J.,* 1967, M.A., 1961, Ph.D., 1964, Western Reserve; Victorian literature, English novel.

Eby, E. Harold, 1927, (Emeritus), Ph.D., 1927, Washington; American literature.

Emery, Donald W., 1934, (Emeritus), M.A., 1928, Iowa; English grammar.

Fowler, David C.,* 1952, (Emeritus), M.A., 1947, Ph.D., 1949, Chicago; medieval literature.

Gerstenberger, Donna L.,* 1960, (Women Studies), M.A., 1952, Ph.D., 1958, Oklahoma; twentieth-century literature, Anglo-Irish literature, feminist criticism.

Harris, Markham, 1946, (Emeritus), M.A., 1931, Williams; fiction writing.

Heilman, Robert B.,* 1948, (Emeritus), M.A., 1930, Ohio State; M.A., 1931, Ph.D., 1935, Harvard; drama.

Irmscher, William F.,* 1960, (Emeritus), M.A., 1947, Chicago; Ph.D., 1950, Indiana; rhetoric and theory of composition.

Johnson, Charles R.,* 1976, M.A., 1973, Southern Illinois; fiction writing.

Jones, Frank W., 1955, (Emeritus), (Comparative Literature, Drama),† Ph.D., 1941, Wisconsin; M.A., 1955, Oxford (England); comparative literature.

Kartiganer, Donald M.,* 1964, M.A., 1960, Columbia; Ph.D., 1965, Brown; twentieth-century literature.

Korg, Jacob,* 1955, M.A., 1947, Ph.D., 1952, Columbia; Victorian, twentieth-century literature.

Leahy, Jack T., 1958, ‡(Engineering), M.A., 1957, Washington; literature of the Third World, the literature of travel, developing countries.

Lockwood, Thomas F.,* 1967, Ph.D., 1967, Rice; eighteenth-century literature.

Matchett, William H.,* 1954, (Emeritus), M.A., 1950, Ph.D., 1957, Harvard; Renaissance literature, Shakespeare.

McCracken, David,* 1966, M.A., 1962, Ph.D., 1966, Chicago; eighteenth-century literature.

McElroy, Colleen W.,* 1973, (Women Studies), M.A., 1963, Kansas State; Ph.D., 1973, Washington; Black literature, woman writers, poetry writing.

McHugh, Heather,* 1982, M.A., 1973, Denver; poetry writing, modern poetry.

Modiano, Raimonda,* 1973, (Comparative Literature),† Ph.D., 1973, California (San Diego); romanticism.

Pellegrini, Angelo M., 1930, (Emeritus), Ph.D., 1942, Washington; Shakespeare.

Reinert, Otto,* 1956, (Drama, Scandinavian Languages and Literature), (Comparative Literature),† M.A., 1948, Ph.D., 1952, Yale; comparative literature, eighteenth-century literature.

Russ, Joanna,* 1977, (Women Studies), M.F.A., 1960, Yale; fiction writing.

Sale, Roger H.,* 1962, M.A., 1954, Ph.D., 1957, Cornell; Renaissance literature.

Simonson, Harold P.,* 1968, M.A., 1951, Ph.D., 1958, Northwestern; American literature.

Stavick, Robert D.,* 1962, M.A., 1951, Tulsa; Ph.D., 1956, Wisconsin; medieval language and literature.

Stirling, Brents, 1932, (Emeritus), Ph.D., 1934, Washington; Renaissance literature.

Wagoner, David R.,* 1954, M.A., 1949, Indiana; twentieth-century literature, fiction and poetry writing.

Webb, Eugene,* 1966, ‡(Comparative Literature, International Studies), M.A., 1962, Ph.D., 1965, Columbia; modern English, French, and German literature, comparative religion.

Zillman, Lawrence J., 1931, (Emeritus), Ph.D., 1936, Washington; romanticism.

Associate Professors

Abrams, Robert E.,* 1971, Ph.D., 1973, Indiana; American literature.

Allen, Carolyn J.,* 1972, (Women Studies), M.A., 1966, Claremont; Ph.D., 1972, Minnesota; twentieth-century literature, woman writers, contemporary critical theory.

Brenner, Gerald J.,* 1966, M.A., 1960, San Francisco State; Ph.D., 1969, New Mexico; American literature, fiction writing.

Butwin, Joseph M.,* 1970, A.M., 1966, Ph.D., 1971, Harvard; Victorian literature.

Coldewey, John C.,* 1972, M.A., 1969, Northern Illinois; Ph.D., 1972, Colorado; Renaissance literature, medieval drama.

Duckett, Margaret R., 1947, (Emeritus), M.A., 1941, North Carolina; American literature.

Dunlop, William M.,* 1962, M.A., 1965, Cambridge; Shakespeare, nineteenth-century literature, poetry writing.

Fisher, Alan S.,* 1968, M.A., 1964, Ph.D., 1969, California (Berkeley); Renaissance, seventeenth- and eighteenth-century literature, history of literary criticism.

Frey, Charles H.,* 1970, J.D., 1960, Harvard; Ph.D., 1971, Yale; Renaissance literature, Shakespeare.

Gould, Florence J., 1948, (Emeritus), M.A., 1931, Oregon; creative writing.

Griffith, John W.,* 1968, Ph.D., 1969, Oregon; American literature.

Hudson, Lois P.,* 1969, A.M., 1951, Cornell; D.Litt. (Hon.), 1965, North Dakota State; fiction writing.

Kaplan, Sydney J.,* 1971, (Women Studies),† M.A., 1966, Ph.D., 1971, California (Los Angeles); twentieth-century literature, woman writers, feminist criticism.

LaGuardia, Eric H.,* 1961, A.M., 1955, Columbia; Ph.D., 1961, Iowa; Renaissance literature.

Longyear, Christopher R.,* 1972, M.A., 1955, Ph.D., 1961, Michigan; linguistics.

Mussetter, Sally A.,* 1978, M.A., 1962, Ohio State; Ph.D., 1975, Cornell; medieval language and literature.

Palomo, Dolores J.,* 1971, (Women Studies), M.A., 1966, Wayne State; Ph.D., 1972, State University of New York (Buffalo); Renaissance literature, woman writers.

Person, Henry A., 1937, (Emeritus), Ph.D., 1942, Washington; English language.

Phillips, William L.,* 1949, (Emeritus), M.A., 1947, Ph.D., 1949, Chicago; American literature.

Pollak, Vivian R.,* 1986, M.A., 1961, Ph.D., 1969, Brandeis; nineteenth-century American literature, American woman writers, biography.

Posnock, Ross,* 1983, M.A., 1976, Ph.D., 1980, Johns Hopkins; American literature.

Searle, Leroy F.,* 1977, M.A., 1968, Ph.D., 1970, Iowa; twentieth-century literature, critical theory, American studies.

Shulman, Robert P.,* 1961, M.A., 1954, Ph.D., 1959, Ohio State; American literature.

Smith, Eugene H.,* 1960, M.A., 1954, Ph.D., 1963, Washington; rhetoric and theory of composition.

Stanton, Robert B.,* 1956, (Emeritus), M.A., 1950, Kansas City; Ph.D., 1953, Indiana; American literature.

Streitberger, William R.,* 1973, M.A., 1971, Ph.D., 1973, Illinois; Renaissance literature, textual criticism, paleography.

Tollefson, James W.,* 1980, M.A., 1973, Purdue; Ph.D., 1978, Stanford; English as a second language, language planning.

van den Berg, Sara J.,* 1980, M.A., 1965, M.Phil., 1967, Ph.D., 1969, Yale; Renaissance and seventeenth-century literature.

Vaughan, Miceal F.,* 1973, (Comparative Literature),† M.A., 1973, Ph.D., 1973, Cornell; medieval language and literature.

Watkins, Evan P.,* 1982, Ph.D., 1972, Iowa; critical theory, modern and contemporary British and American literature.

Webster, John M.,* 1972, M.A., 1969, Ph.D., 1974, California (Berkeley); Renaissance literature.

Willeford, William O.,* 1967, (Comparative Literature),† M.A., 1953, California (Berkeley); Ph.D., 1966, Zurich (Switzerland); Renaissance literature, literature and psychology.

Yaggy, Elinor M., 1943, (Emeritus), M.A., 1939, Idaho; Ph.D., 1946, Washington; American literature, expository and fiction writing.

Assistant Professors

Altieri, Joanne S.,* 1977, M.A., 1964, Ph.D., 1969, North Carolina; Renaissance literature.

Bosworth, David,* 1984, B.A., 1969, Brown; fiction writing, modern fiction and poetry, American Puritans.

Cummings, Katherine,* 1985, M.A., 1979, Montclair State; Ph.D., 1985, Wisconsin (Madison); feminist, psychoanalytical, and literary theory, modern and contemporary literature.

Doyle, Anne E., 1987, (Acting), M.A., 1974, Boston College; composition, history of rhetoric.

Griffith, Malcolm A.,* 1966, M.A., 1962, Ph.D., 1966, Ohio State; twentieth-century literature, modern criticism, American literature.

Handwerk, Gary J.,* 1984, Ph.D., 1984, Brown; literary theory, English and Irish nineteenth- and twentieth-century narrative.

Jeffords, Susan,* 1985, M.A., 1977, Ph.D., 1981, Pennsylvania; feminist and literary theory, novel.

Kenney, Richard L., 1987, B.A., 1970, Dartmouth; poetry.

Markley, Robert M., 1987, M.A., 1976, Ph.D., 1980, Pennsylvania; eighteenth-century English literature.

Patterson, Mark R.,* 1981, Ph.D., 1981, Princeton; American literature.

Rivenburgh, Viola K., 1944, (Emeritus), M.A., 1926, Hawaii; expository writing.

Shapiro, Steven,* 1984, M.A., 1977, M.Phil., 1978, Ph.D., 1981, Yale; contemporary literary theory, Romantic poetry, twentieth-century literature.

Silberstein, Sandra V.,* 1982, (Women Studies), M.A., 1971, Ph.D., 1982, Michigan; English as a second language, sociolinguistics.

Toolan, Michael J., 1986, M.A., 1976, Edinburgh; Ph.D., 1981, Oxford; linguistics and literature.

Vangen, Kathryn W. S., 1985, M.A., 1982, Ph.D., 1987, Michigan; modern poetry, American and Native American literature, feminist theory.

Wong, Shawn H.,* 1984, ‡(Asian American Studies), M.A., 1974, San Francisco State; creative writing, Chinese-American area studies.

Lecturers

Clemens, Lois D., 1950, (Emeritus), M.A., 1956, Washington; expository and fiction writing.

Willis, Leota S., 1943, (Emeritus), M.A., 1930, Ph.D., 1931, Pennsylvania; seventeenth-century literature.

Course Descriptions

Courses for Undergraduates

Upper-division courses are open to all undergraduate students and are intended for general education. The lists of names in the course descriptions for literature courses indicate the kind of material covered, but are neither inclusive nor exclusive of all significant figures covered.

Courses are listed below in numerical order. Courses include studies of historical periods, major authors, literary forms, and a diversity of topics.

Expository writing courses include: ENGL 111, 121, 131, 182, 271, 379, 421.

Creative writing courses include: ENGL 274, 277, 386, 388, 422, 425, 427, 430.

Language study courses include: ENGL 390, 391, 392, 393, 394.

Major authors, special topics, conference, and seminar courses include: ENGL 395, 396, 397, 398, 443, 444, 489, 490, 491, 492, 493, 494, 495, 499.

Courses primarily for teaching candidates include: ENGL 441, 442, 443, 444, 445.

Internships in English are offered under ENGL 496. See English advising office for details.

Introductory Courses

ENGL 100 Intermediate ESL for International Students (0) AWSpS Offered as two separate sections: one for reading and written grammar, sentence patterns, and paragraph coherence; the other for basic listening and conversation management skills related to academic situations. Sections may be taken concurrently. Special fee per section: \$280. Prerequisite: placement examination.

ENGL 101 High Intermediate ESL for International Students (0) AWSpS Offered as two separate sections: one for reading and essay-writing skills, particularly developing controlling idea and support; the other for listening and speaking skills related to academic lectures and class discussions. Sections may be taken concurrently. Special fee per section: \$280. Prerequisite: placement examination.

ENGL 102 Advanced ESL for International Students (0) AWSpS Offered as two separate sections: one for writing research papers, including library research skills and research paper format and organization; the other for speaking skills for international teaching assistants: language behaviors related to lecturing, classroom management, and teacher-student interaction. Special fee per section: \$280 (no special fee for international teaching assistants section). Prerequisite: placement examination.

ENGL 103 ESL for EOP Students (5) Improvement of reading comprehension and vocabulary; emphasis on organizing and developing ideas in various modes of expository prose. Prerequisite: placement examination.

ENGL 104-105 Introductory Composition (5-5) AWSp,AWSp Development of writing skills: sentence strategies and paragraph structures. Expository, critical, and persuasive essay techniques based on analysis of selected readings. For Educational Opportunity Program students only, upon recommendation by the Office of Minority Affairs.

ENGL 106 Practical Forms of Writing (5) Sp Instruction in writing essay examinations, reports, reviews, and research papers. For Educational Opportunity Program students only, upon recommendation by the Office of Minority Affairs. Prerequisites: 104-105, or special placement.

ENGL 111 Composition: Literature (5) Study and practice of good writing; topics derived from reading and discussing stories, poems, essays, and plays.

ENGL 121 Composition: Social Issues (5) Study and practice of good writing; topics derived from reading and discussing essays and fiction about current social and moral issues.

ENGL 131 Composition: Exposition (5) Study and practice of good writing; topics derived from a variety of personal, academic, and public subjects. (Formerly 181. Not available for credit to students who have taken 181.)

ENGL 182 The Research Paper (5) WSp Includes study of library resources, the analysis of reading materials, and writing preparatory papers as basic to writing a reference or research paper. Open to all undergraduates. Prerequisite: one of 111, 121, 131, or equivalent.

ENGL 197 Interdisciplinary Writing/Humanities (5, max. 15) Expository writing based on material presented in a specified humanities lecture course. Assignments include drafts of papers to be submitted in the linked course, and other pieces of analytical prose. Concurrent registration in the linked course required (see quarterly *Time Schedule* for lectures linked).

ENGL 198 Interdisciplinary Writing/Social Science (5, max. 15) Expository writing based on material presented in a specified social science lecture course. Assignments include drafts of papers to be submitted in the linked course, and other pieces of analytic prose. Concurrent registration in linked course required (see quarterly *Time Schedule* for lectures linked).

ENGL 199 Interdisciplinary Writing/Natural Science (5, max. 15) Expository writing based on material presented in a specific natural science lecture course. Assignments include drafts of papers to be submitted in the linked course, and other pieces of analytic prose. Concurrent registration in the linked course required (see quarterly *Time Schedule* for lectures linked).

Lower-Division Courses

ENGL 200 Reading Literature (5) Techniques and practice in reading and enjoying literature. Examines some of the best works in English and American literature and considers such features of literary meaning as imagery, characterization, narration, and patterning in sound and sense. Emphasis on literature as a source of pleasure and knowledge about human experience.

ENGL 202 Great Books I (5) Introduction to literature from broadly cultural point of view, focusing on major works that have shaped the development of literary and intellectual traditions to the Middle Ages.

ENGL 203 Great Books II (5) Introduction to literature from a broadly cultural point of view, focusing on major works that have shaped the development of literary and intellectual traditions from the Middle Ages to the eighteenth century.

ENGL 204 Great Books III (5) Introduction to literature from a broadly cultural point of view, focusing on major works that have shaped the development of literary and intellectual traditions from the eighteenth century to the present.

ENGL 205 Method, Imagination, and Inquiry (5) Examines ideas of method and imagination in a variety of texts, in literature, philosophy, and science. Particularly concerned with intellectual backgrounds and methods of inquiry that have shaped modern Western literature.

ENGL 206 Reading Fiction (5) Critical interpretation and meaning in fiction. Different examples of fiction representing a variety of types from the medieval to modern periods.

ENGL 207 Reading Poetry (5) Critical interpretation and meaning in poems. Different examples of poetry representing a variety of types from the medieval to modern periods.

ENGL 208 Reading Drama (5) Critical interpretation and meaning in plays. Study of different types of drama representing a variety of types from the medieval to modern periods.

ENGL 221 Popular Literature (5) Investigations of themes, conventions, and world views of imaginative works having wide audience appeal. Discussion of their place in our shared cultural experience.

ENGL 223 Children's Literature Reconsidered (5) An examination of books that form a part of the imaginative experience of children, as well as a part of a larger literary heritage, viewed in the light of their social, psychological, political, and moral implications.

ENGL 231 Shakespeare (5) Survey of Shakespeare's career as dramatist. Study of representative comedies, tragedies, romances, and history plays.

ENGL 267 Introduction to American Literature (5) Survey of the major writers, modes, and themes in American literature, from the beginnings to the present. Specific readings vary, but often included are: Taylor,

Edwards, Franklin, Poe, Hawthorne, Melville, Emerson, Thoreau, Whitman, Dickinson, Twain, James, Eliot, Stevens, O'Neill, Faulkner, Hemingway, Ellison, and Bellow.

ENGL 271 Intermediate Expository Writing (5) Writing papers communicating information and opinion to develop accurate, competent, and effective expression. Recommended: sophomore standing.

ENGL 274 Beginning Verse Writing (5) Intensive study of the ways and means of making a poem. Recommended: sophomore standing.

ENGL 277 Beginning Short Story Writing (5) Introduction to the theory and practice of writing the short story. Recommended: sophomore standing.

Upper-Division Courses

ENGL 300 Critical Reading of Major Texts (5) Intensive examination of one or a few major works of literature. Classroom work to develop skills of careful and critical reading. Book selection varies, but reading consists of major works by important authors and of selected supplementary materials.

ENGL 303 English Literary Culture: To 1600 (5) British literature from Middle Ages to end of sixteenth century. Study of literature in its cultural context, with attention to changes in language, form, content, and style. (Formerly 301.)

ENGL 304 English Literary Culture: 1600-1800 (5) British literature in seventeenth and eighteenth centuries. Study of literature in its cultural context, with attention to changes in form, content, and style. (Formerly 302.)

ENGL 305 English Literary Culture: After 1800 (5) British literature in the nineteenth and twentieth centuries. Study of literature in its cultural context, with attention to changes in form, content, and style.

ENGL 306 Literature, Literary Study, and Society (5) Relationship of literature to society with particular emphasis on literary education. What social values determine the educational importance of literature, what segments of society are trained to read and to write literature, and how literature is institutionalized as part of pedagogical methodology. Emphasis varies.

ENGL 307 Literature and the Age (5) Problems of literary periodization. Works by major and minor authors in the context of cultural history; critical and theoretical approaches that have led to the idea of periodization. Emphasis varies. Prerequisite: 300-level English course in the literary period being studied.

ENGL 309 The Bible as Literature (5) Introduction to the development of the religious ideas and institutions of ancient Israel, with selected readings from the Old Testament and New Testament. Emphasis on reading the Bible with literary and historical understanding.

ENGL 310 English Literature: The Middle Ages (5) Literary culture of Middle Ages in England, as seen in selected works from earlier and later periods, ages of *Beowulf* and of Geoffrey Chaucer. Read in translation, except for a few later works, which are read in Middle English.

ENGL 311 Chaucer (5) Chaucer's *Canterbury Tales* and other poetry, with attention to Chaucer's social, historical, and intellectual milieu.

ENGL 313 English Literature: The Age of Queen Elizabeth (5) The "golden age" of English poetry, with poems by Shakespeare, Spenser, Sidney, and others; drama by Marlowe and other early rivals to Shakespeare; prose by Sir Thomas More and the great Elizabethan translators.

ENGL 314 Shakespeare to 1603 (5) Shakespeare's career as dramatist before 1603 (including *Hamlet*). Study of history plays, comedies, and tragedies.

ENGL 315 Shakespeare After 1603 (5) Shakespeare's career as dramatist after 1603. Study of comedies, tragedies, and romances.

ENGL 321 English Literature: The Late Renaissance (5) A period of skepticism for some, faith for others, but intellectual upheaval generally. Poems by John Donne and the "metaphysical" school; poems and plays by Ben Jonson and other late rivals to Shakespeare; prose by Sir Francis Bacon and other writers.

ENGL 322 Milton (5) Milton's early poems and the prose; *Paradise Lost*, *Paradise Regained*, and *Samson Agonistes*, with attention to the religious, intellectual, and literary contexts.

ENGL 325 English Literature: The Augustan Age (5) Selections from wits and satirists; poems by John Dryden and Alexander Pope; plays by Dryden, William Congreve, and other wits; the great satires of Jonathan Swift, and the first stirring of the novel.

ENGL 326 English Literature: The Age of Samuel Johnson (5) Classic age of English prose. Essays, biography, and criticism by Samuel Johnson, Oliver Goldsmith, and others; comedies by Goldsmith and Richard Brinsley Sheridan; fiction by Henry Fielding and others; poetry by a variety of writers.

ENGL 327 Rise of the English Novel (5) Study of the development of this major and popular modern literary form in the eighteenth century. Readings of the best of the novelists who founded the form, and some minor ones, from Defoe to Fielding, Richardson, and Sterne, early Austen, and the gothic and other writers.

ENGL 328 Rise of American Fiction (5) A literary form in which America has found its distinctively American expression. Selected readings among important novelists from the beginnings until 1900, including Cooper, Hawthorne, Melville, Twain, Chopin, James, and Wharton.

ENGL 330 English Literature: The Romantic Age (5) Literary, intellectual, and historical ferment of the period from the French Revolution to the 1830s. Readings from major authors in different literary forms; discussions of critical and philosophical issues in a time of change.

ENGL 331 Romantic Poetry I (5) Blake, Wordsworth, Coleridge, and their contemporaries.

ENGL 332 Romantic Poetry II (5) Byron, Shelley, Keats, and their contemporaries.

ENGL 333 English Novel: Early and Middle Nineteenth Century (5) Studies in the novel in one of its classic phases. Authors include Austen, the Brontës, Dickens, Thackeray.

ENGL 334 English Novel: Later Nineteenth Century (5) Studies in the novel as it passes from a classic format to formats more experimental. Authors include George Eliot, Thomas Hardy, Joseph Conrad, and others.

ENGL 335 English Literature: The Age of Victoria (5) Literature in an era of revolution that also sought continuity, when culture faced redefinition as mass culture and found in the process new demands and creative energies, new material and forms, and transformations of old ones. Readings range from works of Tennyson, Browning, Arnold, Shaw, to Dickens, Eliot, Hardy.

ENGL 340 The Modern Novel (5) The novel on both sides of the Atlantic in the first half of the twentieth century. Includes such writers as Joyce, Woolf, Lawrence, Stein, Hemingway, Faulkner, and others.

ENGL 341 Modern Poetry (5) Poetry in the modernist mode, including such poets as Yeats, Eliot, Pound, Auden, and Moore.

ENGL 342 English Literature: The Early Modern Period (5) Experiments in fiction and poetry. Novels by Joyce, Woolf, Lawrence, and others; poetry by Eliot and Yeats and others.

ENGL 343 English Literature: Contemporary England (5) Return to more traditional forms in such writers as Bowen, Orwell, Waugh, Cary, Lessing, Drabble.

ENGL 344 Modern Anglo-Irish Literature (5) Principal writers in English of the modern Irish literary movement—Yeats, Joyce, Synge, Gregory, and O'Casey among them—with attention to traditions of Irish culture and history.

ENGL 346 Critical Practice (5) Exercise in interpretive practices; a consideration of their powers and limits. Survey of the varieties of critical and interpretive practice from the earliest interpreters of scripture and myth to present-day critics.

ENGL 347 History of Literary Criticism and Theory I (5) Literary criticism and theory from its beginnings in Plato through the early twentieth century. Philosophical and theoretical grounds for critical practice put forward by philosophers and critics.

ENGL 348 History of Literary Criticism and Theory II (5) Contemporary criticism and theory and its background in the New Criticism, structuralism, and phenomenology.

ENGL 351 American Literature: The Colonial Period (5) Responses to the New World and literary strategies in the literature of the colonies and the early republic. Works by Taylor, Edwards, Franklin, and others.

ENGL 352 American Literature: The Early Nation (5) Conflicting visions of the national destiny and the individual identity in the early years of America's nationhood. Works by Emerson, Thoreau, Hawthorne, Melville, and such other writers as Poe, Cooper, Irving, Whitman, Dickinson, and Douglass.

ENGL 353 American Literature: Later Nineteenth Century (5) Literary responses to an America propelled forward by accelerating and complex forces. Works by Twain, James, and such other writers as Whitman, Dickinson, Adams, Wharton, Howells, Crane, Dreiser, DuBois, and Chopin.

ENGL 354 American Literature: The Early Modern Period (5) Literary responses to the disillusionment after World War I, experiments in form and in new ideas of a new period. Works by such writers as Anderson, Toomer, Cather, O'Neill, Frost, Pound, Eliot, Cummings, Hemingway, Fitzgerald, Faulkner, Stein, Hart Crane, Stevens, and Porter.

ENGL 355 American Literature: Contemporary America (5) Works by such writers as Ellison, Williams, O'Connor, Lowell, Barth, Rich, and Hawkes.

ENGL 356 Classic American Poetry: Beginnings to 1917 (5) Poetry by Taylor, Whitman, Dickinson, and such others as Poe, Bradstreet, Crane, Robinson. The lineage and characteristics of lyric and epic in America.

ENGL 358 The Literature of Black America (5) Selected works by Afro-American writers, with emphasis on twentieth-century literature.

ENGL 359 Contemporary Novel (5) Recent efforts to change the shape and direction of the novel by such writers as Murdoch, Barth, Hawkes, Fowles, and Atwood.

ENGL 361 Contemporary Poetry (5) Recent developments by such poets as Hughes, Heaney, Rich, Kinnell, and Hugo.

ENGL 364 Dramatic Literature: Comedy (5) Studies of the comic mode that celebrates social life in all its variety. Emphasis on the romantic and satiric forms of

comedy, or on the historical development of the types of comedy inherited from the Greeks and Romans, or on theories of the comic and the laughable. Emphasis on drama previous to the twentieth century.

ENGL 365 Dramatic Literature: Tragedy (5) Studies of the tragic mode as a universal pattern of experience. Emphasis on drama previous to the twentieth century.

ENGL 366 Twentieth-Century Dramatic Literature (5) Modern and contemporary plays by such writers as Shaw, Synge, O'Casey, O'Neill, Yeats, Eliot, Beckett, Pinter, and Albee.

ENGL 367 Studies in Short Fiction (5) The American and English short story, with attention to the influence of writers of other cultures. Aspects of the short story that distinguish it, in style and purpose, from longer fiction.

ENGL 368 The Art of Prose (5) Techniques and varieties of prose—autobiography, biography, personal essay, reflective and meditative writing, social and scientific inquiry, and persuasive writing. Special attention to use of poetic, fictional, and dramatic devices. Recommended: introductory literature course.

ENGL 369 Fiction and Film (5) Comparative study of technique and meaning in written narratives and films. Short stories and novels selected from American and English literature, and films that employ similar or contrasting techniques in constructing fiction.

ENGL 370 Fantasy (5) Nonnaturalistic literature, selected folktales, fairytales, fables, nonsense, ghost stories, horror stories, science fiction, and utopian literature—the supernatural and surreal, the grotesque, the fantastical. Readings and emphasis vary.

ENGL 371 Modern European Literature in Translation (5) Fiction, poetry, and drama from the development of modernism to the present. Works by such writers as Mann, Proust, Kafka, Gluck, Hesse, Rilke, Brecht, Sartre, and Camus.

ENGL 372 Modern Jewish Literature in Translation (5) Survey of Jewish experience and its expression during the past hundred years. Includes selected writers from Yiddish literature (Sholom Aleichem, Peretz, I. B. Singer), European literature (Kafka, Babel, Wiesel), American literature (Bellow, Roth, Malamud, Ozick), and Israeli literature (Agnon, Appelfield, Amichai).

ENGL 373 Pacific Northwest Literature (5) Concentrates in alternate years on either prose or poetry of the Pacific Northwest. Prose works examine early exploration, conflicts of native and settlement cultures, various social and economic conflicts. Pacific Northwest poetry includes consideration of its sources, formative influences, and emergence into national prominence.

ENGL 374 Study Abroad Program (5) This course, for students in the Study Abroad program, relates major works of literature to the landscape and activities of its setting.

ENGL 375 Women and the Literary Imagination (5, max. 15) Study of woman writers or ways various writers have portrayed woman's image, social role, and psychology.

ENGL 376 Women Writers (5, max. 15) Study of the work of woman writers in English and American literature.

ENGL 377 Contemporary American Indian Literature (5) Creative writings—novels, short stories, poems—of contemporary Indian authors; traditions out of which they evolved. Differences between Indian writers and writers of the dominant European/American mainstream. Offered jointly with AIS 377.

ENGL 379 Advanced Expository Writing (5) Concentration on the development of prose style for experienced writers. Recommended: sophomore standing.

ENGL 382 The Novel: Special Studies (5, max. 10) Readings may be English or American and drawn from different periods, or they may concentrate on different types—gothic, experimental, novel of consciousness, realistic novel. Special attention to the novel as a distinct literary form. Specific topic varies from quarter to quarter.

ENGL 383 Poetry: Special Studies (5, max. 10) A poetic tradition or group of poems connected by subject matter or poetic technique. Specific topics vary, but might include poetry as a geography of mind, the development of the love lyric, the comic poem.

ENGL 384 Dramatic Literature: Special Studies (5, max. 10) Study of a particular dramatic tradition (such as expressionism or the absurd theatre) or character (the clown) or technique (play-within-a-play, the neoclassical three unities). Topics vary.

ENGL 386 Intermediate Seminar: Verse Writing (5, max. 10) Intensive study of the ways and means of making a poem. Further development of fundamental skills. Emphasis on revision. Recommended: 274.

ENGL 388 Intermediate Seminar: Short Story Writing (5) Exploring and developing continuity in the elements of fiction writing. Methods of extending and sustaining plot, setting, character, point of view, and tone. Recommended: 277.

ENGL 390 English Language Study (5) Wide-range introduction to the study of written and spoken English. The nature of language; ways of describing language; the use of language study as an approach to English literature and the teaching of English.

ENGL 391 English Syntax (5) Description of sentence, phrase, and word structures in present-day English. Prerequisite: 390 or LING 200 or equivalent.

ENGL 392 Language Variation in Current English (5) Examination of geographical, social, and occupational varieties of American English. Relationship between societal attitudes and language use.

ENGL 393 History of the English Language (5) Evolution of English sounds, forms, structures, and word meanings from Anglo-Saxon times to the present. Prerequisite: 390 or LING 200 or equivalent.

ENGL 394 The Language of Literature (5) Roles of explicitly describable language features in the understanding and appreciation of various verbal forms. Emphasis on literature, but attention also may be given to nonliterary prose and oral forms.

ENGL 395 American Writers: Studies in Major Authors (5, max. 15) Concentration on one writer or a special group of American writers.

ENGL 396 British Writers: Studies in Major Authors (5, max. 15) Concentration on one writer or a special group of British writers.

ENGL 397 Topics in American Literature (5, max. 15) Exploration of a theme or special topic in American literary expression.

ENGL 398 Topics in British Literature (5, max. 15) Themes and topics of special meaning to British literature.

ENGL 407 Literary Modernism (5) Various modern authors, from Wordsworth to the present, in relation to such major thinkers as Kant, Hegel, Darwin, Marx, Nietzsche, Bergson, and Wittgenstein, who have helped create the context and the content of modern literature. Recommended: 305 or other 300-level course in nineteenth- or twentieth-century literature.

ENGL 408 Literature and the Other Arts and Disciplines (5, max. 10) Relationships between literature and other arts, such as painting, photography, architecture, and music, or between literature and other disciplines, such as science. Content varies.

ENGL 413 Arthurian Legends (5) Medieval romance in its cultural and historical setting, with concentration on the evolution of Arthurian romance. (Offered alternate years.)

ENGL 414 The Popular Ballad (5) The origin, development, and transmission of both texts and tunes of English and Scottish folk ballads in Great Britain and North America. (Offered alternate years.)

ENGL 415 Introduction to the Folktale Among Literate Peoples (3) Techniques of classification, geographic-historical distribution, theories of origin and interpretations, and related areas of investigation of the oral prose folk narrative of literate peoples.

ENGL 416 Introduction to American Folklore (5) Study of different kinds of folklore inherited from America's past and to be found in America today.

ENGL 421 Special Studies in Expository Writing (5) Individual projects in various types of nonfictional prose, such as biographical sketches, informational reports, literary reviews, and essays. Recommended: sophomore standing.

ENGL 422 Advanced Seminar: Verse Writing (5, max. 15) Intensive study of ways and means of making a poem. Recommended: 386.

ENGL 425 Advanced Seminar: Short Story Writing (5, max. 10) Experience with the theory and practice of writing the short story. Recommended: 388.

ENGL 427 Seminar: Novel Writing (5, max. 15) Experience in planning, writing, and revising a work of long fiction, whether from the outset, in progress, or in already completed draft.

ENGL 430 Seminar: Playwriting (5, max. 10) Experience in planning, writing, and revising a play, whether from the outset, in progress, or in already completed draft.

ENGL 441 The Composition Process (5) Consideration of psychological and formal elements basic to writing and related forms of nonverbal expression and the critical principles that apply to evaluation.

ENGL 442 Language Learning (5) Consideration of how an individual achieves psychological and esthetic grasp of reality through language; relates language development to reading skills, literary interpretation, grammar acquisition, oral fluency, discursive and imaginative writing.

ENGL 443 Current Developments in English Studies: Conference (5)

ENGL 444 Special Topics in English for Teachers (3-5, max. 10)

ENGL 445 Colloquium in English for Teachers (1-5, max. 10)

ENGL 489 Special Studies in Literature (3 or 5, max. 10) Themes and topics offering special approaches to literature.

ENGL 490, 491 Major Conference (3,3) Individual study by arrangement with instructor. Prerequisite: permission of associate chairperson.

ENGL 492 Major Conference for Honors (5) Individual study (reading, papers) by arrangement with the instructor. Required of, and limited to, honors seniors in English.

ENGL 493, 494 Advanced Writing Conference (3-5,3-5) Tutorial arranged by prior mutual agreement between individual student and instructor. Revision of manuscripts is emphasized, but new work may also be undertaken. Prerequisite: permission of director of creative writing.

ENGL 495 Major Conference for Honors in Creative Writing (5) Special projects available to honors students in creative writing. Required of, and limited to, honors students in creative writing.

ENGL 496 Internship (1-6, max. 12) Supervised experience in local businesses and other agencies. Open only to upper-division English majors. Offered on credit/no credit basis only. Prerequisite: 25 credits in English.

ENGL 499 Honors Seminar (5, max. 10) Seminar study of themes and topics offering special approaches to literature. Required of, and limited to, honors students.

Courses for Graduates Only

ENGL 500 Reading Medieval Literature (5) Special problems involved in the study and interpretation of medieval texts, selected examples drawn from the beginnings of English literature to 1500.

ENGL 501 The Renaissance and Literary Tradition (5) Examination of selected texts from 1500 to 1750, concentrating on specific problems of interpretation and scholarship characteristic of the study of works written before 1750.

ENGL 502 Backgrounds of Modern Literature (5) Intensive study of selected issues in modern literature, concentrating on a few influential English and American texts written after 1750.

ENGL 504 Approaches to Teaching Composition (5) Readings in composition theory and discussion of practical classroom applications. Prerequisite: previous experience or concurrent assignment in teaching writing.

ENGL 505 Graduate English Studies (5)

ENGL 506 Studies in Literary Genres (5, max. 15)

ENGL 507, 508, 509 Literary Criticism (5, max. 15; 5, max. 15; 5, max. 15)

ENGL 510, 511, 512 The Renaissance and Spenser (5, max. 15; 5, max. 15; 5, max. 15)

ENGL 513 Shakespeare's Dramatic Contemporaries (5)

ENGL 515, 516 Chaucer (5,5)

ENGL 517, 518, 519 Shakespeare (5,5,5)

ENGL 521, 522, 523 Seventeenth-Century Literature (5, max. 15; 5, max. 15; 5, max. 15)

ENGL 524, 525, 526 American Literature (5, max. 15; 5, max. 15; 5, max. 15)

ENGL 527, 528 Studies in Medieval Literature (5, max. 15; 5, max. 15)

ENGL 530 The English Language (5)

ENGL 531 Introductory Reading in Old English (5)

ENGL 532 Advanced Reading in Old English (5)

ENGL 533 Foundations of American English (5)

ENGL 534 American English Dialectology (5)

ENGL 535 Comparative Grammars (5) Prerequisite: teaching experience.

ENGL 538, 539, 540 Early Nineteenth-Century Literature (5, max. 15; 5, max. 15; 5, max. 15)

ENGL 541, 542, 543 Victorian Literature (5, max. 15; 5, max. 15; 5, max. 15)

ENGL 544, 545, 546 Eighteenth-Century Literature (5, max. 15; 5, max. 15; 5, max. 15)

ENGL 547 Rhetoric (5)

ENGL 548, 549, 550 Twentieth-Century Literature (5, max. 15; 5, max. 15; 5, max. 15)

ENGL 553 Current Rhetorical Theory (5) Prerequisite: teaching experience.

ENGL 555 Colloquium in Teaching English as a Second Language (5, max. 10) Prerequisite: LING 445 or permission of instructor.

ENGL 556 Methods and Materials for Teaching English as a Second Language (5) Prerequisite: LING 445 or permission of instructor.

ENGL 557 Research Methods in Second-Language Acquisition (5) Prerequisite: 556, LING 449, or permission of instructor.

ENGL 558 Testing and Evaluation in English as a Second Language (5) Evaluation and testing of English language proficiency, including testing theory, types of tests, and teacher-prepared classroom tests. Prerequisites: 555 and 556 or permission of instructor.

ENGL 560 Practicum in Teaching English as a Second Language (3) Discussion and practice of second-language teaching techniques. Three hours per week teaching required in addition to regular class meetings. Prerequisite: 555 or permission of instructor.

ENGL 580 Critical Approaches to Literary Texts (5, max. 15)

ENGL 581 Textual Criticism (5) Introduction to paleography, codicology, analytical and descriptive bibliography; examination of the major contributions to textual theory in the nineteenth and twentieth centuries; practice in applying textual theory in editing literary works. Recommended: 505.

ENGL 582 Recent and Contemporary Literary Criticism and Theory (5) Recent and contemporary developments in literary criticism and theory, especially such movements as poststructuralism, deconstruction, feminism, reader-oriented theories, hermeneutics, and socially oriented theories.

ENGL 584 Advanced Fiction Workshop (5, max. 15) Prerequisite: graduate standing.

ENGL 585 Advanced Poetry Workshop (5, max. 15) Prerequisite: graduate standing.

ENGL 586 Graduate Writing Conference (5)

ENGL 590-591 Master's Essay (5-6, max. 11) Two-quarter research and writing project under the close supervision of a faculty member expert in that field of study. Work is independent and varies; one quarter of the project used for background reading and research and the other quarter for presentation of an original thesis in written form.

ENGL 599 Special Studies in English (5, max. 15)

ENGL 600 Independent Study or Research (*)

ENGL 601 Internship (3-9, max. 9)

ENGL 700 Master's Thesis (*)

ENGL 800 Doctoral Dissertation (*)

Environmental Studies

201 Engineering Annex

The Institute for Environmental Studies is an interdisciplinary educational unit that offers students an opportunity to broaden their understanding of the complexity of many of today's environmental issues and concerns.

The institute's undergraduate introductory sequence includes a series of core courses that explore the contributions of the physical, biological, and social sciences to an understanding of environmental problems. At more advanced undergraduate levels, the institute offers a small number of courses aimed at integrating humanistic and scientific inquiry and exploring the framework of environmental law.

Undergraduate Program

Environmental Studies is one of several interdisciplinary programs whose degrees are granted through General Studies. A student must be admitted two years prior to graduation, must have a 2.60 grade-point average, and must design an integrated program approved by faculty advisers. In addition to completing 50 credits of environment-related courses suitable to a student's particular interest, the student must complete 5 credits of a senior thesis and is encouraged to complete 5 credits of an internship. A complete list of requirements appears in the institute's brochure, *Undergraduate Program in Environmental Studies*. Either a Bachelor of Arts degree or a Bachelor of Science degree may be earned. Since most environmentally related careers require a thorough grounding in a traditional discipline, the institute encourages students to consider a double major or a double degree if the complementary area is outside the College of Arts and Sciences. Additional information is available from the institute's undergraduate adviser.

Faculty

Professors

Boersma, P. Dee,* 1974, (Zoology), Ph.D., 1974, Ohio State; population ecology.

Brown, Gardner M., Jr.,* 1965, ‡(Economics), Ph.D., 1964, California (Berkeley); resource economics.

Campbell, Frederick L.,* 1966, ‡(Sociology), M.A., 1962, Ph.D., 1967, Michigan; population and ecology, social organization.

Charlson, Robert J.,* 1965, (Chemistry), (Atmospheric Sciences, Geophysics), † Ph.D., 1959, Stanford; Ph.D., 1964, Washington; air resources, geochemical cycles, environmental chemistry.

Crutchfield, James A., 1949, (Emeritus), (Economics, Public Affairs), † M.A., 1942, California (Los Angeles); Ph.D., 1954, California (Berkeley); natural resources economics, policy and management, especially marine and environmental resources.

del Moral, Roger,* 1968, ‡(Botany, Landscape Architecture), M.A., 1966, Ph.D., 1968, California (Santa Barbara); plant ecology, competition, succession, vegetation management.

Dunne, Thomas,* 1973, ‡(Geological Sciences, Quaternary Research Center), Ph.D., 1969, Johns Hopkins; geomorphology and hydrology.

Hancock, John L.,* 1969, ‡(Urban Design and Planning), M.A., 1955, Minnesota; Ph.D., 1964, Pennsylvania; planning history, urban history, planning theory, social analysis and social evaluation methods, comparative urbanism.

Jackson, W. A. Douglas,* 1955, ‡(Geography, International Studies), M.A., 1949, Toronto; Ph.D., 1953, Maryland; political systems, nature and culture, Soviet Union, Canada.

Johnson, Ralph W.,* 1955, ‡(Law, Marine Studies), LL.B., 1949, Oregon; natural resources, legislation, Indian law.

Kohn, Alan J.,* 1961, ‡(Quaternary Research Center, Zoology), Ph.D., 1957, Yale; invertebrate zoology, ecology and functional morphology of maritime invertebrates, biology of mollusks.

Leopold, Estella B.,* 1976, ‡(Botany, Forest Resources, Geological Sciences, Quaternary Research Center), M.S., 1950, California (Berkeley); Ph.D., 1955, Yale; palynology and Quaternary environments.

Leovy, Conway B.,* 1968, (Astronomy), (Atmospheric Sciences, Geophysics), † Ph.D., 1963, Massachusetts Institute of Technology; planetary atmospheres.

Mar, Brian W.,* 1967, ‡(Civil Engineering, Fisheries), M.S., 1956, Ph.D., 1958, M.S.C.E., 1967, Washington; system engineering, environmental management, interdisciplinary management.

Morrill, Richard L.,* 1960, (Geography), † M.A., 1957, Ph.D., 1959, Washington; spatial organization, migration, diffusion and population, regional planning and development, inequality.

Murphy, Sheldon D.,* 1983, ‡(Environmental Health), Ph.D., 1958, Chicago; metabolic and mechanistic aspects of pesticide toxicology, toxic interactions, toxicology of environmental contaminants, risk assessment, standards for environmental quality.

Olstad, Roger G.,* 1964, ‡(Education), M.A., 1959, Ph.D., 1963, Minnesota; science education.

Orians, Gordon H.,* 1960, (Zoology), † Ph.D., 1960, California (Berkeley); ecology and ethology.

Rothberg, Joseph E.,* 1969, ‡(Physics), M.A., 1958, Ph.D., 1963, Columbia; experimental high-energy physics.

Schneider, Jerry B.,* 1968, ‡(Civil Engineering, Urban Design and Planning), M.C.P., 1961, California (Berkeley); Ph.D., 1966, Pennsylvania; metropolitan and regional planning, transportation and land-use interrelationships, computer graphics, forecasting methods, futures research.

Sleicher, Charles A.,* 1960, ‡(Chemical Engineering), S.M., 1949, Massachusetts Institute of Technology; Ph.D., 1955, Michigan; fluid mechanics, heat transfer.

Sternberg, Richard W.,* 1965, ‡(Oceanography), M.Sc., 1961, Ph.D., 1965, Washington; geological oceanography, marine sedimentation processes.

Taub, Frieda B.,* 1962, ‡(Fisheries), M.S., 1957, Ph.D., 1959, Rutgers; ecology.

Untermann, Richard K.,* 1971, ‡(Landscape Architecture, Urban Design and Planning), M.L.A., 1967, Harvard; urban design and site planning, housing, recreation, nonmotorized circulation.

Wallace, John M.,* 1966, ‡(Atmospheric Sciences), Ph.D., 1966, Massachusetts Institute of Technology; large-scale motions.

Welch, Eugene B.,* 1968, ‡(Civil Engineering), M.S., 1959, Michigan State; Ph.D., 1967, Washington; water resources and aquatic biology.

Woodruff, Gene L.,* 1965, ‡(Nuclear Engineering), M.S., 1963, Ph.D., 1966, Massachusetts Institute of Technology; neutronics experiments, fusion reactor technology.

Wooster, Warren S.,* 1976, ‡(Fisheries, Marine Studies, Oceanography), M.S., 1947, California Institute of Technology; Ph.D., 1953, California (La Jolla); circulation and distribution of physical and chemical properties of the world ocean, application of such information to fishery problems, ocean affairs.

Associate Professors

Eaton, David L.,* 1979, (Environmental Health), † Ph.D., 1978, Kansas; hepatobiliary disposition of xenobiotics, biochemical and environmental toxicology.

Keating, John P.,* 1972, ‡(Psychology), M.A., 1962, Gonzaga; M.S.T., 1969, Santa Clara; M.A., 1971, Ph.D., 1972, Ohio State; communication media and attitude change, environmental psychology, emergency behavior.

Lee, Kai N.,* 1973, (Marine Studies), (Political Science), † Ph.D., 1971, Princeton; American government, politics and public policy.

Murray, James W.,* 1973, ‡(Oceanography), Ph.D., 1973, Massachusetts Institute of Technology; marine geochemistry, aquatic chemistry.

Richey, Jeffrey E.,* 1973, (Research), ‡(Oceanography, Quaternary Research Center), M.S.P.H., 1970, North Carolina; Ph.D., 1973, California (Davis); quantitative problems of aquatic ecosystems.

Thomas, Robert P.,* 1963, ‡(Economics), Ph.D., 1964, Northwestern; economic history.

Assistant Professor

Swierzbinski, Joseph E.,* 1981, (Economics), † Ph.D., 1981, Harvard; resource economics.

Course Descriptions

Courses for Undergraduates

ENV S 101 Introduction to Environmental Studies (5) Asp Natural history and human modifications of the natural world. Evolutionary biology, physical geography, toxicology, energy, economics, law, public policy.

ENV S 203 Introduction to Physical Sciences and the Environment (5) A *Leovy, ZumBrunner* Climate, water, geological, and soil processes essential to life. Broad picture of physical processes important in Earth's evolution. Not recommended for students with more than 15 credits of physical science.

ENV S 204 Introduction to Biological Sciences and the Environment (5) W *Boersma* Terrestrial and oceanic ecosystems. Natural selection, dynamics of plant and animal populations. Basic biological processes affecting individuals, species, populations, and communities. Not recommended for students with more than 15 credits of biological science. Recommended: 203 or background in physical sciences.

ENV S 205 Social Sciences and the Environment (5) Sp *Lee, Swierzbinski* Insights and approaches to environmental decision making from the standpoints of psychology, economics, and other social sciences.

ENV S 206 Laboratory in Environmental Problems (4) Sp *Boersma* Interface between science and democratic decision making. Processes and structure of ecosystems and conflicting uses made of these environments. Role and application of science. Field trips to natural and human-modified ecosystems; weekend field trips required. Prerequisite: 204 or equivalent.

ENV S 207 Introduction to Global Environmental Issues (5) Sp *Boersma, Leovy* Application of principles of environmental science to global environmental problems arising from energy use and agricultural development. Problems range from climate change to species extinctions. Relationships between local and global problems. Alternative energy and agricultural options. Prerequisite: 203, 204.

ENV S 221 The Problem of Nuclear Arms I (3) W *Jones, Leovy* Properties and effects of nuclear weapons; delivery and command systems; interplay between technical and political factors in issues involving nuclear weapons systems, arms control, and proposals to reduce risk of nuclear war. Joint with SIS 221.

ENV S 222 The Problem of Nuclear Arms II (3) Sp *Jones* Military-political nuclear weapons policies of U.S.A., USSR, France, Britain, China, India, and potential nuclear powers. Bilateral and multilateral arms control agreements and ongoing negotiations. Strategic implications of ballistic missile defense. Joint with SIS 222. Recommended: 221.

ENV S 305 Toxic Chemicals in the Environment (3) W *Eaton, Omiecinski* Basic principles governing the behavior and effects of toxic chemicals released into the environment; sources, distribution, and fate of toxic chemicals in the environment; chemicals and cancer; chemicals and birth defects; ecological effects of chemicals; government regulation of chemical hazards. Joint with ENVH 305. Prerequisites: BIOL 101-102 and CHEM 102, or equivalent.

ENV S 361 Environmental Values and Perceptions (5) W *Benton* How individual and cultural values affect our perception of, and relation to, the en-

vironment. Explores role of individual characteristics in perceptual acuity and value formation, conflicting values within and between societies, impingement of these conflicts on environmental problems, and possible methods of resolution with emphasis on American environmental experience.

ENV S 441 Methods for Environmental Policy Analysis (3) Sp Swierzbinski Introduction to methods for quantifying trade-offs involved in environmental policy decisions. Widely used conceptual frameworks such as decision analysis, benefit-cost analysis, linear programming, and forecasting methods are introduced via specific applications, including fishery management, epidemiology, risk management, bargaining, and water resource policy. No specific background in mathematics is assumed.

ENV S 481 Environmental Law (5) W Legislative, administrative, and common law dealing with the environment. Introduces the student to the fundamental concepts and classic issues underlying the body of law and policy dealing with the environment. Includes air and water quality, noise, energy policy and management, and land use. For nonlaw students. Prerequisite: permission of instructor.

ENV S 482 Special Topics in Environmental Law (3-5) Sp Examination of current environmental law issues. Topics to be announced. Prerequisite: 481.

ENV S 498 Special Topics in Environmental Studies (1-5, max. 10) Lecture, seminar, and/or team study of topics varying from quarter to quarter. Prerequisite: permission of instructor.

ENV S 499 Undergraduate Research (*, max. 20) Individual or team research of selected environmental topics. Prerequisite: permission of instructor.

Courses for Graduates Only

ENV S 508 Geochemical Cycles (4) Sp Charlson Descriptive and quantitative aspects of the earth as a biogeochemical system. Fundamental methods for study of equilibria, transport processes, chemical kinetics and biological processes and their application to the carbon, sulfur, nitrogen, phosphorus, and other elemental cycles. Emphasis on stability of biogeochemical systems and the nature of human perturbations of their dynamics. Joint with GPHY 508. Prerequisites: CHEM 150, 350, MATH 238.

ENV S 515 Environmental and Occupational Toxicology (4) Sp Eaton Principles of toxicology, with emphasis on the biological fate and mechanisms of toxic action of chemicals encountered in the workplace and general environment. Joint with ENVH 515. Prerequisites: organic chemistry, introductory physiology and biochemistry, or permission of instructor.

ENV S 520 Seminar in Environmental Studies (1-3, max. 12) Study and research in advanced topics of environmental studies, with focus on unpublished areas of research; conducted by visiting professors and Institute or department faculty. Prerequisite: permission of instructor.

ENV S 530 Science and Environmental Policy (4) W Boersma, Lee Role of science and scientists in formulating public policy related to the environment. Conceptualizes policy processes as a means of understanding opportunities for, and limits of, science in development and implementation of public policy. Prerequisites: concurrent registration in 531 and ECON 435 or equivalent.

ENV S 531 Science and Environmental Policy: Case Histories (3) W Boersma, Lee Examples of the use of scientific analysis in the development of environmental policies. Prerequisite: concurrent registration in 530.

ENV S 532 Internship Seminar (1) AWSp Lee, Wright Preparation for an analytical paper concerning the role of science in decision making. Focuses on the agency or firm in which the student served as an intern. Prerequisites: 530, 531.

ENV S 577 Risk Assessment for Environmental Health Hazards (3) A Faustman, Omenn Context, methodologies, types of data, uncertainties and institutional arrangements for risk assessment. Both qualitative and quantitative approaches to the identification, characterization, and control of environmental hazards to health emphasized through didactic and case studies. Joint with ENVH 577, CEWA 577, and PB AF 577. Prerequisites: either 305 or 515 and BIOT 511, EPI 511, or permission of instructor.

ENV S 599 Special Topics in Environmental Studies (*) Research-level lectures, seminars, or discussions of topics of current interest in the area of environmental studies. Subject matter varies from quarter to quarter. Prerequisites: permission of the instructor and institute director.

General Studies

B10 Padelford

General Studies provides students with an opportunity to obtain an interdisciplinary degree. Students may pursue an individually designed "atypical major" or one of several organized interdisciplinary programs.

Undergraduate Program

Bachelor of Arts, Bachelor of Science Degrees

Admission Requirements: A written statement describing the proposed major and a list of 50 to 70 credits specifically related to the proposal. Approval of two faculty supervisors and the General Studies committee. Prospective majors should submit proposals to the General Studies committee for review at least three quarters prior to graduation.

Major Requirements: Completion of the approved curriculum and a 5-credit required senior study. Awarding of the Bachelor of Arts or Bachelor of Science degree depends on the content of each student's program.

Course Descriptions

Courses for Undergraduates

G ST 350 Independent Fieldwork (1-6, max. 18) AWSpS Off-campus independent fieldwork in community agencies, apprenticeships, internships, as approved for College of Arts and Sciences credit. Faculty supervisor is required. Prerequisites: permission of faculty supervisor and General Studies adviser.

G ST 391 Supervised Study in Selected Fields (*, max. 15) AWSpS Special supervised study in a field represented in the College of Arts and Sciences. Prerequisites: permission of faculty supervisor and General Studies adviser.

G ST 493 Senior Study (5) AWSpS For General Studies majors only. Prerequisites: permission of faculty supervisor and General Studies adviser.

Genetics

J205 Health Sciences

An undergraduate degree is not offered. Students who desire an undergraduate curriculum emphasizing subject matter in genetics are advised to refer to the cellular and molecular biology listing under Biology.

Graduate Program

Breck E. Byers, Graduate Program Coordinator

The Department of Genetics offers graduate programs leading to the degrees of Master of Science and Doctor

of Philosophy. A student may choose among a wide variety of research areas, while, at the same time, receiving a broad training in genetics. New graduate students join a research project in one of the faculty laboratories during each of the first three quarters in residence. New students thereby become acquainted with several different experimental approaches in research in genetics, and the projects help them choose an adviser for their thesis work at the end of the first year. In addition to graduate courses offered by the Department of Genetics, students can choose among a large number of courses in related departments to broaden their perspective. Graduate students also participate in undergraduate teaching after gaining expertise in pertinent areas. A General Examination is taken at the end of the second year to gain formal admittance to candidacy for the Ph.D. degree.

Applications for graduate work are invited from students who have emphasized biology, the physical sciences, or mathematics in their undergraduate careers. Applicants are asked to submit Graduate Record Examination scores and three letters of recommendation.

Financial Aid

The Department of Genetics offers financial support to promising students who wish to work toward the doctoral degree.

Research Facilities

The department is housed in a modern, well-equipped building shared with the Department of Biochemistry and the Howard Hughes Medical Institute. Students benefit from interdisciplinary research and teaching programs in collaboration with departments having related interests.

Correspondence and Information

Graduate Program Coordinator
J205 Biochemistry-Genetics, SK-50

Faculty

Chairperson

Walton L. Fangman

Professors

Bendich, Arnold J.,* 1970, ‡(Botany), Ph.D., 1969, Washington; nucleic acids as evolutionary indicators, DNA sequence organizations in plants, plant cancers.

Byers, Breck E.,* 1970, (Biochemistry), M.A., 1963, Ph.D., 1967, Harvard; cell biology: mitosis and meiosis, mechanisms of nuclear division and crossing-over in yeast.

Champoux, James J.,* 1972, ‡(Microbiology), Ph.D., 1970, Stanford; DNA replication, tumor biology.

Fangman, Walton L.,* 1967, Ph.D., 1965, Purdue; molecular genetics: control of replication of yeast chromosomes, plasmid and mitochondrial DNA.

Felsenstein, Joseph,* 1967, (Statistics), Ph.D., 1968, Chicago; estimation of phylogenies, long-term evolutionary processes, theoretical population genetics.

Gallant, Jonathan A.,* 1961, Ph.D., 1961, Johns Hopkins; molecular genetics, control mechanisms in bacteria, accuracy of translation.

Gartler, Stanley M.,* 1957, (Medicine), † Ph.D., 1952, California (Berkeley); mammalian somatic cell genetics with emphasis on the mechanism of X-chromosome inactivation.

Hall, Benjamin D.,* 1963, (Biochemistry), A.M., 1956, Ph.D., 1958, Harvard; molecular genetics of yeast and higher plants.

Hartwell, Leland H.,* 1968, Ph.D., 1964, Massachusetts Institute of Technology; genetic analysis of chromosome transmission and of the control of division by hormones in yeast.

Hawthorne, Donald C.* 1958, (Emeritus), M.S., 1951, Ph.D., 1955, Washington; yeast genetics, chromosome mapping, suppressors.

Laird, Charles D.* 1971, ‡(Zoology), Ph.D., 1966, Stanford; cell and developmental biology.

Martin, George M.* 1957, ‡(Pathology), M.D., 1953, Washington; pathology.

Motulsky, Arno G.* 1953, (Medicine), † M.D., 1947, Illinois; clinical population genetics and human biochemical genetics, delineation and mechanisms of disease susceptibility, pharmacogenetics.

Pious, Donald A.* 1964, ‡(Pediatrics), M.D., 1956, Pennsylvania; pediatrics.

Roman, Herschel L., 1942, (Emeritus), Ph.D., 1942, Missouri; yeast genetics, factors affecting genetic recombination.

Schubiger, Gerold A.* 1972, ‡(Zoology), Ph.D., 1967, Zurich (Switzerland); developmental biology of insects, embryonic determination in *Drosophila*, regeneration, transdetermination.

Stadler, David R.* 1956, M.A., 1950, Ph.D., 1952, Princeton; mutation and genetic repair in *Neurospora*.

Young, Elton T.* 1969, ‡(Biochemistry), Ph.D., 1967, California Institute of Technology; biochemistry.

Associate Professors

Furlong, Clement E.* 1977, (Research), (Medicine), † Ph.D., 1968, California (Davis); human biochemical genetics and biochemistry of membrane transport systems.

Sibley, Carol H.* 1976, M.A., 1966, M.S., 1969, Rochester; Ph.D., 1974, California (San Francisco); mammalian cell genetics: function, structure, and regulation of cell membrane receptors in differentiation of normal cells and their tumor counterparts.

Assistant Professors

Garber, Richard L.* 1983, M.Phil., 1976, Ph.D., 1977, Yale; developmental genetics, molecular analysis of *Drosophila* homeotic genes.

Manoil, Colin C., 1986, Ph.D., 1979, Stanford; molecular genetics, protein localization in bacteria.

Thomas, James H., 1988, Ph.D., 1984, Massachusetts Institute of Technology; development of *Caenorhabditis elegans*; genes involved in the determination of cell lineage and cell interactions that specify cell fate.

Course Descriptions

Courses for Undergraduates

GENET 351 Human Genetics: The Individual and Society (3) WSp Principles of Mendelian inheritance as illustrated by human traits and diseases; chromosomes and sex determination; distribution of genes in populations; natural selection and evolution; counseling and genetic engineering. Appropriate for non-science majors.

GENET 360 Introductory Genetics (5) AS Includes transmission of genes and chromosomes, recombination and linkage mapping, genetics of bacteria and viruses, biochemical and molecular genetics, gene regulation and development, population genetics and evolution. Not open for credit to students who have completed 365. Prerequisite: 10 credits in biological or physical sciences. (Formerly 451.)

GENET 385 General Genetics (4) WSp Advanced course in general genetics for students who have been introduced to basic genetic concepts. Cytogenetics, microbial genetics, intragenic recombination, mutation and DNA repair, gene regulation in development, molecular basis of gene regulation. Not open for credit to students who have completed 360. Prerequisite: BIOL 210.

GENET 453 Genetics of the Evolutionary Process (3) W Felsenstein Contributions of genetics to the understanding of evolution. Processes of mutation, selection, and random genetic events as they affect the genetic architecture of natural populations and the process of speciation. Emphasis on experimental data and observation, rather than mathematical theory. Prerequisite: 360.

GENET 455 Molecular Genetics (3) Sp Hartwell The structure of genes and molecular mechanisms of gene expression. First part of the course draws upon information obtained with viruses and bacterial cells and serves as background for a study of eukaryotic cells in the second part. Prerequisites: 360, CHEM 232, or permission of instructor.

GENET 456 Genetic Mutation (3) W Stadler Measurement of mutation rates and dose-response relationships; analysis of mutational lesions; molecular mechanisms of mutation and DNA repair; mutation method for measurement of genetic size; hazard of environmental mutagens. Prerequisite: 360 or equivalent. (Offered alternate years.)

GENET 499 Undergraduate Research (*) AWSpS Prerequisite: permission of instructor.

Courses for Graduates Only

GENET 501 Introduction to Research Materials (3, max. 9) AWSp The student is assigned to one of the several research areas of the department to work with a research group for a quarter at a time. Prerequisite: graduate standing in the Department of Genetics or permission of graduate program coordinator.

GENET 520 Seminar (1, max. 15) AWSpS Prerequisite: graduate standing in the Department of Genetics or permission of graduate program coordinator.

GENET 531 Human Genetics (3) Sp Gartler, Motulsky, Stamatoyanopoulos General course in human genetics for graduate students. Areas covered: pedigree analysis, cytogenetics, biochemical genetics, and population genetics. Prerequisites: 360, BIOC 440, or equivalent. (Offered alternate years.)

GENET 551 Mutation and Recombination (3) A First course in a three-quarter sequence in molecular and microbial genetics: mutation rates; recombination analysis in phage, bacteria, and fungi; mechanism of recombination.

GENET 552, 553 Structure and Function of Genetic Material I, II (3,3) W,Sp Chromosome structure and DNA replication; formal genetics of gene expression; physical analysis of DNA; gene expression in relation to DNA structure, developmental genetics. Prerequisite: 551 or permission of instructor.

GENET 554 Topics in Genetics (2, max. 6) AWSp Current problems and research methods. Prerequisite: permission of instructor.

GENET 560 Chromosomal Behavior (3) W Properties of meiotic chromosomes with special emphasis on recombination and segregation. Prerequisite: permission of instructor. (Offered alternate years.)

GENET 562 Population Genetics (3) A Felsenstein Mathematical and experimental approaches to the genetics of natural populations, especially as they relate to evolution. Emphasis on theoretical population genetics. Prerequisite: permission of instructor.

GENET 564 Molecular Cytogenetics (3) W Byers Cellular processes of gene transfer in mitosis, meiosis, and gametogenesis, with emphasis on ultrastructure and macromolecular mechanisms. Prerequisite: permission of instructor. (Offered alternate years.)

GENET 571 Immunogenetics (3) Sp Genetic approaches to the biology of cells of the immune system. Using the immune system as a model system, genetic, developmental and biochemical concepts and tech-

niques are examined as they apply to eukaryotic cells. Cell-cell interactions, histocompatibility, host resistance to infectious disease, and evolution of the immune system. (Offered alternate years.)

GENET 575 Developmental Genetics (3) A Garber, Sibley Genetic control of early development in a range of organisms, emphasizing systems in which cellular, genetic, and molecular approaches have combined to make significant contributions to understanding. Prerequisite: permission of instructor.

GENET 584 Genetic and Biochemical Analysis by Electron Microscopy (1-5) Byers Practical application of electron microscopic methods for determining cellular and macromolecular structure, with emphasis on genetic systems. Prerequisite: permission of instructor.

GENET 590 Population Genetics Seminar (1) AWSp Felsenstein Weekly presentation by participants of current literature and ongoing research in evolutionary genetics of natural populations, human population genetics, and quantitative genetics applied to animal and plant breeding. May be repeated for credit. Prerequisite: 562 or permission of instructor.

GENET 600 Independent Study or Research (*) AWSpS

GENET 700 Master's Thesis (*) AWSpS

GENET 800 Doctoral Dissertation (*)

Geography

408A Smith

Geography is a small but lively discipline providing a distinctive spatial approach to many of today's societal problems and issues: regional economic inequality, growth of service activities, residential and educational segregation, health-care delivery, urban growth management, efficient transportation system, environmental and pollution problems, economic impacts of major investments or technological changes, spatial efficiency of industrial production, the activities of international corporations, and many more. Geography may be defined as the study of how individuals, groups, and societies use and organize their space. Geography seeks to understand the complex processes that result in observed patterns of settlement, location of economic activities, patterns of development, and the linkages and direction of trade and communication.

Individual undergraduate and graduate programs are built around four groups of faculty teaching competencies and research interests:

1. *Social and urban geography.* Human population distribution, activities, migration, settlements, and systems of cities. Geographic facets of ethnicity and race, wealth and poverty, and health and disease. Location of urban services, including health-care systems, urban transportation, housing, and neighborhoods. Urban spatial policies.

2. *Economic geography.* Regional and "third world" economic development. Location, spatial-organizational structures and economic interdependencies of industrial and commercial activities. Analysis of resource distribution and use, market areas, and patterns of technological change. Domestic and international trade; land, air, and water transportation networks and systems. Related policies, policy conflicts, regulations, and management.

3. *International relations and foreign areas.* Continental and global patterns of international relations and development. Application of geographic concepts in the regional context, with special emphasis on East Asia, the Soviet Union, eastern and western Europe, Latin America, Canada, and the United States.

4. *Cartography and information systems.* Role and design of geographic information systems for research and planning. Use of computers in the collection, manipulation, and cartographic presentation of data.

Special Research and Teaching Facilities

The University Libraries maintains separately the Edward L. Ullman Geography Library, which has subscriptions to 370 periodicals and an extensive collection of atlases. Departmental facilities include the John C. Sherman Laboratory, which contains a variety of microcomputer and computer cartography/GIS workstations that are connected to the campus computer network. The Department of Geography is also a member of the Center for Social Science Computation and Research, which maintains an extensive data archive and offers many statistical and software consulting services.

Undergraduate Program

Douglas Fleming, Richard Roth, Advisers

Bachelor of Arts Degree

Major Requirements: 55 credits in geography and 25 credits in related fields, to include the following:

Geography—(1) At least four courses at the 100 and 200 level, including at least two from 200, 207, and 277; (2) One course in physical geography. If GEOG 205 is not taken, an approved course in a geoscience (e.g., GEOL 311, ATM S 321, BOT 350, or ENV S 204) may be substituted; (3) 360 or 365; (4) 326 or 426; (5) two upper-division regional courses (at least one at the 400 level and at least one region other than North America); (6) 15 credits in upper-division systematic courses (at least 10 at the 400 level). Not more than two cartography courses may be used to fulfill this requirement.

Related Fields—(7) 25 credits in related fields (i.e., nongeography courses approved by the undergraduate adviser that relate to the student's specialization within geography), including 15 credits in upper-division courses. A maximum of 15 upper-division geography courses may be approved for the related-field requirement if such courses are more appropriate for the student's field of specialization than nongeography courses.

Recommended—MATH 124; a foreign language; courses designed to improve writing skills; an internship (GEOG 496); completion of a senior essay (GEOG 494); frequent consultation with a faculty counselor.

Majors who have not completed requirements (1) and (2) above should obtain approval of the undergraduate adviser before enrolling in 400-level courses. Not more than 5 credits of 494 through 499 may count toward the 55 credits in geography at this university. Transfer students must complete a minimum of 25 upper-division credits in geography. In courses taken to fulfill major requirements: (1) minimum grade of 2.0 in each course is required; (2) cumulative grade-point average of 2.50 is required.

Graduate Program

The Department of Geography has flexible programs of graduate study leading to the Master of Arts and Doctor of Philosophy degrees.

The aspirant to the Master's degree (thesis and non-thesis tracks) is expected to complete all work for the degree in four to six quarters. The aspirant to the doctoral degree is expected to undertake two years of post-master's study and must take a departmental diagnostic examination upon entry, pass the General Examination, attain an appropriate level of competence in

a foreign language or cognate field of concentration, and successfully complete a dissertation. Normally, doctoral program students complete all degree requirements in three to four years.

Admission Requirements

Admission to the graduate program normally requires a minimum grade-point average of 3.00 (on a 4.00 scale), or B, during the junior and senior years. Students holding a master's degree must meet this minimum scholastic requirement, but also should have achieved a grade-point average higher than 3.00 for graduate studies completed. North American applicants must take the Graduate Record Examination. Specific information regarding application procedures may be obtained by writing to the graduate program adviser.

Financial Aid

The department usually awards approximately thirteen teaching assistantships for the academic year. Most of the assistantships are for teaching quiz sections for a larger lecture class. A few of the more-advanced doctoral candidates may teach a class. Normally, several research assistantships are available.

Correspondence and Information

Graduate Program Coordinator
408A Smith, DP-10

Faculty

Chairperson

Morgan D. Thomas

Professors

Beyers, William B.,* 1967, (Landscape Architecture), Ph.D., 1967, Washington; regional science, economic geography, location theory, regional analysis, environment of the Pacific Northwest.

Fleming, Douglas K.,* 1965, (Marine Studies), Ph.D., 1965, Washington; transportation geography (especially ocean and air), regional organization of western Europe.

Hudson, G. Donald, 1951, (Emeritus), M.A., 1926, Ph.D., 1934, Chicago.

Jackson, W. A. Douglas,* 1955, (Environmental Studies), (International Studies),† M.A., 1949, Toronto; Ph.D., 1953, Maryland; political systems, nature and culture, Soviet Union, Canada.

Krumme, Günter,* 1970, Diplom. oec. publ. 1962, Munich, (Germany); Ph.D., 1966, Washington; economic geography, regional economics, location theory, organization and decision theory, European regional development and planning.

Marts, Marion E.,* 1951, (Emeritus), M.A., 1944, Washington; Ph.D., 1950, Northwestern; water resources, conservation, resource policy.

Mayer, Jonathan D.,* 1977, (Family Medicine, Health Services), M.A., 1975, Ph.D., 1977, Michigan; urban geography (including historical), transportation, medical geography, geographic philosophy and methods.

Morrill, Richard L.,* 1961, (Environmental Studies),† M.A., 1957, Ph.D., 1959, Washington; spatial organization, migration, diffusion and population, regional planning and development, inequality.

Sherman, John C.,* 1942, (Emeritus), M.A., 1943, Clark; Ph.D., 1947, Washington; cartography, graphics communication, remote sensing.

Thomas, Morgan D.,* 1959, (Parent and Child Nursing), Ph.D., 1954, Queen's (Belfast); regional economics, regional development, technical innovation.

Velikonja, Joseph,* 1964, Ph.D., 1948, Rome (Italy); social and political geography, international migration, immigrants in America, eastern Europe.

Associate Professors

Chang, Kuei-sheng,* 1966, (Emeritus), M.A., 1950, Ph.D., 1955, Michigan; economic geography of China, historical geography of exploration, Third World development.

Hodge, David C.,* 1975, M.A., 1973, Ph.D., 1975, Pennsylvania State; urban social and political geography, mass transportation, spatial equity, research methods, computer cartography.

Kakiuchi, George H.,* 1957, (International Studies),† M.A., 1953, Ph.D., 1957, Michigan; Japan, agriculture, internal migration, regional geography.

ZumBrunnen, Craig,* 1977, M.S., 1968, California Institute of Technology; Ph.D., 1973, California (Berkeley); natural resource management and conservation, environmental quality, methods of resource analysis, physical, Soviet Union.

Assistant Professors

Chrisman, Nicholas R.,* 1987, Ph.D., 1982, Bristol (England); geographic information systems, computer-assisted cartography.

Lawson, Victoria A.,* 1986, M.A., 1982, Ph.D., 1986, Ohio State; Third World development, migration, urbanization, Latin America.

Nyerges, Timothy L.,* 1985, M.A., 1976, Ph.D., 1980, Ohio State; geographic information systems, computer-assisted cartography.

Lecturer

Haney, Barbara B., 1984, Ph.D., 1971, Washington; USSR, historical geography.

Course Descriptions

Courses for Undergraduates

Prerequisites: In addition to specified prerequisites for individual courses, students should meet the general course-level requirements as indicated by the numbers, except where they may have special preparation or background in geography or in related fields.

Introduction to Geography

GEOG 100 Introduction to Geography (5) *Jackson, Mayer* Basic patterns of human occupancy of the earth; analysis of population, settlement, and resource-use problems; introduction to geographic theories pertaining to spatial organization, interaction, and environmental perception.

GEOG 102 World Regions (5) *Kakiuchi* Spatial study of world regions, based on historical, cultural, political, economic, and other factors. An attempt to understand the underlying forces that have led to the formation of regions and regional patterns.

GEOG 200 Introduction to Human Geography (5) *Velikonja* Patterns and systems of human occupancy of the world. Emphasis on cultural processes, dynamic change, functional relations and networks.

GEOG 205 Introduction to the Physical Environment (5) *ZumBrunnen* Major atmospheric, hydrologic, and geomorphic processes used to interpret the character, distribution, and human significance of different natural and human-altered environments. Includes laboratory exercises for science and non-science majors, geography majors and nonmajors.

GEOG 207 Economic Geography (5) *Beyers, Krumme, Thomas* Spatial order and changing locational patterns of man and his economic activities. Emphasis on concepts and theories pertaining to primary, secondary, and tertiary production, to transportation, and to the geography of consumption. Special attention given to cities and the distribution of activities within cities.

GEOG 227 Geographic Perspectives on Minorities in the United States (5) *Hodge, Morrill* Geographic aspects of race relations through analysis of past and present geographic distribution of minorities in the United States, and the processes of migration and segregation that created those patterns. Focus especially on the experiences of Asian, Black, Chicano, and Native Americans.

GEOG 230 Urbanization in Developing Nations (5) *Lawson* Cities in their cultural and economic contexts, geographical patterns of cities, and internal city structure. Problems facing these rapidly growing cities and selected policy solutions.

GEOG 258 Maps and Map Reading (3) Categories of maps and aerial photographs and their special uses; map reading and interpretation.

GEOG 277 Geography of Cities (5) *Hodge, Mayer* Spatial and functional orderliness of cities; their location, distribution, function, and spread. Particular emphasis on current urban problems—sprawl, city decline, and metropolitan transportation.

Systematic Fields

GEOG 300 Concepts of Regions (5) *Kakiuchi* Historical development and application of the concept of region. Examines systematically how varied societies constitute parts of a total world order.

GEOG 301 Cultural Geography (5) *Jackson* Analysis of the role of culture in the formation of landscape patterns; components of culture that contribute not only to a "sense of place," but also to the mosaic of settlement patterns and occupancy that can be traced to culture. Prerequisite: 100 or equivalent.

GEOG 316 Urban Economics (5) Application of economic analysis to urban trends, problems, and prescriptions, such as changing urban form and function, urban public finance, housing and renewal, poverty and race, transportation, and environmental problems. Joint with ECON 316. Prerequisite: ECON 201 or equivalent.

GEOG 325 Historical Geography of the United States (5) *Haney, Morrill* Changing geography of the United States from the time of modern European contact to the early twentieth century. Emphasis on the evolving settlement, land use, landscape, and regional patterns.

GEOG 342 Geography and Inequality in the United States (3) *Morrill* Geography of social and economic inequality. Spatial distribution of wealth and poverty and the possible causes. Geographic and other aspects of the alleviation of poverty. The geography of racial and ethnic discrimination, from Indian reservations to ghettos, as well as religious and age discrimination.

GEOG 349 Geography of International Trade (5) *Fleming* Processes and patterns of international commerce. Geographical dimensions of trade linkages. Emergence of trading blocks, problems of "north-south" trade arrangements, and role of multinationals in the global trading system. Recommended: 207.

GEOG 350 Urban-Regional and Market-Area Analysis (5) *Krumme* Methods and concepts for analysis of small regions, market areas, and their economic development. Tools for population, employment, and consumer profiles. Industrial and service locations, trading patterns, commodity flows. Spatial constraints on behavior of producers, consumers. Economic impact analysis, feasibility studies. Prerequisite: 207 or 277 or permission of adviser.

GEOG 370 Problems in Resource Management (5) *ZumBrunnen* Principles and practices of effective conservation and utilization of natural resources. Role of technology in resource use. Physical, political, and economic aspects of resource management for food, population, land, water, air, energy, and timber resources. Prerequisite: 100 or equivalent.

GEOG 375 Geopolitics (5) *Jackson* Spatial aspects of international politics, with attention to perceptions of national space, the way states organize territory, and the strategic use of geography to advance state goals. Joint with SIS 375. Prerequisite: 100 or equivalent.

GEOG 380 Geographical Patterns of Health and Disease (4) *Mayer* Geography of infectious and chronic diseases at local, national, and international scales; environmental, cultural, and social explanations of those variations; comparative aspects of health systems. Prerequisite: 100 or equivalent.

GEOG 399 Future Patterns of Settlement (3) *Morrill, Schneider* Possible future patterns of human use of the environment from apocalyptic to glorious. Review of landscape evolution. Problems of long-range regional and national planning. Joint with URBPD 399. Prerequisite: 207 or 277 or URBPD 340, or permission of department adviser.

GEOG 436 Geographical Exploration (5) Comparative study of discoveries made by the world's great explorers and expeditions, their motivations, and the effect on geographical thought, relations between cultures, and the development of civilization.

GEOG 440 Regional Analysis (5) *Beyers* Regional industrial structures and economic change. Application of shift and share, cohort, multiplier, input-output, location-interaction, and programming models to the analysis and to the projection of urban and regional population patterns, and to income distributions, interurban and interregional growth differentials, regional and interregional linkages and flows, as well as urban and regional impacts of government expenditures. Prerequisite: 207 or permission of department adviser.

GEOG 441 Technology and Industrial Change (5) *Thomas* The "technology factor" in the process of industrial change in a turbulent contemporary world. Restructuring the world economy, transnational corporations, industry strategies and government policies. Prerequisite: 207 or permission of adviser.

GEOG 442 Social Geography (5) *Velikonja* Spatial patterns of social relations, social regions.

GEOG 443 Location and Movement Models (5) *Morrill* Application of models of optimum location and allocation; assignment, transportation, and spatial equilibrium; spatial interaction; geographic simulation; and spatial diffusion.

GEOG 444 Geography of Water Resources (3) Analysis and appraisal of water resources in land and industrial development; problems and policies of river basin planning with emphasis on the Pacific Northwest.

GEOG 445 Population Distribution and Migration (5) *Lawson, Morrill* Relation of population distribution to environment, economic development, and culture. Frontier and rural settlement, urbanization, and suburbanization. Regional variation in age, ethnicity, fertility, and mortality. Causes and effects of migration from the world to the local scale. Recommended: 100 or 200 or SOC 331.

GEOG 447 The Geography of Air Transportation (3 or 5) *Fleming* Geographic analysis of world air routes, passenger and cargo flows, and airport activities; consideration of physical, economic, political, and institutional determinants of routes and flows. Recommended: 207 and junior standing or above.

GEOG 448 Geography of Transportation (5) *Mayer* Circulation geography, principles of spatial interaction emphasizing commodity flow, the nature and distribution of rail and water transport, the role of transport in area development.

GEOG 449 Geography of Ocean Transportation (5) *Fleming* Geographic analysis of ocean trade routes, cargo and passenger flows, and port activities. Evaluation of the role of the transportation carrier in international trade. Recommended: 207.

GEOG 450 Theories of Location (5) *Krumme* Systematic presentation of classical, neoclassical, and modern theories of location, land use, and spatial structure, including introduction to decision-making concepts. Location principles, patterns, and processes in the context of rural, commercial, industrial, residential, and recreational activities focusing on the effects of transportation, communication, uncertainty, and other factors. Prerequisite: 207 or 277 or 350 or permission of adviser.

GEOG 466 Regional Development (3 or 5) *Thomas* The process of regional economic development. Theories and conceptualizations of economic growth and structural change, technological change and industrial development, spatial variation in economic activities and government policies. Prerequisite: 207 or ECON 200 or equivalent.

GEOG 471 Methods of Resource Analysis (5) *ZumBrunnen* Economic and noneconomic criteria for resource analysis. Theory and methods of linear models of natural resource analysis. Includes materials-balance modeling, residuals management, constrained system optimization approaches to water quality analysis, land-use patterns and interregional energy use, and multiple objective planning techniques applied to natural resource problems. Prerequisite: 370 or permission of instructor.

GEOG 475 Geography of International Relations (5) *Jackson* Selected problems of spatial patterns and dynamic relationships. Geographical problems of regional, national, and international organization. Joint with SIS 475. Prerequisite: 375 or permission of department adviser.

GEOG 478 Intraurban Spatial Patterns (5) *Hodge, Morrill* Geographic patterns and processes within metropolitan areas. Economic land-use patterns (commercial and industrial location), social land-use patterns (segregation, housing, and neighborhood change), urban political geography, analysis of urban infrastructure, and assessment of contemporary and future trends in urban development. Prerequisite: 277 or permission of instructor.

Regional Fields

GEOG 302 The Pacific Northwest (3) *Beyers* Economy of the Pacific Northwest in the light of factors of location, resources, resource-oriented industries, and resource policies. An introduction to regional studies on a local scale.

GEOG 304 Western Europe (5) *Fleming* Physical and socioeconomic characteristics of western Europe. Contemporary political and economic integration trends in their regional context.

GEOG 305 Eastern Europe (5) *Velikonja* Physical, historical, and socioeconomic characteristics of eastern Europe.

GEOG 308 Canada: A Geographic Interpretation (5) *Jackson* Study of Canada; emergence of political-geographic and cultural entity and identity in North America that presents significant contrasts to the United States. Components that have helped shape Canadian earth-space and landscape.

GEOG 313 East Asia (5) *Kakiuchi* Nature and geographic setting of East Asian civilization. Origins, development, and present outlines of settlement; cultures, resource use, and economic structures in China, Japan, and Korea.

GEOG 333 Russia's Changing Landscape (5) *Jackson* Russian/Soviet landscape as it has been affected by migration and settlement, urbanization, collectivization, industrialization, and the growth of a transport network.

GEOG 335 Geography of the Developing World (5) *Haney, Lawson* Characteristics and causes, external and internal, of Third World development and

obstacles to that development. Special attention to demographic and agricultural patterns, resource development, industrialization and urbanization, drawing on specific case studies from Asia, Africa, and Latin America. Joint with SIS 335. Prerequisite: 100 or equivalent.

GEOG 336 China (5) China's physical environment. Human response to varied geographical conditions. Pattern and process of development in agriculture, manufacturing, and urbanization. Prerequisite: 100 or equivalent.

GEOG 402 United States (5) *Morrill* Spatial pattern of economic and social life in America—how it evolved, the role of the environment and resources; problems of regional inequality in development.

GEOG 404 Problems in the Geography of Western Europe (5) *Fleming* Problems stemming from contemporary political and socioeconomic changes under way in Europe. Topics include urbanization, regional development, economic integration and patterns of trade.

GEOG 405 Problems of Eastern Europe (5) *Velikonja* Selected geographical aspects of eastern Europe. Natural and human resource base, social and political organization. Their relationships and interdependence. Prerequisite: 305 or permission of instructor.

GEOG 410 Immigrants and the American West (5) *Velikonja* Historic-geographic appraisal of European and Asiatic immigration to the West. Geographic precondition and processes of immigrant settlement. Assessment of the role of ethnicity.

GEOG 430 Contemporary Development Issues in Latin America (5) Contemporary development issues in Latin America, seen from a spatial perspective. Concept of development; competing theories as related to various Latin American states. Economic structural transformation, migration, urbanization, regional inequality, and related policies.

GEOG 433 Soviet Resource Use and Management (5) *Jackson, ZumBrunnen* Implications of Soviet industrial growth for resources; use of resources and associated problems; conservation in theory and practice.

GEOG 434 Southeast Asia: Conflict and Development (5) Study of complexity of ethnic, cultural, and socioeconomic background in relation to division and rivalry in past; conflict and development in contemporary southeast Asia. Prerequisite: 100.

GEOG 435 Resources and Industrialization in China (5) Analysis of China's resources, foundations and development, population growth and control, major industrial bases, and international relations underlining programs of industrialization and modernization.

GEOG 437 Contemporary Japan (5) *Kakiuchi* Topical and regional study of Japan's physical, industrial, and agricultural geography. Analysis of contemporary spatial patterns, considering both cultural and environmental factors. Aspects of historical development are examined to provide time perspective.

Cartography and Geographic Information Systems

GEOG 360 Principles of Cartography (5) Map scales, grid systems, symbolism, and map reproduction. Laboratory experience in application of these principles to map design and construction.

GEOG 361 Experimental Cartography (5) Application of, and experimentation with, cartographic techniques and materials. Problems of relief representation, mapping of quantitative data, and their relation to reproduction processes. Prerequisite: 360.

GEOG 363 Aerial Photographs as Source Materials (3) Training in the use of aerial photographs as source materials in map compilation and other geographic purposes. Prerequisite: 360.

GEOG 365 Introduction to Computer Cartography (5) *Nyerges* Origins, development, and methods of computer-assisted cartography. Experiments with a user-oriented package of computer mapping programs capable of performing most thematic mapping operations.

GEOG 458 Map Intelligence (3) Analysis and appraisal of maps; mapping agencies, coverage, organization, and indexing; analysis of errors associated with maps and map-derived data.

GEOG 462 Problems in Map Compilation and Design (5) Application and analysis of map intelligence procedures as related to map compilation. Measurement and experimental study of psychophysiological factors in design of map elements. Prerequisite: 360.

GEOG 463 Microcomputer Processing of Geographic Data Bases (5) Design and implementation of geographic information systems using microcomputers. Conceptual organization of data structures, programming microcomputers, interfacing with peripheral equipment, and computer graphic presentation.

GEOG 484 Problems in Map Reproduction (3) Processes and photographic techniques applicable to cartographic and geographic presentations. Prerequisite: 360.

GEOG 485 Computer Cartographics (5) Methods and techniques of programming used in computer graphics applications in cartography. Basic concepts and procedures for interactive graphics. Development of skills in computer graphics programming. Students are encouraged to develop and implement computer cartographic applications. Prerequisites: 365 and elementary FORTRAN programming ability or permission of instructor.

Research Techniques

GEOG 326 Introduction to Geographic Research (5) *Lawson* Approaches to geographic pattern solving. Topics include defining geographic problems; methods of analysis, seeking, organizing, and analyzing spatial data. Provides experience defining a geographic research problem, collecting and analyzing data, and drawing conclusions from that endeavor.

GEOG 426 Quantitative Analysis of Spatial Distributions (5) *Hodge, Morrill* Application of statistics to spatially ordered data. Descriptive and inferential statistics of spatial (bivariate) distributions. Theoretical spatial distributions. Problems of spatial autocorrelation and pattern analysis. Trend surface, factorial ecology, and regionalization. Prerequisite: basic statistics course.

GEOG 490 Field Research: The Seattle Region (6) Investigation of settlement and economic development of the Seattle region, including role of environment and institutions. Field analysis of contemporary regional planning issues: transportation, land use, location of employment, shopping and housing, political fragmentation, and environmental degradation. Field report required. Prerequisite: 100 or 205 or 207.

GEOG 494 Senior Essay (3) Supervised individual research and writing of major paper during senior year. Prerequisites: senior standing and permission of faculty sponsor and undergraduate adviser.

GEOG 495 Special Topics (*, max. 10) Topics vary and are announced in the preceding quarter.

GEOG 496 Internship in Geography (3 or 5, max. 12) Internship in the public or private sector, supervised by a faculty member. Prerequisites: sophomore standing or above in geography and permission of faculty sponsor and undergraduate adviser.

GEOG 497 Tutorial in Geography (1-3, max. 6) Intensive directed study and tutoring. Literature reviews, formulations of project outlines and research designs, orientation in contemporary geographic thought and

trends. Directed writing. Required for honors students. Prerequisite: permission of undergraduate adviser or instructor.

GEOG 498 Undergraduate Seminar in Economic Geography and Regional Science (3) *Krumme* Selected advanced topics and current problems in location theory and analysis as well as urban and regional-economic development, analysis and planning. Emphasis on conceptual frameworks and analytical tools does not preclude a problem-oriented selection of predominantly local and regional empirical research subjects. Prerequisite: permission of department adviser or instructor.

GEOG 499 Special Studies (*, max. 15) Supervised reading programs, undergraduate and graduate library and field research; special projects for undergraduate honors students. Prerequisite: permission of instructor or department adviser.

Courses for Graduates Only

GEOG 500 Contemporary Geographic Thought (4, max. 8)

GEOG 501 Geographic Analysis (3)

GEOG 503 Research Seminar: Eastern Europe (3, max. 6) *Velikonja*

GEOG 505 Research Seminar: China and Northeast Asia (3, max. 6)

GEOG 506 Research Seminar: Southeast Asia (3, max. 6)

GEOG 507 Research Seminar: Canadian Problems (3, max. 6) *Jackson* Consideration of the spatial dimensions of Canadian socioeconomic, cultural, and political development, with emphasis on resource potentials and relations with the United States, Japan, and other important trading partners. Prerequisite: 308 or permission of instructor.

GEOG 509 Research Seminar: Japan (3, max. 6) *Kakiuchi*

GEOG 510 Research Seminar: Settlement and Urban Geography (3, max. 9) *Mayer*

GEOG 520 Research Seminar: Cartography (3, max. 6)

GEOG 526 Advanced Quantitative Methods in Geography (4) *Morrill*

GEOG 529 Urban Region Geocoding and Land-Based Information Systems (3) Multipurpose land information systems. The United States census geocoding system and cadastral file information use. Applications to land surveying, urban and transportation planning, and geographic analysis. Joint with CETS 529 and URBPD 529.

GEOG 531 Latin American Development Seminar (3) Evolution of development theory in Latin America from a spatial perspective. Theories and development issues, using case studies from Latin America. How geographers have conceptualized development problems and solutions. Prerequisite: 430.

GEOG 533 Research Seminar: Soviet Union (3, max. 6) *Jackson*

GEOG 538 Research Seminar: Geography of Transportation (3, max. 6) *Fleming, Mayer*

GEOG 539 Research Seminar: Utilization of Water Resources (3, max. 6)

GEOG 540 Research Seminar: Industrial Geography (3, max. 6) *Beyers*

GEOG 542 Research Seminar: Social and Population Geography (3, max. 6) *Morrill, Velikonja*

GEOG 550 Research Seminar in Location Theory (3) *Krumme* Selected research-oriented topics in classical, neoclassical, and behavioral location theory. Theoretical problems of locational analysis. Relationships between location theory and regional development and planning concepts. Location concepts for urban analysis.

GEOG 551 Location Strategies of Corporate Organizations (3) *Krumme* Geographic dimensions of organizational behavior. Emphasis on locational strategies of large corporations. Industrial location, organization, regional development, and interregional trade and investment as factors influencing spatial patterns and processes of multiregional and multinational corporations.

GEOG 555 Landscape Analysis (3) *Fleming, Jackson* Methods of landscape analysis; search for a sense of place, transformation of territory into meaningful landscape; science and significance of regions; concepts of landscape change.

GEOG 556 Seminar in Urban Economics (3) Use of economic theory to explain land-use trends, transportation, housing and renewal, the ghetto, and the public economy in urban areas. Joint with ECON 556. Prerequisites: ECON 300, 301, or equivalent.

GEOG 566 Regional Development Seminar (3) *Thomas* Regional economic development theories and methodologies. The dynamic roles of social, economic, technical, and institutional factors in the process of regional development. Impacts of industry and firm strategies and government policies.

GEOG 567 Research Seminar: Geography and Industrial Development (3, max. 6) *Thomas* Spatial and economic dimensions of contemporary restructuring of world economy. Explanatory roles of such factors as governments, technical change, complex corporations, capital markets, information costs, transfer costs, and international trade in this process of global restructuring.

GEOG 570 Research Seminar: Natural Resources Analysis (3, max. 6) *ZumBrunnen*

GEOG 575 Research Seminar: Geography in Politics and World Affairs (3, max. 6) *Jackson* Literature in political geography and related fields pertaining to state and interstate relationships. Prerequisites: 375, 475.

GEOG 577 Research Seminar: Internal Spatial Structure of Cities (3, max. 9)

GEOG 580 Medical Geography (3) *Mayer* Geography of disease, consideration in health systems planning. Analysis of distributions, diffusion models, migration studies. Application of distance, optimal location models to health systems planning; emergency medical services; distribution of health professionals; cultural variations in health behavior. Joint with HSERV 559. Prerequisites: familiarity with social science research; health-related issues.

GEOG 581 Seminar in Medical Geography (3) *Mayer* Research and methodologies in medical geography; critical analysis of readings in medical geography; interrelations of medical geography with (1) other geographical specialties, (2) other health sciences. Prerequisite: 580.

GEOG 588 Geography Colloquium (1, max. 3) Participation in, and critique of, student thesis and dissertation research, faculty research, and visitor contributions.

GEOG 600 Independent Study or Research (*)

GEOG 700 Master's Thesis (*)

GEOG 800 Doctoral Dissertation (*)

Geological Sciences

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The geological sciences include the collection and interpretation of field data as well as the application of principles of physics, chemistry, biology, and mathematics to the study of the earth, its environment, its origin, and the processes by which it has been transformed and reconstituted through time. The curriculum of the department provides a base of required courses for the undergraduate and contains a wide variety of more specialized upper-division courses that reflect the diversity of the geological sciences.

The department is well equipped with modern analytical and experimental facilities and has sizable research/teaching collections of rock, minerals, and fossils.

Undergraduate Program

Sara Caka, Adviser

Bachelor of Science Degree

The Department of Geological Sciences offers courses in all the major subdisciplines of geology, preparing students for graduate school and for careers in industry, government, and academe. Courses are also offered for nonmajors interested in understanding the processes responsible for the distribution of continents, the landscapes, the availability of natural resources, and the occurrence of such natural hazards as earthquakes and volcanism.

Major Requirements: GEOL 101 or 205, 306, 311, 320, 321, 340, 401 plus 13 (biology option) or 15 credits at the 400 level in geological sciences, excluding GEOL 401, 498 and 499; MATH 124, 125, and either 126 or STAT 311; CHEM 145 or 140, 155 or 150; PHYS 121, 122, 123. Recommended: MATH 238, 327, 328, and PHYS 224, 225, 226, or BIOL 101-102. (Biology option: PHYS 121; BIOL 101-102 or two courses chosen from BIOL 210, 211, 212 may substitute for PHYS 122, 123.) All required courses must be completed with grades not lower than 2.0.

Graduate Program

Bernard Evans, Graduate Program Coordinator

The Department of Geological Sciences offers graduate programs leading to the degrees of Master of Science and Doctor of Philosophy. The department emphasizes a rigorous scientific approach to significant problems in the geological sciences. Study in virtually all branches of geology is possible; any emphasis on field, laboratory, or theoretical work is largely dictated by the nature of the research problem selected.

Research Facilities

Analytical, experimental, and computational research facilities include a wet chemistry laboratory with an atomic absorption spectrophotometer, a forty-eight-channel ICP unit for elemental analysis, a JEOL 733 four-channel microprobe with EDS/WDS, a thermal-ionization mass spectrometer and clean laboratory for separation of radiogenic and trace elements (Rb/Sr, Sm/Nd, U, Pb), two single-crystal X-ray diffractometers for crystal-structure studies at high pressure and temperature, a power X-ray diffractometer, a microcomputer laboratory, a Microvax 2 facility for geochemistry research, a VAX 750 facility for research in crystallography and mineral physics, a remote-sensing laboratory with an image-processing system with LANDSAT tape library and spectral reflectance equipment, and gas-atmosphere-controlled furnaces. Additional facilities are provided by the Burke Memorial Washing-

ton State Museum with paleontological laboratory and collections (extensive reference collections of invertebrate, vertebrate, and plant fossils; petrologic and mineralogic collections) and the Quaternary Research Center (scanning and transmission electron microscopes, K-Ar dating, radiocarbon and oxygen-isotope research, palynology, snow and ice research, and periglacial laboratory).

Master of Science Degree

Graduation Requirements: With Thesis—36 credits, of which 18 must be in courses at the 500 level or above and up to 9 may be for thesis (GEOL 700). Final examination consists of oral presentation and defense of thesis. Without Thesis—45 credits, of which 18 must be in courses at the 500 level or above, which includes a 5-credit research paper (GEOL 600). Final examination is written or oral and is administered by the supervisory committee. All students must present approved field courses or other approved field experience. A maximum of 9 credits of field geology may be applied.

Doctor of Philosophy Degree

Admission Requirements: Either Master of Science or Master of Arts degree in geological sciences or related field.

Graduation Requirements: Credits variable; one-half total program, including dissertation, must be in courses at the 500 level or above; a minimum of 27 credits for thesis (GEOL 800); at least 18 credits completed with numerical grade in courses numbered 400 and 500. Completion of two years of graduate study, passage of qualifying examination, General Examination (both written and oral parts), and admission to candidacy; completion of acceptable dissertation and passage of Final Examination.

Financial Aid

The department awards annually a number of teaching assistantships, endowed scholarships, research assistantships, minority fellowships, and a museum curator assistantship. Industry-sponsored grants are also available. Qualified students are strongly encouraged to apply for National Science Foundation and other fellowships available through national and private agencies.

Correspondence and Information

Graduate Program Coordinator
63 Johnson, AJ-20

Faculty

Chairperson

Thomas Dunne

Professors

Adams, John B.,* 1961, (Astronomy), M.S., 1958, Ph.D., 1961, Washington; planetology, remote sensing.

Bostrom, Robert C.,* 1964, (Geophysics),† M.A., 1952, Ph.D., 1961, Oxford, (England); geophysics.

Coombs, Howard A., 1934, (Emeritus), M.S., 1932, Ph.D., 1935, Washington; engineering geology.

Cowan, Darrel S.,* 1974, Ph.D., 1972, Stanford; structural geology and regional tectonics.

Creager, Joe S.,* 1958, (Oceanography),† M.S., 1953, Ph.D., 1958, Texas A&M; marine geology.

Crosson, Robert S.,* 1966, ‡(Geophysics), M.S., 1963, Utah; Ph.D., 1966, Stanford; seismology.

Dunne, Thomas,* 1973, (Environmental Studies, Quaternary Research Center), Ph.D., 1969, Johns Hopkins; geomorphology and hydrology.

Evans, Bernard W.,* 1969, Ph.D., 1959, Oxford (England); petrology and mineralogy.

Ghose, Subrata,* 1972, (Geophysics, Materials Science and Engineering), M.S., 1959, Ph.D., 1959, Chicago; x-ray crystallography, mineralogy, applications of solid-state physics techniques to mineralogy.

Hallet, Bernard,* 1980, (Quaternary Research Center), Ph.D., 1975, California (Los Angeles); glaciology, permafrost studies, geomorphology.

Leopold, Estella B.,* 1976, ‡(Botany, Environmental Studies, Forest Resources, Quaternary Research Center), M.S., 1950, California (Berkeley); Ph.D., 1955, Yale; palynology and Quaternary environments.

Mallory, V. Standish,* 1952, (Emeritus), M.A., 1948, Ph.D., 1952, California (Berkeley); biostratigraphy, micropaleontology, paleoecology.

McCallum, I. Stewart,* 1970, Ph.D., 1968, Chicago; petrology.

Merrill, Ronald T.,* 1967, (Oceanography), (Geophysics), † M.S., 1961, Michigan; Ph.D., 1967, California (Berkeley); geomagnetism.

Porter, Stephen C.,* 1962, (Quaternary Research Center), M.S., 1958, Ph.D., 1962, Yale; Quaternary geology and geomorphology.

Raymond, Charles F.,* 1969, ‡(Geophysics, Quaternary Research Center), Ph.D., 1969, California Institute of Technology; glaciology.

Rensberger, John M.,* 1966, M.A., 1961, Ph.D., 1967, California (Berkeley); Cenozoic mammalian evolution, taxonomy, and biostratigraphy.

Smith, J. Dungan,* 1967, (Geophysics, Oceanography), † M.S., 1963, Brown; Ph.D., 1968, Chicago; oceanography, fluid mechanics, sediment transport processes.

Smith, Stewart W.,* 1970, ‡(Geophysics), M.S., 1958, Ph.D., 1961, California Institute of Technology; earthquake seismology.

Stuiver, Minze,* 1969, (Oceanography), (Quaternary Research Center), † M.S., 1953, Ph.D., 1958, Groningen (The Netherlands); geochronology, isotope geology.

Tsukada, Matsuo,* 1969, ‡(Botany, Quaternary Research Center), M.S., 1958, D.Sc., 1961, Osaka City (Japan); interpretation of Quaternary events from palynological and kindred data.

Ward, Peter D.,* 1985, (Zoology), M.S., 1973, Washington; Ph.D., 1976, McMaster; invertebrate paleontology, paleobiology.

Washburn, A. Lincoln, 1966, (Emeritus), Ph.D., 1942, Yale; geomorphology, periglacial processes and environments.

Associate Professors

Bourgeois, Joanne,* 1980, Ph.D., 1980, Wisconsin; stratigraphy, sedimentation.

Brown, J. Michael,* 1984, ‡(Geophysics), M.S., 1978, Washington; Ph.D., 1980, Minnesota; experimental and theoretical mineral physics.

Cheney, Eric S.,* 1964, Ph.D., 1964, Yale; economic geology, application of light isotopes to ore deposits.

Ghiorso, Mark S.,* 1980, M.A., 1978, Ph.D., 1980, California (Berkeley); geochemistry.

Stewart, Richard J.,* 1969, (Oceanography), Ph.D., 1970, Stanford; sedimentary petrology, diagenesis of sediments.

Vance, Joseph A.,* 1957, Ph.D., 1957, Washington; igneous and metamorphic petrology, general geology.

Assistant Professors

Nelson, Bruce K.,* 1986, M.S., 1980, Kansas; Ph.D., 1985, California (Los Angeles); isotope geochemistry.

Possolo, Antonio,* 1984, ‡(Statistics), Ph.D., 1983, Yale; spatial statistics, point processes.

Lecturers

Bruner, William M.,* 1983, Ph.D., 1980, California (Los Angeles); structural geology.

Chernicoff, Stanley E., 1980, Ph.D., 1980, Minnesota; geomorphology.

Course Descriptions

Courses for Undergraduates

GEOL 100 Dinosaurs (2) A Rensberger Biology, behavior, ecology, evolution, and extinction of dinosaurs, and a history of their exploration. With dinosaurs as focal point, course also introduces the student to how hypotheses in geological and paleobiological science are formulated and tested. Optional ten-day, pre-quarter field trip to dinosaur deposits offered when possible.

GEOL 101 Introduction to Geological Sciences (5) AWSps Chernicoff Survey of the physical systems that give the earth its form. Emphasizes the dynamic nature of interior and surface processes and their relevance to mankind and stresses the value of rocks and earth forms in the understanding of past events. A course with laboratory for nonscience majors. Not open for credit to students who have taken 205. Field trips.

GEOL 205 Physical Geology (5) ASp Introduction to the physical and chemical processes of the earth's surface and interior. Plate tectonics, earthquakes, volcanism, glaciation. Optional field trips to Cascades and Olympics. Background in geology not required but science background desirable. Not open for credit to students who have taken 101.

GEOL 300 Geology of the National Parks (3) Sp Important geological processes and concepts of North American national parks. Prerequisite: 101 or 205 or equivalent.

GEOL 302 Great Ice Age (5) W Chernicoff Growth of mile-thick ice sheets, worldwide lowering of sea level, and other changes that accompany the harsh environments of a global ice age. Geology of the last three million years, focusing on the geological and ecological impact of our current ice age. Prerequisite: 101 or 205.

GEOL 306 Evolution of the Earth (5) W Earth and its physical and biological aspects through time. Origin of earth, its early history, and development of continents and ocean basins as chronicled by the rock and fossil record. Field trips required. Prerequisite: 101 or 205.

GEOL 308 Geology of the Northwest (5) SpS Chernicoff Geologic history of Washington, Oregon, and Idaho. Emphasis on use of geologic principles in interpreting evidence found in landscapes and rocks. Prerequisite: 101 or 205 or equivalent.

GEOL 311 Introductory Geomorphology (5) A Dunne, Hallet Processes that generate landscapes. Two one-day field trips. Prerequisites: 101 or 205, and prior or concurrent enrollment in PHYS 121.

GEOL 312 Volcanoes and Glaciers of the Pacific Northwest (3) S Irving Introduction to volcanic and glacial processes, emphasizing examples in the Pacific Northwest. Volcanic products, landforms, hazards, prediction, and history. Relationship to tectonics. Nature and distribution of present and former glaciers in Washington. Two all-day Saturday field trips to Cascade volcanoes required.

GEOL 313 Environmental Geology (4) A Dunne Analysis of geologic constraints upon human activity and the environmental consequences of such activity. Topics include hillslope processes, fluvial processes, earthquake and volcanic hazard, and environmental aspects of the development of water, energy, and mineral resources. The laboratory/discussion section often is replaced by an afternoon or weekend field trip. Prerequisites: 101, 205, or permission of department.

GEOL 320 Mineralogy (5) W Ghiorso, Ghose, McCallum Introduction to mineralogy, including elementary crystallography (lattice types, external mor-

phology, stereographic projection), elementary crystal physics (relationship of physical properties, including tensor properties to crystal symmetry), and elementary crystal chemistry (structures, bonding, etc.), especially of the silicates. Prerequisites: CHEM 101 or 140, MATH 124.

GEOL 321 Principles of Petrology (5) Sp Evans, McCallum, Vance Description, classification, and origin of igneous, metamorphic, and sedimentary rocks, with laboratory hand specimen study of rock specimens. Two one-day field excursions. Prerequisite: 320 or equivalent.

GEOL 340 Structural Geology (5) A Cowan, Stewart Mechanics of rock deformation; description, classification, origin, and tectonic significance of common structures. Emphasizes interpretation and analysis of geologic maps and cross-sections. Prerequisites: MATH 124, PHYS 121.

GEOL 401 Field Geology (12) SpS Geologic mapping in diverse areas in the western United States. Development of skills in mapping, field interpretation, and report writing. Prerequisites: 205, 306, 320, 321, 340, and permission of department.

GEOL 403 Principles of Paleobiology (4) Sp Ward Fossil record and methods of analysis. Biologic systems in geologic time, including preservation, variation, population structure, adaptation, functional morphology, biostratigraphy, paleoecology, evolution, and biogeography. Prerequisites: 101 or 205, and 306.

GEOL 405 The Earth's Interior (3) Sp Bostrom Geophysical evidence as to the earth's interior regionalization and workings; development of the major surface features.

GEOL 409 Great Geological Issues (3) Sp Bourgeois History and development of geological and paleontological theories and controversies; philosophy and methodology that have driven scientific inquiry in the earth sciences. Prerequisite: advanced standing in geological sciences or course work in history of science (e.g., HST 311, 312), or permission of instructor.

GEOL 410 Introduction to Geological Remote Sensing (4) A Adams Principles of image interpretation for geologists. Study of land forms, structure, lithology, surface processes using aircraft and satellite data. Use of digital multispectral images and radar images for geological mapping. Prerequisite: 311.

GEOL 412 Fluvial Geomorphology (5) Sp Dunne Hydraulic, sedimentologic, and morphological characteristics of streams and valley floors. Landscape evolution by stream erosion and deposition. Interpretation of fluvial sedimentary environments. Five field exercises emphasize the quantitative analysis of fluvial processes and channel forms and the acquisition of various skills, such as mapping, topographic surveying, and report writing. Prerequisites: 311, MATH 125, PHYS 121. (Offered odd-numbered years.)

GEOL 413 Hillslope Geomorphology (5) Sp Dunne Theoretical, laboratory, and field study of hillslope evolution by mass wasting and water erosion. Five field exercises emphasize the quantitative analysis of geomorphic processes and the acquisition of various skills, such as mapping, topographic surveying, and report writing. Prerequisites: 311, MATH 125, PHYS 121. (Offered even-numbered years.)

GEOL 414 Image Interpretation (4) W Adams Image interpretation in geological remote sensing. Analysis of aircraft and satellite images to solve field problems. Aerial stereo photography, digital multispectral images, thermal IR, radar images. Prerequisite: 410.

GEOL 415 Principles of Glaciology (4) A Hallet, Maykut, Porter, Raymond, Stuiver, Warren Snow deposition and metamorphism, avalanches, heat and mass balance at snow and ice surfaces, glacier flow, ice sheets, sea ice, permafrost, methods of paleoclimate reconstruction, Ice Age theories. Joint with GPHYS 415. Prerequisite: permission of instructor.

GEOL 416 Glacial Geology (3) A Porter Interpretation of glacial environments and history through study of sediments and landforms; stratigraphic approaches, chronology, reconstructions, applications. Recommended: 311, 415.

GEOL 417 Quaternary Glacial Ages (3) A Porter Physical, biological evidence of climatic change during Quaternary Period; stratigraphy, chronology. Impact of alternating glacial/interglacial cycles on earth's terrestrial, marine environments. Theories on causes of climatic variation. Joint with QUAT 417. Prerequisite: introductory course in earth science and biological science.

GEOL 419 Glacial Landscapes and Deposits (3) Sp Hallet Development of steep-sided valleys, turquoise lakes, deep cirques, craggy peaks. Physics of glacial erosion and deposition. Geological and geochemical properties of glacial sediments. Prerequisites: 311, 415.

GEOL 420 Advanced Mineralogy (3) Sp Ghose Dynamic aspects of mineral behavior and associated thermodynamic and other physical properties; lattice dynamics, phase transition, cation order-disorder and exsolution, ligand field theory, color and magnetic properties of transition metal-bearing minerals. Diffraction and spectroscopic techniques, such as infrared, Raman, Mossbauer, NMR, EPR.

GEOL 423 Optical Mineralogy (4) A Vance Petrographic microscope and recognition of common minerals in thin section. Prerequisite: 320 or equivalent.

GEOL 424 Petrography and Petrology of Igneous Rocks (5) W McCallum, Vance Systematic study of igneous rocks and their origin, using the petrographic microscope. Prerequisite: 423 or equivalent.

GEOL 425 Petrography and Petrology of Metamorphic Rocks (5) Sp Evans Mineralogy, textures, and origins of metamorphic rocks; metamorphic facies and metamorphic phase equilibria; controls of metamorphism. Prerequisites: 423, 424, or equivalents.

GEOL 426 Petrology and Petrography of Sedimentary Rocks (5) W Bourgeois, Stewart Mineralogy, textures, and origin of sedimentary rocks, using petrographic microscope. Prerequisites: 320, 423, or equivalents.

GEOL 430 Invertebrate Paleontology (5) W Ward Important larger invertebrate groups; morphology, classification, stratigraphic distribution, evolution, paleoecology. Prerequisite: 306 or permission of instructor.

GEOL 432 Paleocology of Invertebrates (5) Properties of fossil populations and interpretation of habit and habitat in the geologic past; applications to interpretation of the stratigraphic record.

GEOL 435 Seismic Exploration (4) Sp Brown Introduction to theory and practice of seismic exploration. Application of refraction and reflection techniques to problems in engineering geology and mineral exploration. Constraints in the interpretation of subsurface structure. Joint with GPHYS 435. Prerequisites: 340, MATH 126, PHYS 123.

GEOL 436 Micropaleontology (5) A Mallory Principles of paleontology as applied to micropaleontology; the systematic study of foraminifera. Prerequisite: 430 or permission of department. (Offered odd-numbered years.)

GEOL 437 Fossil Vertebrates (5) W Rensberger Highlights in evolutionary history of the fossil vertebrates, from early Paleozoic fishes through late Cenozoic mammals. Morphology, adaptations, relationships of the major groups. Bone structures and systematic relationships. Field trip. Prerequisite: 100 or BIOL 101 or equivalent. (Offered even-numbered years.)

GEOL 438 Fossil Mammals (5) Rensberger Evolutionary relationships of fossil mammals, from mammal-like reptiles of late Paleozoic to diverse Cenozoic groups. Morphology, adaptations, extinctions, evolutionary patterns. Structures and relationships of most major groups. Field trip. Prerequisite: 100 or BIOL 101 or 437. (Offered odd-numbered years.)

GEOL 443 Tectonics (3) W Cowan Development of orogenic belts in space and time; critical evaluation of large-scale zones of deformation as geological expressions of plate interactions; characteristics of modern and ancient convergent plate boundaries. Prerequisite: 340.

GEOL 450 Techniques in Geophysics (3) A Bostrom Geophysics of the solid earth, outlining instruments, techniques, and interpretation. Prerequisite: senior standing in geology or permission of instructor.

GEOL 452 Principles of Sediment Transport by Turbulent Flow (3) Sp J. D. Smith Theoretical and experimental techniques used in studying erosion, transportation, and deposition of sediment. Initial motion of sediments, bed-load motion, suspension of sediment by turbulent flows, erosion and deposition of sediments, and applications of sediment transport theory to problems of geological interest. Joint with GPHYS and OCEAN 452. Prerequisite: 455.

GEOL 455 Introduction to Geomechanics (4) W J. D. Smith Basic principles of continuum mechanics, their application to flow of water, mud, magma; deformation of soil, rock, ice. Emphasis on sound physical understanding of these principles and use of elementary mathematics in their application to earth sciences problems. Joint with GPHYS 455. Prerequisites: MATH 126, PHYS 123, or equivalent.

GEOL 461 Stratigraphy (4) A Bourgeois Systematic study of stratified rocks and space-time implications. Principles of stratigraphy, including biostratigraphy, magnetostratigraphy, seismic stratigraphy, subsurface analysis. Basin analysis, evolution of sedimentary basins and continental margins. Prerequisites: 306, 321, or equivalents.

GEOL 462 Depositional Environments (4) Sp Bourgeois Principles of sedimentary facies analysis, including survey of modern processes that produce sedimentary sequences. Recognition of various depositional environments represented in the geologic record, including terrestrial, marine terrigenous, and carbonate environments. Two field trips required. Prerequisite: 306 or equivalent historical geology; recommended: 311, 321.

GEOL 472 Introduction to Geochemistry (4) A Ghiorso Thermodynamics; practical application of thermodynamic data to geologic problems. Crystal chemistry. Phase equilibria and phase diagrams. Aqueous geochemistry. Organic geochemistry. Systematics of radiometric dating. Stable isotope equilibria. Prerequisites: 320, 321, CHEM 150 or 155, or permission of instructor.

GEOL 474 Introduction to X-ray Crystallography (3) W Ghose Point groups and space groups. Reciprocal lattice. Theory of x-ray diffraction from single crystals. Powder diffraction; identification of unknowns and determination of precise cell dimensions. Single crystal camera (precession and Weissenberg) techniques; determination of cell dimensions and space groups; study of exsolution and phase transformation in rock-forming silicates. Structure factor formula and the use of three-dimensional Fourier and Patterson series in the determination of crystal structures. Prerequisites: 320, PHYS 123.

GEOL 476 Isotope Geology (3) Sp Nelson, Stuiver Methods involving the application of radioactive isotopes in age dating (radiocarbon, ionium, potassium-argon dating, etc.), and of stable isotope variations in nature in determining the temperature history of the earth and igneous rock formations. Applications of geo-

bal aspects of the hydrologic cycle, age dating in archaeology, and geochemical cycling of elements. Prerequisite: background in introductory mathematics.

GEOL 485 Principles of Economic Geology (5) A Cheney Principles of economic geology and exploration as illustrated by selected types of metallic and non-metallic ore deposits and coal. Prerequisites: 321, 340, and senior standing in geological sciences.

GEOL 488 Economic Field Geology (5) Sp Adams, Bostrom, Cheney Identification of hydrothermally altered rocks, oxidation, and supergene enrichment; principles of exploration, geochemistry and remote sensing. Four-to-eight-day trip to mining districts for field inspection of ore deposits. Two weekends (three days each) mapping mineral deposits. Prerequisites: 485 or equivalent and permission of instructor.

GEOL 490 Special Topics (2-5, max. 10) AWSpS

GEOL 498 Undergraduate Thesis (5) AWSp The thesis must be submitted at least one month before graduation. Prerequisite: permission of department.

GEOL 499 Undergraduate Research (*, max. 15) AWSp Prerequisite: permission of department.

Courses for Graduates Only

GEOL 509 Great Geological Issues (3) Sp Bourgeois History and development of geological and paleontological theories and controversies; philosophy and methodology that have driven scientific inquiry in the earth sciences. Requires a term paper analyzing primary material. Prerequisites: 409 and graduate standing in earth sciences, or in history of science, or permission of instructor.

GEOL 511 Seminar in Geomorphology and Hydrology (*) AWSp Dunne, Hallet, Porter Prerequisite: permission of instructor.

GEOL 512 Seminar in Quaternary Research (2) Porter Seminar with advanced readings and discussion stressing current problems in Quaternary research. Prerequisite: permission of instructor.

GEOL 518 Periglacial Geology (3) W Hallet Geomorphic features and fundamental processes active in areas subjected to subfreezing temperatures. Geotechnical and environmental problems characteristic of periglacial areas. Prerequisites: 311 and prior or concurrent enrollment in 455; recommended: CHEM 350.

GEOL 519 Advanced Geological Remote Sensing (4) Sp Adams Critical examination of remote sensing methods that are used to determine chemistry, mineralogy, and structure of the earth's surface and the surfaces of solar system bodies. Photographic and digital multispectral imagery, reflectance spectroscopy, thermal infrared spectroscopy, gamma ray spectroscopy, radar imagery, and other techniques. Emphasis on the application of satellite and aircraft measurements to terrestrial geologic problems. Prerequisite: 410 or equivalent. (Offered even-numbered years.)

GEOL 521 Metamorphic Minerals (5) A Evans Structures, compositions, optical properties, stability, occurrence, and paragenetic associations of rock-forming metamorphic minerals. Significance of these observations in the determination of metamorphic environments. Laboratory study using the polarizing microscope. Prerequisite: 425 or equivalent. (Offered even-numbered years.)

GEOL 522 Metamorphic Parageneses (5) A Evans Metamorphic parageneses and processes in the context of tectonic environment. Laboratory study of material from contrasting metamorphic belts. Prerequisite: 425 or equivalent. (Offered odd-numbered years.)

GEOL 523 Advanced Optical Mineralogy (4) A Universal stage, petrofabrics, advanced optical theory, feldspar determination.

GEOL 524 Petrogenesis of Igneous Rocks (3) Sp McCallum, Vance Origin of one or more of the major groups of igneous rocks. Selected petrogenetic problems in light of tectonic setting, petrography, geochemistry, and experimental studies. Prerequisite: 424 or equivalent. (Offered alternate years.)

GEOL 525 Theoretical Metamorphic Petrology (4) W Evans Theoretical treatment of metamorphic mineral assemblages and metamorphic processes. Prerequisites: 425, CHEM 456, or equivalent.

GEOL 526 Theoretical Igneous Petrology (4) A McCallum Review of thermodynamics, with emphasis on solutions. Crystal-liquid equilibria. Physical properties of silicate melts. Oxidation states of magmas. Magmatic gases. Quantitative treatment of fractionation, assimilation, and magma mixing. Trace elements and isotope ratios. Stable isotopes as tracers. Nucleation and crystal growth. Diffusion in melts. Cooling and crystallization models. Elementary fluid dynamics applied to magma flow. Prerequisites: 424, CHEM 456, or equivalents. (Offered odd-numbered years.)

GEOL 527 Phase Equilibria in Silicate Systems (4) A McCallum Phase equilibria in 1-, 2-, 3-, 4-, and multi-component systems appropriate to igneous rocks. Geometrical aspects stressed. Effect of H_2O , CO_2 , and variable oxidation states on phase equilibria. Application to the petrogenesis of common igneous rocks. Prerequisite: 424 or equivalent. (Offered even-numbered years.)

GEOL 531 Seminar in Paleontology (2-4) Advanced topics in paleontology and biostratigraphy, including paleobiology and evolution.

GEOL 533 Seminar in Vertebrate Paleontology (3, max. 9) AWSp Rensberger Advanced topics in vertebrate evolution, morphology, classification, function, ecology, and stratigraphy. Subject to be chosen by class at beginning of quarter. Prerequisite: advanced standing in paleontology, vertebrate zoology, or physical anthropology.

GEOL 548 Tectonic Evolution of Western North America (4) Sp Cowan Survey of each of the major Mesozoic and Cenozoic tectonic provinces in western North America, emphasizing structural styles, tectonic framework, and plate-tectonic setting. Provinces include: Laramide, Rocky Mountain foothills, Basin and Range, Cordilleran core complexes, San Andreas, Sierran-Klamath, Franciscan-Great Valley, Vancouver Island-San Juan Islands-North Cascades. Prerequisites: 340, 443. (Offered odd-numbered years.)

GEOL 549 Small-Scale Structures in Deformed Rocks (5) Sp Cowan Origin, geometry, tectonic significance of small-scale structures, including foliation, lineations, folding and boudinage, brittle and ductile fault zones; qualitative strain analysis and principles of structural analysis. Includes work with deformed rocks in the field. Prerequisites: 340, 423. (Offered even-numbered years.)

GEOL 550 Theoretical Structural Geology (4) Bruner Analysis of finite deformation; elastic, plastic, and viscous behavior; dislocations and crystal deformation; deformation mechanisms and flow laws for rocks; formation of folds, boudinage, and mullions; tensile fracture and the growth of joints, dikes, and veins; mechanics of faulting; large-scale crystal deformation. Prerequisites: 340, 455, or equivalents.

GEOL 556 Planetary Surfaces (3) Sp Adams Comparison of surface processes and conditions on Mercury, Venus, Earth, moon, Mars, asteroids, and satellites of the great planets. Emphasis on understanding how and why planetary surfaces differ from one another and on the implied course of solar-system evolution. Analysis of data from Earth-based telescopes and from manned and unmanned space missions. Joint with ASTR 556 and GPHYS 556. (Offered odd-numbered years.)

GEOL 557 Origin of the Solar System (3) W Brownlee Nebular and nonnebular theories of the origin of the solar system; collapse from the interstellar medium, grain growth in the solar nebula, formation of planetesimals and planets, early evolution of the planets and other possible planetary systems; examination of the physical and chemical evidence upon which the ideas concerning the origin of the solar system are based. Joint with ASTR 557 and GPHYS 557.

GEOL 560 Mechanics of Erosion and Sediment Transport (3) A J. D. Smith Physics of transportation of sediment by turbulent flows. Use of theoretical fluid mechanics to formulate and solve problems of bed-load and suspended-load transport. Joint with GPHYS and OCEAN 560. Prerequisites: 455 or MATH 329, and 452. (Offered odd-numbered years.)

GEOL 561 Seminar in Geological Fluid Mechanics (3) W J. D. Smith Reading and discussion of topics of current interest in geological fluid mechanics. Course work includes a report on a specialized topic. Joint with OCEAN 561 and GPHYS 561. Prerequisite: permission of instructor.

GEOL 562 Mechanics of Sediment-Transporting Flows (3) A J. D. Smith Mechanics of turbulent near-bottom flows responsible for erosion and transportation of sediment. How bed-load and suspended load transport modify characteristics of these flows. Joint with GPHYS and OCEAN 562. Prerequisites: 455 or MATH 329, and 452. (Offered even-numbered years.)

GEOL 564 Sedimentology of Carbonate Rocks (2-4) Bourgeois Petrographic and environmental interpretation of carbonate sediments and rocks. Hand-specimen and thin-section studies, with references to modern and ancient carbonate environments. (Offered even-numbered years.)

GEOL 565 Interpretation of Sedimentary Structures (2-4) Physical and environmental analysis of sedimentary structures, including biogenic sedimentary structures. Clastic sediments and rocks. Field trips required. Recommended: 452.

GEOL 572 Solution Geochemistry (4) W Ghiorso Solution chemistry and thermodynamics as applied to solid and liquid silicates and aqueous fluids. Modeling configurational entropies in solids, activity coefficients and complexes in aqueous solution, and modeling chemical mass transfer in geologic systems. Prerequisite: 472 or equivalent.

GEOL 573 Electron Beam Microanalysis (4) W Boudreau Materials analysis using electron beams, including electron-target interactions, wave and energy dispersive x-ray analysis, scanning electron microscopy, and applications of these and related techniques to geological problems.

GEOL 574 Advanced X-ray Crystallography (4) Sp Ghose Theory of x-ray diffraction; determination of crystal structures with special emphasis on minerals and inorganic compounds, through the application of three-dimensional Patterson function, Fourier series, and direct methods; structure refinement; determination of cation distribution, exsolution, and antiphase domain structure through x-ray diffraction. Prerequisite: 474 or permission of instructor.

GEOL 575 Physics and Chemistry of the Mantle (3) A Brown, Irving Constitution and large-scale chemical, physical evolution of mantle. High-pressure phase transitions; lateral and vertical heterogeneities from seismological observations; influence of fluids on rheology and melting; metasomatism, other mass transport processes; trace element/isotopic characteristics of mantle samples and mantle-derived magmas. Joint with GPHYS 575.

GEOL 576 Geochronometry (4) A Nelson, Stuiver Principles, methods, and applications of dating rocks and organic materials.

GEOL 582 Seminar in Sedimentology (2-4) Sp Bourgeois Selected problems of current interest; extended field trips to classic sedimentologic localities.

GEOL 586 Economic Geology of Sedimentary Rocks (5) W Cheney Description and origin of metallic and nonmetallic ore deposits indigenous to regoliths, sediments, and sedimentary rocks. Prerequisite: 485 or equivalent or permission of instructor. (Offered even-numbered years.)

GEOL 587 Economic Geology of Igneous and Metamorphic Rocks (5) W Cheney Description and origin of metallic and nonmetallic ore deposits formed in igneous and metamorphic rocks or by igneous and metamorphic processes. Prerequisite: 485 or equivalent or permission of instructor. (Offered odd-numbered years.)

GEOL 590 Special Topics (2-5, max. 10) AWSpS

GEOL 600 Independent Study or Research (*) AWSpS

GEOL 700 Master's Thesis (*) AWSpS

GEOL 800 Doctoral Dissertation (*) AWSpS

Geophysics

202 Atmospheric Sciences-Geophysics

Geophysics is an interdisciplinary physical science concerned with the nature of the earth and its environment. It seeks to apply the techniques of physics, mathematics, and chemistry to the structure and dynamic behavior of the earth and other planets. Included in this interdisciplinary area are a large number of complex and interrelated natural processes ranging from convection in the mantle to electron precipitation in the magnetosphere, with a wide variety of possibilities in between. An undergraduate degree is not offered.

Graduate Program

The Geophysics Program offers graduate study leading to the Master of Science and Doctor of Philosophy degrees. These degrees, like the field that they encompass, cover a broad range of topics in which the analytic techniques of physics and mathematics are brought to bear on problems of the earth and its environment. Major areas of interest are the internal and surface structures of planets, dynamical processes within the earth, oceans, and atmosphere, and the associated environmental applications of these processes.

The required curriculum is flexible so as to permit pursuit of the wide variety of scientific disciplines that may be necessary for approaching a specific geophysical problem. However, a core curriculum of basic physics and mathematics and a sequence of courses dealing with some of the important problems encountered in space, the atmosphere, the oceans, and the solid earth are required. Additional specialized course work necessary before embarking on a thesis project is handled on an individual basis by the student and a faculty committee.

Special Requirements

A written qualifying examination is given once each year in the late summer. Normally, students take this examination at the end of their first year. A grade of pass with distinction is required if the student is to continue study for a Ph.D. degree.

Financial Aid

Most financial aid is provided through graduate research assistantships that enable students to work with individual faculty members on important research projects. However, two teaching assistantships also are awarded each year.

Research Facilities

Research facilities include a high-pressure/temperature laboratory, including diamond anvil cells for studying rock and mineral properties; a permanent statewide seismic network; a portable telemetered seismic network for studying volcanoes and active faults in western North America; a cold laboratory for studying problems in snow-cover geophysics, glaciology, and sea-ice research; a geophysical fluids laboratory; and a laboratory for studying electrodynamics in the ionosphere and space. Computer facilities include a Pyramid 90X as a main computer in a local area network linking various laboratory workstations and peripheral devices via Ethernet. This local net is connected to a campuswide fiber-optic ring that provides access to other campus computers and national networks. Many of the geophysics faculty members also have laboratories or access to laboratories in other departments, thus making possible a wide diversity of research opportunities. This is particularly valuable in such fields as aeronomy, tropospheric aerosols, radioactive age dating, and geophysical fluid mechanics. In addition to laboratory work, field programs are carried out at a number of remote sites, particularly in the Washington Cascades and Olympics. In marine geophysics, joint geophysics/oceanography projects provide opportunities for studying the earth's structure and tectonic processes on the sea floor. Facilities for heat-flow determination, reflection profiling, long-range seismic refraction, and magnetic and paleomagnetic measurements are available.

Correspondence and Information

Chairperson, Geophysics Program
202 Atmospheric Sciences-Geophysics, AK-50

Faculty

Chairperson

Ronald T. Merrill

Professors

Baker, Marcia B.,* 1971, (Atmospheric Sciences),† M.S., 1960, Stanford; Ph.D., 1971, Washington; atmospheric geophysics.

Booker, John R.,* 1971, (Atmospheric Sciences), M.S., 1965, Ph.D., 1968, California (San Diego); geomagnetism, fluid mechanics, inverse theory.

Bostrom, Robert C.,* 1964, (Geological Sciences),† M.A., 1952, Ph.D., 1961, Oxford (England); geotectonics.

Businger, Joost A.,* 1958, (Emeritus), (Atmospheric Sciences),† M.S., 1950, Ph.D., 1954, Utrecht; energy transfer, air-sea interface.

Charlson, Robert J.,* 1965, (Chemistry), (Atmospheric Sciences, Environmental Studies),† M.S., 1959, Stanford; Ph.D., 1964, Washington; air chemistry.

Clark, Kenneth C.,* 1948, (Physics),† A.M., 1941, Ph.D., 1947, Harvard; spectroscopy of upper atmosphere.

Criminale, William O., Jr.,* 1968, (Applied Mathematics, Oceanography),† Ph.D., 1960, Johns Hopkins; geophysical fluid dynamics.

Crosson, Robert S.,* 1966, (Geological Sciences), M.S., 1963, Utah; Ph.D., 1966, Stanford; seismology.

Ghose, Subrata,* 1972, ‡(Geological Sciences, Materials Science and Engineering), M.S., Ph.D., 1959, Chicago; X-ray crystallography, mineralogy, applications of solid-state physics techniques to mineralogy.

Gregg, Michael C.,* 1974, (Research), ‡(Oceanography), Ph.D., 1971, California (San Diego); physical oceanography, ocean microstructure.

Hobbs, Peter V.,* 1963, ‡(Atmospheric Sciences), Ph.D., 1963, London; cloud precipitation physics, atmospheric chemistry, air pollution.

LaChapelle, Edward R.,* 1968, (Emeritus), (Atmospheric Sciences),† D.Sc. (Hon.), 1957, Puget Sound; snow-cover geophysics.

Leovy, Conway B.,* 1968, (Astronomy), (Atmospheric Sciences, Environmental Studies),† Ph.D., 1963, Massachusetts Institute of Technology; planetary atmospheres.

Lewis, Brian T. R.,* 1970, (Oceanography),† Ph.D., 1970, Wisconsin; marine geophysics.

Lister, Clive R. B.,* 1965, ‡(Oceanography), Ph.D., 1963, Sc.D., 1984, Cambridge (England); marine geophysics, cooling processes in the earth's outer layers, geodynamics.

Malone, Stephen D.,* 1972, (Research), Ph.D., 1972, Nevada; seismicity of Cascade volcanoes, computer applications in seismic network analysis.

Merrill, Ronald T.,* 1967, (Oceanography), (Geological Sciences),† M.S., 1961, Michigan; Ph.D., 1967, California (Berkeley); geomagnetism and paleomagnetism.

Parks, George K.,* 1971, (Atmospheric Sciences, Physics), Ph.D., 1966, California (Berkeley); magnetospheric and space plasma physics.

Raymond, Charles F.,* 1969, (Geological Sciences, Quaternary Research Center), Ph.D., 1969, California Institute of Technology; glaciology.

Smith, J. Dungan,* 1967, (Geological Sciences, Oceanography),† M.S., 1963, Brown; Ph.D., 1968, Chicago; geophysical fluid dynamics, sediment transport mechanics.

Smith, Stewart W.,* 1970, (Geological Sciences), M.S., 1958, Ph.D., 1961, California Institute of Technology; earthquake seismology.

Untersteiner, Norbert,* 1962, (Atmospheric Sciences),† Ph.D., 1950, Innsbruck; Dozent, 1961, Vienna; glaciology, arctic sea ice.

Associate Professors

Brown, J. Michael,* 1984, (Geological Sciences), M.S., 1978, Washington; Ph.D., 1980, Minnesota; experimental and theoretical mineral physics.

Harrison, Halstead,* 1971, ‡(Atmospheric Sciences, Civil Engineering, Environmental Studies), Ph.D., 1960, Stanford; atmospheric chemistry.

Holzworth, Robert H. II,* 1982, (Physics), M.A., 1974, Ph.D., 1977, California (Berkeley); space physics and electrical fields.

Warren, Stephen G.,* 1982, (Quaternary Research Center), (Atmospheric Sciences),† A.M., 1968, Ph.D., 1973, Harvard; radiation and climate, glaciology.

Assistant Professors

Creager, Kenneth C.,* 1986, Ph.D., 1984, California (San Diego); global seismology and geophysical inverse theory.

Schultz, Adam,* 1985, (Research), ‡(Oceanography), Ph.D., 1985, Washington; marine electrical conductivity, magnetotellurics, computer systems.

Senior Research Associates

Maykut, Gary A.,* 1969, (Atmospheric Sciences),† Ph.D., 1969, Washington; sea-air interaction, sea ice, climate.

Qamar, Anthony,* 1984, M.A., 1968, Ph.D., 1971, California (Berkeley); earthquake seismology and internal structure of the earth.

Sorensen, Yosiko S.,* 1983, M.S., 1970, Ph.D., 1973, Tokyo (Japan); experimental high-pressure geophysics.

Research Associates

Jay, David A., 1987, Ph.D., 1987, Washington; estuarine physics.

Waddington, Edwin D.,* 1984, M.Sc., 1973, Alberta; Ph.D., 1981, British Columbia; glacier and ice sheeting modeling.

Course Descriptions

GPYS 401 Geophysical Continuum Mechanics (3) A Analysis of stress. Finite and infinitesimal strain. Measurement and interpretation of strain in geological materials. Elasticity applied to determine stress in the earth's crust. Creep of solids and flow of geological materials. Prerequisite: MATH 238 or equivalent.

GPYS 402 Seismology (3) W Introduction to theoretical and observational seismology. Basic theory of elastic plane wave propagation through homogeneous and stratified media. Surface waves and eigenvibrations. Ray theory. Structure of the earth's mantle and core. Seismicity distributions, earthquake focal mechanisms and their relationship to tectonics. Prerequisite: 401 or permission of instructor.

GPYS 403 Geophysics: The Earth (3) Sp The earth and its interior; gravity, magnetism, heat flow, seismology. Earth's outer structure, studied through the unifying concepts of plate tectonic theory. Quantitative approaches to problems, using techniques of classical physics. Prerequisites: 402 and PHYS 322 or permission of instructor.

GPYS 404 Geophysics: The Ocean (3) A Introduction to geophysical fluid dynamics. An overview of fluids in geophysics with emphasis on the oceans. A nonrigorous development of the equations of motion with examples drawn from dynamical oceanography. Prerequisites: MATH 238 or equivalent and PHYS 323, or permission of instructor.

GPYS 406 Geophysics: The Atmosphere (3) Sp Phenomena of the lower atmosphere: some simple applications of the principles of classical thermodynamics and fluid dynamics to the atmospheric hydrological cycle, global energy balance, and atmospheric dynamics. Joint with ATM S 406. Prerequisite: 404 or permission of instructor.

GPYS 407 Geophysics: Space (3) W Survey of various phenomena occurring in the outer regions of the earth's atmosphere, the ionosphere, the magnetosphere, and the Van Allen radiation belts. Behavior of charged particles in the geomagnetic field and simple concepts of plasma and magnetohydrodynamic waves. Prerequisite: PHYS 323 or equivalent.

GPYS 415 Principles of Glaciology (4) A Hallet, Maykut, Porter, Raymond, Stuiver, Warren Snow deposition and metamorphism, avalanches, heat and mass balance at snow and ice surfaces, glacier flow and erosion, ice sheets, sea ice, frozen ground, methods of paleoclimate reconstruction, Ice Age theories. Joint with GEOL 415. Prerequisite: permission of instructor.

GPYS 431 Seismology and Earthquake Engineering (3) A Evans, S. Smith Overview of earthquake processes and details of the characteristics of destructive ground motion; effects of such motion on engineering structures; current practice in estimating earthquake hazards for important structures such as nuclear power plants. Joint with CISM 431. Prerequisite: MATH 238 or permission of instructor.

GPYS 432 Applied Seismology Laboratory (2) W Interpretation methods in seismology. Seismogram interpretation, including body and surface waves. Seismic instrumentation. Earthquake location, magnitude, and fault-plane solutions. Seismic reflection and refraction methods. Measurement and interpretation of strong ground motion near the epicenter of large earthquakes. Prerequisite: concurrent registration in 402, or permission of instructor.

GPYS 435 Seismic Exploration (4) Sp Brown Introduction to theory and practice of seismic exploration. Application of refraction and reflection techniques to problems in engineering geology and mineral exploration. Constraints in the interpretation of subsurface structure. Joint with GEOL 435. Prerequisites: MATH 126, PHYS 123, GEOL 340.

GPHYS 452 Principles of Sediment Transport by Turbulent Flow (3) Sp J. D. Smith Theoretical and experimental techniques in studying erosion, transportation, and deposition of sediment. Initial motion of sediments, bed-load motion, suspension of sediment by turbulent flows, erosion and deposition of sediments, applications of sediment transport theory to problems of geological interest. Joint with GEOL 452 and OCEAN 452. Prerequisite: 455

GPHYS 455 Introduction to Geomechanics (4) W J. D. Smith Basic principles of continuum mechanics, their application to flow of water, mud, magma; deformation of soil, rock, ice. Emphasis on sound physical understanding of these principles and use of elementary mathematics in their application to earth sciences problems. Joint with GEOL 455. Prerequisites: MATH 126, PHYS 123 or equivalent.

GPHYS 480 Special Topics in Geophysics (2-6, max. 12) AWSp Intensive treatment of a selected geophysical topic presented through faculty lectures, guest lectures, and student reports. For students in geophysics and related fields. Subject varies from year to year. Prerequisites: one year each of physics and calculus, and permission of instructor.

GPHYS 499 Independent Study for Undergraduates (1-5, max. 10) AWSp Prerequisite: permission of instructor.

Courses for Graduates Only

GPHYS 501 Earth Potential Fields (3) A Lister Basic potential theory, with emphasis on qualitative understanding of theorems. Application to gravity and geoid anomalies, mention of comparable results in magnetism where appropriate. Extension of potential theory to thermal problems, with examples drawn from measurement of the earth's heat flow. Prerequisite: 403 or equivalent.

GPHYS 502 Geophysics of Solids (3) W Brown, Merrill Applications of solid-state physics to various geophysical problems. Topics vary, but usually include the thermal properties of relevant geophysical materials, the equation of state for the earth's mantle and core, defects in solids and their roles in tectonophysics. Prerequisite: permission of instructor. (Offered odd-numbered years.)

GPHYS 504 Geophysical Data Collection and Analysis (3) A Crosson Theory and practical application of data collection and analysis applied to geophysical problems. Digital processing of signals; filtering and spectral analysis. Laboratory sessions include problem solving on computer-based processing system.

GPHYS 505 Geophysical Inverse Theory (3) Sp Booker Introduction to the mathematical techniques for estimating properties of physical systems, such as the earth or atmosphere, from data that is insufficient for a precise specification of the system. Emphasis is on the concept of the resolving power of data sets. The ideas developed are quite general and have a wide range of applicability in the field of data interpretation. Prerequisites: 504 and permission of instructor. (Offered odd-numbered years.)

GPHYS 506 Physics of Marine Geologic Processes (5) W Lewis Thermomechanics of hot material upwelling at spreading centers and formation of characteristic physical structures; lithosphere thickening with age and related geophysical observables; mechanics of subduction zones; fate of sinking slabs and deep mantle recycling; geometry of plate tectonics on a sphere; causes of vertical motions at the earth's surface. Joint with OCEAN 506. Prerequisite: permission of instructor.

GPHYS 508 Geochemical Cycles (4) Sp Descriptive and quantitative aspects of the earth as a biogeochemical system. Fundamental methods for study of equilibria, transport processes, chemical kinetics and

biological processes and their application to the carbon, sulfur, nitrogen, phosphorus, and other elemental cycles. Stability of biogeochemical systems and the nature of human perturbations of their dynamics. Joint with ENV S 508. Prerequisites: CHEM 150, 350, MATH 238.

GPHYS 510 Physics of Ice (3) W Raymond Structure of the water molecule. Crystallographic structures of ice. Electrical, optical, thermal, and mechanical properties of ice. Growth of ice from the vapor and liquid phases. Physical properties of snow. Joint with ATM S 510. Prerequisite: permission of instructor. (Offered odd-numbered years.)

GPHYS 511 Formation of Snow and Ice Masses (3) A Warren Snow climatology. Transport of snow by wind. Transfer of radiative, sensible, and latent heat at the surface of snow and ice. Freezing of natural water bodies. Heat and mass budget of ice masses. Remote sensing of snow and ice. Theories of ice ages. Joint with ATM S 511. Prerequisite: permission of instructor. (Offered even-numbered years.)

GPHYS 512 Dynamics of Snow and Ice Masses (3) Sp Raymond Rheology of snow and ice. Sliding and processes at glacier beds. Thermal regime and motion of seasonal snow, glaciers, and ice sheets. Avalanches and glacier surges. Deformation and drift of sea ice. Response of natural ice masses to change in climate. Joint with ATM S 512. Prerequisite: permission of instructor. (Offered odd-numbered years.)

GPHYS 513 Structural Glaciology (3) W Raymond Physical and chemical processes of snow stratigraphy and metamorphism. Interpretation of ice sheet stratigraphy in terms of paleoenvironment. Dynamic metamorphism from ice flow. Structures formed at freezing interfaces. Structure of river, lake, and sea ice. Relationship between structures and bulk physical properties. Joint with ATM S 513. Prerequisite: permission of instructor. (Offered even-numbered years.)

GPHYS 514 Ice and Climate Modeling (3) A Warren Principles of global climate modeling. Modeling seasonal cycles of snow cover and sea ice. Ice-sheet mass balance and flow. Solar radiation anomalies due to changes in earth's orbit. Climate/ice-sheet models of Pleistocene ice ages. Joint with ATM S 514. Prerequisite: permission of instructor. (Offered odd-numbered years.)

GPHYS 520 Seminar (1-2) AWSp Review of current literature in geophysics and graduate student research with faculty participation.

GPHYS 532 Atmospheric Electrical Dynamics (3) A Holzworth Global and local dynamical electric field models, including upper atmospheric and tropospheric sources as modified by propagation delays, orographic features, and transient phenomena. Radiation and plasma waves along with microphysics of corona discharge and charge separation mechanisms. Prerequisites: 406 and 407, or permission of instructor.

GPHYS 537 Magnetosphere I (3) Sp Parks Formation by interaction of solar wind with geomagnetic field. Trapped particles. Electromagnetic waves in anisotropic plasma. Dynamic disturbances and plasma instabilities. Prerequisite: 407 or permission of instructor.

GPHYS 538 Magnetosphere II (3) A Parks Plasma waves. Propagation of very-low-frequency and hydromagnetic waves in the magnetosphere. Interactions between plasma waves and particles. Prerequisite: 537.

GPHYS 541, 542 Theoretical Seismology I, II (3,3) Sp, A Creager, Crosson Advanced theoretical seismology. Attenuation and physical dispersion. Waves in anisotropic media. Moment-tensor source representation. Lamb's problem. Waves in stratified media: propagator methods, asymptotic ray theory, WKBJ seismograms. Inverse methods and analysis of

seismological data. Prerequisites: 401, 402, and PHYS 424, or permission of instructor for 541; 541 for 542. (Offered even-numbered years.)

GPHYS 545 Thermomechanics and Mechanisms in Hydrothermal Systems (3) A Lister Thermal balance of hot material injected at a plate divergence; heat transport capability of fluid convection through cracks compared to thermal conduction; theory of hydrothermal penetration into hot rock by thermal contraction cracking; development history of a hydrothermal system; effects of rock/water chemical interaction and mineral deposition; mineral stills. Joint with OCEAN 545. Prerequisite: permission of instructor. (Offered odd-numbered years.)

GPHYS 555 Planetary Atmospheres (3) A Leovy, Warren Problems of origin, evolution, and structure of planetary atmospheres, emphasizing elements common to all planetary atmospheres; roles of radiation, chemistry, and dynamical processes; new results on the atmospheres of Venus, Mars, Jupiter, and other solar-system objects in the context of comparative planetology. Joint with ASTR 555 and ATM S 555. (Offered even-numbered years.)

GPHYS 556 Planetary Surfaces (3) Sp Adams Comparison of surface processes and conditions on Mercury, Venus, Earth, moon, Mars, asteroids, and satellites of the great planets. Emphasis on understanding how and why planetary surfaces differ from one another and the implied course of solar-system evolution. Analysis of data from earth-based telescopes and manned and unmanned space missions. Joint with ASTR 556 and GEOL 556. (Offered odd-numbered years.)

GPHYS 557 Origin of the Solar System (3) W Brownlee Nebular and nonnebular theories of solar system origin; collapse from the interstellar medium, grain growth in the solar nebula, formation of planetesimals and planets, early evolution of the planets and other possible planetary systems; the physical and chemical evidence upon which the ideas concerning the origin of the solar system are based. Joint with ASTR 557 and GEOL 557.

GPHYS 560 Mechanics of Erosion and Sediment Transport (3) A J. D. Smith Physics of transportation of sediment by turbulent flows. Use of theoretical fluid mechanics to formulate and solve problems of bed-load and suspended load transport. Joint with GEOL 560 and OCEAN 560. Prerequisites: 455 or MATH 329, and 452. (Offered odd-numbered years.)

GPHYS 561 Seminar in Geological Fluid Mechanics (3) W J. D. Smith Reading and discussion of topics of current interest in geological fluid mechanics. Course work includes a report on a specialized topic. Joint with GEOL 561 and OCEAN 561. Prerequisite: permission of instructor.

GPHYS 562 Mechanics of Sediment Transporting Flows (3) A J. D. Smith Mechanics of turbulent near-bottom flows responsible for erosion and transportation of sediment; how bed-load and suspended-load transport modify characteristics of these flows. Joint with GEOL 562 and OCEAN 562. Prerequisites: 455 or MATH 329, and 452. (Offered even-numbered years.)

GPHYS 570 Petroleum Exploration (3) W Bos-trom The search for sediment basins and reservoirs. Financial and political considerations. Prerequisite: permission of instructor.

GPHYS 571 Gravity and Geomagnetic Interpretation (3) A Lewis Power of the numerical Fourier transform to compute potential fields; gravity and magnetic fields of source bodies of arbitrary shape; application of the techniques to a real problem on the computer. Joint with OCEAN 571. Prerequisites: MATH 328, PHYS 323, or equivalent or permission of instructor.

GPHYS 572 Geodynamics (3) A Lister Driving forces of plate tectonics and of other large-scale motions. Critical review of measured data, energy balances, and the basic properties of low Reynolds number flow. Emphasis on the qualitative physics of the processes and on order-of-magnitude calculations, rather than on complex mathematic theory. Critiques of some hypotheses. Joint with OCEAN 572. (Offered even-numbered years.)

GPHYS 573 Terrestrial Magnetism (3) W Merrill Advanced aspects of earth magnetism intended for specialists in this field. Extensive discussion of origin theories and their implications; physical basis and theories of magnetism in rocks; paleomagnetic techniques and results. Joint with OCEAN 573. Prerequisite: permission of instructor. (Offered even-numbered years.)

GPHYS 575 Physics and Chemistry of the Mantle (3) A Brown, Irving Constitution and large-scale chemical, physical evolution of mantle. High-pressure phase transitions; lateral and vertical heterogeneities from seismological observations; influence of fluids on rheology and melting; metasomatism and other mass transport processes; trace element/isotopic characteristics of mantle samples and mantle-derived magmas. Joint with GEOL 575. (Offered odd-numbered years.)

GPHYS 580 Special Topics in Geophysics (2-6, max. 12) AWSp Intensive treatment of a selected topic in geophysics presented by lectures or seminars for students in geophysics and related special fields. Subject is selected from all areas in geophysics and varies from year to year. Prerequisite: permission of instructor.

GPHYS 600 Independent Study or Research (*) AWSp

GPHYS 700 Master's Thesis (*) AWSp

GPHYS 800 Doctoral Dissertation (*)

Germanics

340 Denny

The Department of Germanics is concerned with the German language, literature, and civilization, with emphasis on present-day Germany, its history, literature, and philosophy and their role in Western civilization, and with linguistic analysis, especially historic, of the Germanic languages. The department offers in English some courses on well-known authors and topics, designed especially for the nonmajor.

Undergraduate Program

Charles Barrack, Adviser
347 Denny

Bachelor of Arts Degree

Major Requirements: German language and literature—52 credits (1) 38 to 40 credits in core courses: GERM 301, 302, 303, 310, 311, 312; two from 401, 402, 403; one from 413, 414; three from 410, 411, 412, 415, 490, 495. (2) 12 to 14 credits of electives in upper-division German courses. *German area studies*—25 credits of lower-division college-level German or equivalent; 25 credits of upper-division German courses, including courses offered in English; 20 credits chosen from one of five interdepartmental areas of specialization; senior thesis. A grade of at least 2.0 must be earned in every upper-division German course; a 2.50 grade-point average must be maintained in these courses.

Graduate Program

Joseph B. Voyles, Graduate Program Coordinator

The Department of Germanics offers a closely integrated program leading to the Master of Arts and to the Doctor of Philosophy degrees. The doctoral curriculum serves the needs of the future professors at universities and colleges, stressing scholarship and research. The master's curriculum requires a minimum of 36 credits, a final comprehensive examination, and a master's thesis or two papers. The study period of the doctoral program is two years (minimum number of post-master's credits is 54). The completion of the necessary course work is followed by general written and oral examinations. A third doctoral year is reserved for the writing of the dissertation.

The M.A. program demands concentration on German literature, civilization, and philosophical traditions, with supplementary course work in at least one of the following three areas: philology and linguistics; methodology and pedagogy; related courses outside the Department of Germanics.

The curriculum for the Ph.D. program during the final two years of graduate study (minimum of 54 credits) allows the choice of one of two areas of concentration: either (1) "Literature and Civilization" and "German Philosophical Traditions," or (2) "Philology and Linguistics" and "Literature and Civilization"—plus supplementary course work in other areas (philology and linguistics; German philosophical traditions; methodology and pedagogy; related courses outside the Department of Germanics). The doctoral dissertation must be an original contribution to scholarship and must demonstrate mastery of the pertinent methods of investigation.

Special Requirements

Aspirants for advanced degrees in German must have the equivalent of an undergraduate major in German. A reading knowledge of one foreign language (usually German) is a prerequisite for the M.A. degree. Reading knowledge of a second language is required before the student is admitted to the Ph.D. General Examination. The languages chosen are subject to approval by the department.

Financial Aid

A limited number of teaching assistantships are available. The teaching load consists of a five-hour course on the first- or second-year level. The teaching assistants are supervised by experienced staff members.

Correspondence and Information

Graduate Program Coordinator
340C Denny, DH-30

Faculty

Chairperson
Diana I. Behler

Professors

Behler, Diana I.,* 1969, (Comparative Literature),† M.A., 1966, Ph.D., 1970, Washington; romanticism, nineteenth century, comparative literature.

Behler, Ernst H.,* 1966, (Comparative Literature),† Ph.D., 1951, Munich (Germany); history of ideas and comparative literature.

Hertling, Gunter H.,* 1961, M.A., 1957, Ph.D., 1963, California (Berkeley); eighteenth- and nineteenth-century literature.

Hruby, Antonin,* 1961, (Emeritus), (Comparative Literature),† Ph.D., 1946, Prague; medieval literature.

Jaeger, C. Stephen,* 1985, (Comparative Literature), M.A., 1965, Ph.D., 1970, California (Berkeley); medieval literature.

Rey, William H., 1950, (Emeritus), Ph.D., 1937, Frankfurt; nineteenth- and twentieth-century German literature.

Voyles, Joseph B.,* 1965, (Linguistics), M.A., 1962, Ph.D., 1965, Indiana; Germanics and linguistics.

Associate Professors

Ammerlahn, Hellmut H.,* 1963, (Comparative Literature),† M.A., 1960, Vermont; Ph.D., 1965, Texas; classicism and comparative literature.

Barrack, Charles M.,* 1968, M.A., 1966, Ph.D., 1969, Washington; Germanic linguistics.

Buck, George C.,* 1950, M.A., 1948, Ph.D., 1954, Yale; eighteenth-century and modern German literature.

McLean, Sammy K.,* 1967, (Comparative Literature),† M.A., 1957, Ph.D., 1963, Michigan; twentieth-century (poetry, Bertolt Brecht, Franz Kafka) and comparative literature.

Meyer, Herman C., 1934, (Emeritus), Ph.D., 1936, Chicago; Germanics.

Peck, Jeffrey M.,* 1979, (Comparative Literature),† M.A., 1974, Chicago; Ph.D., 1979, California (Berkeley); nineteenth- and twentieth-century German literature, literary theory, comparative literature.

Rabura, Horst M.,* 1963, M.A., 1966, Washington; German language and methodology.

Rieckmann, Jens,* 1981, Staatsexamen, 1971, Göttingen (West Germany); Ph.D., 1975, Harvard; twentieth-century German literature (fiction, turn of the century, Thomas Mann).

Sauerlander, Annemarie M., 1947, (Emeritus), M.A., 1930, Buffalo; Ph.D., 1936, Cornell; Germanics.

Wilkie, Richard F., 1937, (Emeritus), M.A., 1936, Washington; Ph.D., 1953, California (Berkeley); Germanics.

Assistant Professors

Collin, Amy D., 1982, M.A., 1980, Ph.D., 1982, Yale; twentieth-century German literature, poetry, comparative literature.

Taubeneck, Steven A., 1987, M.A., 1983, Ph.D., 1987, Virginia (Charlottesville); twentieth-century German literature, literary theory, comparative literature.

Course Descriptions

Lists of names under various literature courses indicate the kind of material covered but are neither comprehensive nor exclusive of other significant figures. Detailed descriptions of courses are published by the Department of Germanics prior to registration each quarter.

Courses for Undergraduates

GERM 101, 102, 103 First-Year German (5,5,5) AWS, AWSps, AWSps The methods and objectives are primarily audiolingual, with emphasis on speaking and listening. Secondary objectives are reading and writing. (See credit note following 115.)

GERM 104 Individualized First-Year German (1-15) AWSps Individualized approach to elementary German instruction. Students progress at their own pace. Credits vary. Depending upon amount of material mastered, any number of credits up to 15 may be earned per quarter. Students must register initially for 5 credits and must pay for 5 credits regardless of number of credits earned. (See credit note following 115.)

GERM 115 Intensive First-Year German (15) S Barrack, Rabura Accelerated first-year German. Speaking and listening. Secondary objectives are reading and writing.

Students may receive credit for only one course in each of the following: 101 and the first 5 credits of 104; 102 and the second 5 credits of 104; 103 and the last 5 credits of 104. They may, however, receive credit for courses in different first-year sequences if the courses are taken in progressively more advanced order (e.g., the first 5 credits of 104 followed by 102 and 103). 115 is the equivalent of 101, 102, 103, or 15 credits of 104.

GERM 121, 122 First-Year Reading German (5,5) AS,WS Special beginning course devoted exclusively to the reading objective; 122 continuation of 121.

GERM 150 Conversational German Through Films (2, max. 6) AWSp Conversational practice in small groups based on films. Because series progresses through the year, beginners may enroll only Autumn Quarter. May be taken concurrently with other Germanics courses. No credit if 250 has been taken.

GERM 201 Basic Second-Year German (5) AWSpS Readings and oral practice in German, plus grammar review. The student may not receive credit for both 201 and 211. Prerequisite: 103 or equivalent.

GERM 202 Intermediate Second-Year German (5) AWSpS Continuation of 201. The student may not receive credit for both 202 and 212. Prerequisite: 201 or equivalent.

GERM 203 Readings in German Literature (3) AWSp Introduction to classics of German literature. Majors and minors take concurrently with 207. Prerequisite: 202 or equivalent.

GERM 205 Literature and Conversation (5) Introduction to German literature and discussion of literary and general topics to develop oral fluency. Equivalent to 203 and 207. Prerequisite: 202 or equivalent.

GERM 207 Advanced Second-Year Conversation (2) AWSp Discussion of general topics in order to develop oral fluency. Prerequisite: 202 or equivalent.

GERM 230 Conversational German (5) S Intensive conversational German. Prerequisite: 103 or equivalent.

GERM 250 Advanced Conversational German Through Films (2, max. 6) AWSp Conversational practice in small groups based on films. May be taken concurrently with other Germanics courses.

GERM 299 Supervised Study (1-5, max. 10) AWSpS Prerequisite: permission of department adviser.

GERM 300 Studies in Germanics (3 or 5) Topics or figures of German literature or language. German texts. Prerequisite: 15 credits in second-year German or equivalent.

GERM 301, 302, 303 Conversation and Writing Skills (3,3,3) AW,WSp,Sp Language skill development (speaking, writing) using materials selected to broaden understanding of German-speaking countries. Prerequisite: 15 credits in second-year German or equivalent.

GERM 307 Third-Year Composition (5) S For participants in special summer programs only.

GERM 310 Critical Approaches to German Literature (3) A Introduction to literary terminology. Diverse interpretive strategies, ranging from close reading to biographical and sociological approaches. Characteristics of different genres (poetry, prose, drama). Readings primarily from twentieth-century literature. Prerequisite: second-year German or equivalent or permission of instructor.

GERM 311 Themes in German Literature (3) W Exploration of major themes (e.g., the family, revolution, the Faust theme) through selected readings in the main genres (prose, drama, poetry). Emphasis on eighteenth and nineteenth centuries. Prerequisite: second-year German or equivalent or permission of instructor.

GERM 312 Major Figures of German Literature (3) Sp Focus on major figure such as Goethe, Schiller, Kleist, Fontane, Thomas Mann, Kafka. Emphasis on his/her cultural and sociopolitical contexts. Literary and nonliterary texts, including film, art, political, historical, and philosophical texts. Prerequisite: second-year German or equivalent or permission of instructor.

GERM 330 Conversational German (5) S For participants in special summer programs only.

GERM 393 Proctoring of First-Year German Film Course (1-2, max. 6) AWSp Restricted to upper-division students of German who have demonstrated sufficient proficiency in speaking German to lead discussion groups of participants in 150. Discussion group leaders (proctors) may participate in this program one or two hours per week and receive 1 credit for each hour in class. 6 credits may be earned by proctors for participating in three quarters of 150, which runs the entire year under a different format each quarter.

GERM 394 Proctoring of Second-Year German Film Course (1-2, max. 6) AWSp Restricted to upper-division students of German who have demonstrated sufficient proficiency in speaking German to lead discussion groups of participants in 250. Discussion group leaders (proctors) may participate in this program one or two hours per week and receive 1 credit for each hour in class. 6 credits may be earned by proctors for participating in three quarters of 250, which runs the entire year under a different format each quarter.

GERM 401, 402 Advanced Writing and Conversation (3,3) A,W Texts and exercises, both grammatical and stylistic, to develop vocabulary, stylistic awareness, and the practical application of grammatical rules in written German. Prerequisites: 301, 302, and 303, or permission of instructor.

GERM 403 Advanced Writing and Conversation (3) Sp Texts and exercises, both grammatical and stylistic, to increase ability to write critically and independently. Subtle points of German grammar and style. Prerequisite: 401 or 402 or permission of instructor.

GERM 404 History of the German Language (3) From early Germanic to the present. Prerequisite: third-year German or permission of instructor.

GERM 405 Linguistic Analysis of German (3) Prerequisite: third-year German or permission of instructor.

GERM 407 Advanced Composition (5, max. 10) S For participants in special summer programs only. Not open for credit to those who have had 401, 402, 403.

GERM 410, 411, 412 Survey of Modern German Literature and Culture (3,3,3) A,W,Sp 410: German romanticism—literature from 1800 to 1830 with esthetic and historical consideration of works by Novalis, Brentano, Eichendorff, Heine, Kleist, Büchner, E. T. A. Hoffmann, Grillparzer, and others. 411: Nineteenth-century realism—literature from 1830 to 1890, with esthetic and historical consideration of works by Keller, Hebbel, Meyer, Stifter, Fontane, and others. 412: The twentieth century—literature from 1890 to 1945, with esthetic and historical consideration of works by Hauptmann, Kaiser, Brecht, Kafka, Mann, Rilke, Trakl, Stadler, Stramm, van Hoddiss, and others. Prerequisite: for either 410, 411, or 412, 15 credits in third-year German or permission of instructor.

GERM 413, 414, 415 Survey of Older German Literature and Culture (5,5,5) A,W,Sp 413: Medieval literature—German literature from 750 to 1400, with esthetic and historical consideration of works from the Carolingian and Clunian Periods, the Court Epic, the Heroic Epic, the Spielmannsepik, the Minnesang, the poetry of the epigones who followed the Age of High Chivalry, and the German Mystics. 414: Literature of the sixteenth, seventeenth, and early eighteenth

Centuries—esthetic and historical consideration of authors and works such as the *Ackermann aus Böhmen*, Erasmus, Luther, Hans Sachs, the *Historia von Dr. Faustus*, Baroque poetry and the literature of the early Enlightenment. 415: Literature of the eighteenth century—esthetic and historical consideration of works by Lessing, Schiller, and Goethe, with attention to the historical background and development of German classicism. Prerequisite: for either 413, 414, or 415, 15 credits in third-year German, or permission of instructor.

GERM 430 Advanced Conversational German (5, max. 10) S For participants in special summer programs only. Not open for credit to those who have had 401, 402, 403.

GERM 473 Teaching of College-Level German (1, max. 9) AWSp For teaching assistants only.

GERM 479 Special Topics in the Teaching of Foreign Languages (3, max. 9) S Intensive workshop for in-service and preservice teachers of all foreign languages on some aspect of foreign-language teaching methodology. Prerequisite: foreign-language teaching experience or participation in a previous foreign-language methods course.

GERM 490 Contemporary German Literature (3) Interpretation of selected works by contemporary German authors.

GERM 491 Studies in German Poetry (3) Introduction to various methods of interpretation and to their practical application.

GERM 492 History of Germanic Philology (3) Introduction to the works of outstanding scholars in the field of Germanics.

GERM 495 Proseminar in German Literature (3, max. 15) Special topics, the subject matter and depth of which are not included in other literature courses, arranged through consultation among students and faculty members. Prerequisite: 15 credits in third-year German or permission of instructor.

GERM 497 Studies in German Literature (1-6, max. 15)

GERM 498 Studies in the German Language (1-6, max. 15)

Courses in English

GERM 210 Classics of German Literature and Thought (5) Sp Introduction to major figures of German culture from the Reformation to the present, their contribution to the intellectual life of the Western world. Luther, Kant, Goethe, Schopenhauer, Marx, Nietzsche, Freud, Kafka, Brecht, and Mann.

GERM 340 Friedrich Nietzsche in English (5) Analysis of Friedrich Nietzsche's chief works and the discussion of his position within modern German literature and thought.

GERM 341 Franz Kafka in English (5) Short stories and novels of Franz Kafka; emphasis on philosophical relevance and esthetic significance.

GERM 342 Thomas Mann in English (5) Some of Thomas Mann's theoretical writings, short stories, and novels, interpreted within the wider context of German literature and philosophy at the turn of the century.

GERM 345 Bertolt Brecht in English (5) Brecht's life and work, particularly his plays and writings on theatre, and some poems and short prose pieces to provide additional perspective on his life and work as a whole. The development of his writing and of his ideas and attitudes.

GERM 346 The Contemporary German Novel in English (5) Major novels of the postwar period (1945 to present), discussed in their historical context. Contrasts between West and East German writers, such as Mann, Frisch, Grass, Böll, Lenz, Wolf, and Plenzdorf.

GERM 349 Goethe in English (5) Selected major works (especially *Faust*) of Goethe, whose literary, philosophical, and scientific achievements are examined as integral parts of his quest for meaning, wholeness, and universality, and whose impact on Western thinking is traced up to Thomas Mann and C. G. Jung.

GERM 350 The German Drama in English (5) German drama from the eighteenth to the twentieth centuries. German history and culture as reflected in the plays. Discussion of major themes.

GERM 351 Vienna 1900 in English (5) Interdisciplinary study of Vienna at the turn of the century. Discussion of literary texts with emphasis on other intellectual and cultural trends of this very rich and complex period.

GERM 352 Literature and Society in Weimar and National Socialist Germany in English (5) Literature, theater, and film, with adjunct consideration of art and architecture, in relation to the German social and cultural situation *circa* 1918 to *circa* 1947.

GERM 353 Germany: East and West—Literature and Culture in English (5) Postwar development and present-day character of the literature and the cultural, social, and political life in the German Democratic Republic and the Federal Republic of Germany. Readings include works by Böll, Grass, Wolf, Plenzdorf, and nonliterary texts devoted to culture and everyday life in the two German states.

GERM 355 German Literature and Film in English (5) Relationship between literature and film in the German tradition. Content varies; focus may be on a particular time period, director, or theme. Special attention paid to critical and analytical skills required for interpreting the two mediums.

GERM 356 Pagan Germany: Myth, Religion, Folklore in English (5) *Jaeger* History and culture of the German peoples before and during the conversion to Christianity. Readings include Tacitus's *Germania* and other historical sources, *Beowulf*, *Nibelungenlied*, *Grimm's Fairy Tales*, and German legends. Treatment of archaeological finds and a variety of materials that bear on religion, prophecy, magic, folk customs, and festivals.

GERM 390 Germanic Studies in English (3 or 5) Topics or figures of German literature or language.

Courses for Graduates Only

GERM 500 Literary Theory, Methodology, and Bibliography (3) A Historical survey and analysis of criticism (*Methodengeschichte*) and modern trends in contemporary theory. Methods of research and bibliography, as well as theoretical aspects of practical interpretation.

GERM 503 Contemporary German Literature (3) Seminar analyzing the esthetic movements and thought of contemporary West, as well as East German literature, the social and political problems dealt with in the works of representative authors, and major experimental concepts. Some previous exposure to the German literature and civilization after 1945 is expected.

GERM 504 Special Studies in Literary Criticism and Theory (3, max. 9) Literary criticism and theory, focusing on special topics proposed by the instructor. Taught in English. Prerequisite: 500 or equivalent.

GERM 510 Medieval Literature and Civilization (3) A German literature and civilization from 750 to 1400, with esthetic and historical consideration of works from the Carolingian and Cluniac periods, the Court Epic, the Heroic Epic, the *Spielmannsepik*, the *Minnesang*, the poetry of the epigones who followed the Age of High Chivalry, and the German Mystics. Prerequisite: permission of department or departmental coordinator.

GERM 511 Literature and Civilization From 1400 to 1700 (3) W Survey of fifteenth-, sixteenth-, and seventeenth-century culture and literature for students with no previous instruction in this period. Discussion of works by Tepl, Brant, Erasmus, Luther, Sachs, Grimmelshausen, Opitz, Gryphius, and other poets of German Renaissance, humanism, and baroque. Prerequisite: permission of department or departmental coordinator.

GERM 512 Literature and Civilization of the Eighteenth Century (5) A Survey of German literature of the eighteenth century, presented within the context of European civilization during that period. Prerequisite: permission of department or departmental coordinator.

GERM 513 Proseminar in German Literature of the Eighteenth Century (3) A Discussion and critical evaluation of representative topics selected from the German literature of the eighteenth century. Prerequisite: permission of department or departmental coordinator.

GERM 514 Literature and Civilization of the Nineteenth Century (5) W Survey of nineteenth-century German literature. Major contributions from German-speaking countries such as Austria and Switzerland, within the context of European civilization during that period. Prerequisite: permission of department or departmental coordinator.

GERM 515 Proseminar in German Literature of the Nineteenth Century (3) W Discussion and critical evaluation of representative topics selected from the German literature of the nineteenth century. Prerequisite: permission of department or departmental coordinator.

GERM 516 Literature and Civilization of the Twentieth Century (5) Sp Survey of modern German literature from the turn of the century to our own time. Major contributions from German-speaking countries such as Austria and Switzerland, within the context of European civilization during that period. Prerequisite: permission of department or departmental coordinator.

GERM 517 Proseminar in German Literature of the Twentieth Century (3) Sp Discussion and critical evaluation of representative topics selected from the German literature of the twentieth century. Prerequisite: permission of department or departmental coordinator.

GERM 521 Seminar in the Literature of the Reformation and Renaissance (3)

GERM 522 Seminar in Baroque (3)

GERM 525 Seminar in Romanticism (3)

GERM 526 Seminar in Nineteenth-Century Drama (3)

GERM 527 Seminar in Nineteenth-Century Prose (3)

GERM 528 Nineteenth-Century Poetry (3) Representative selections from Hölderlin, the late Goethe, and from prevalent trends in nineteenth-century poetry, such as romanticism, "Young Germany," poetic realism, and the experimental poetry of naturalism.

GERM 533 Seminar in Eighteenth-Century Literature (3) Study of one or more of the literary movements: Enlightenment, sentimentalism, anacreontics, storm and stress, classicism, early romanticism, and works by principal authors such as Gottsched, Bodmer, Gellert, Lessing, Wieland, Klopstock, Herder, Lenz, Goethe, Schiller, Jean Paul.

GERM 534 Storm and Stress (3) Extensive investigation of poetological and esthetic concepts advanced by initiators and exponents of German storm and stress. Analyses of narrative and dramatic works of storm and stress reveal reflections and implementations of the new theoretical concepts.

GERM 535 Classicism: Goethe, Schiller (3)

GERM 540 Twentieth-Century Poetry (3) Development of German poetry from Rilke, Hofmannsthal, and George through Trakl, Benn, the Expressionists and the Dadaists, Brecht, and Enzensberger, to such contemporaries as Eich, Heissenbüttel, the concrete poets, Celan, and Bachmann.

GERM 541 Twentieth-Century German Drama (3) Selection from modern German drama representative of the concern with the human condition, of social criticism, and of experimentation with the new dramatic forms.

GERM 542 Twentieth-Century Prose (3) Selected modern German novels, short novels, and short stories by representative authors dealing with the social and political problems of Germany as well as with individual problems of existence and identity.

GERM 550 Gothic (3)

GERM 551 Seminar in Germanic Philology and Linguistics (3) Topics vary. Prerequisites: basic knowledge of German and at least one elementary linguistics course.

GERM 552 Old High German (3)

GERM 555 Old Saxon (3)

GERM 556 Middle High German (3)

GERM 560 Modern Dialects (3)

GERM 565 Seminar in Courtly Epic (3) Aspects and methods of literary analysis pertaining to the study of medieval courtly epics.

GERM 567 Minnesang (3) In-depth study of medieval German lyrics in the context of German and European literary and intellectual development. Poems of the period from Kurenberger through Walther are analyzed with stress on grammatical, formal, stylistic, and ideological interpretation. Prerequisite: adequate knowledge of Middle High German.

GERM 568 Seminar in Heroic Epic (3) Literary and historic problems of the German heroic epic, with special emphasis on the *Nibelungenlied* and the *Dietrichsepik*.

GERM 575 Teaching of German Literature and Civilization (3) Teaching of German language and literature on the advanced level in secondary schools and colleges.

GERM 576 Modern Methods and Materials in Teaching German (3) The audiolingual method and its application; current developments in foreign-language teaching; evaluation of teaching materials.

GERM 580 Seminar in German Literature (3 or 5, max. 15) Open topics seminar with varying content.

GERM 581 Seminar in Poetry (3 or 5, max. 15) Open topics seminar with varying content.

GERM 582 Seminar in Drama (3 or 5, max. 15) Open topics seminar with varying content.

GERM 583 Seminar in Prose (3 or 5, max. 15) Open topics seminar with varying content.

GERM 590 German Mysticism of the Late Middle Ages (1-5)

GERM 591 German Idealism and Materialism (3)

GERM 592 German Existentialism and Neomaxism (3)

GERM 600 Independent Study or Research (*) AWSpS

GERM 700 Master's Thesis (*) AWSpS

GERM 800 Doctoral Dissertation (*) AWSpS

History

315 Smith

History undertakes the study of human affairs in a manner that seeks to understand change and development rather than the state of things at a given moment, taking into account societies in diverse parts of the world from the earliest times for which written records exist to the present.

Undergraduate Program

Advisers
206A Smith

Bachelor of Arts Degree

Major Requirements: 55 credits in history with a grade-point average of 2.00 or higher. At least 5 credits each of ancient, medieval, modern European, and United States history (HST 111, 112, 113, and HSTAA 201 or upper-division courses in the same subject areas; adviser must approve substitutions for the basic courses) plus an additional 5 credits in the history of some area or nation outside Europe, the United States, and Canada. At least 25 upper-division credits. One undergraduate seminar or colloquium is required, and each history degree candidate must write at least one major paper in an upper-division course. Beyond the required subjects, the student may or may not specialize, depending upon personal interests and career plans. In addition to all courses with the prefix HST, the history major may include approved courses offered outside the Department of History. A short list of these courses is maintained by undergraduate advisers. Transfer students are required to complete a minimum of 25 upper-division credits in history at the University.

History and Science Emphasis: 55 credits in history, to include the following: 15 credits of HST 311, 312 and one additional approved course in the history of science, technology, and medicine; 5 credits for junior colloquium; 10 credits for senior thesis; of the remaining 25 credits in history at least 20 must be in courses outside the history of science and must include at least one course each in European history, American history, and an area or nation outside Europe, the United States, and Canada; 35 credits of natural science to include at least 20 credits above the 100 level in the same natural science. Science courses are to be chosen from anthropology, astronomy, atmospheric sciences, biology, botany, chemistry, computer science, geological sciences, mathematics, physics, psychology, and zoology.

Graduate Program

George K. Behlmer, Graduate Program Coordinator

The Department of History offers graduate training leading to the Master of Arts and Doctor of Philosophy degrees in a large number of fields within the discipline. Two pathways, one a general M.A. and the other a preparation for the Ph.D. program are offered. Students in the programs can prepare for careers as college or secondary-school teachers or as members of university faculties who combine teaching with scholarship and professional writing, for positions as archivists, librarians, or editors. A few graduates enter government service, college administration, or publishing. The M.A. program is normally completed in four or five full academic quarters or their equivalent. The Ph.D. program requires at least three years of full-time work beyond the M.A. degree. Graduate training at both levels includes (1) course work or independent study leading to examinations in special historical fields, and (2) sustained investigation and interpretation of historical problems in seminars involving the writing of essays and a thesis.

Special Requirements

Admission to the graduate program requires a sound undergraduate major in history or in one of the basic disciplines related to history completed within a college of liberal arts and sciences. The department also requires evidence of the applicant's ability to write cogently and lucidly and to interpret historical data.

Financial Aid

Beginning graduate students may qualify for a very limited number of readerships. Students with, or who expect to receive, the M.A. degree by the time they begin their duties may apply for an appropriate level of teaching assistantships and may, with continued satisfactory scholarly progress, expect reappointment for a total of three years, provided adequate funds are available.

Correspondence and Information

Graduate Program Coordinator
206 Smith, DP-20

Faculty

Chairperson

Jere L. Bacharach

Professors

Alden, Dauril,* 1959, (International Studies),† M.A., 1952, Ph.D., 1959, California (Berkeley); Latin American history, comparative colonial history.

Bacharach, Jere L.,* 1967, M.A., 1962, Harvard; Ph.D., 1967, Michigan; history of the Near East.

Bestor, Arthur, 1962, (Emeritus), M.A., 1956, Oxford (England); Ph.D., 1938, Yale; history.

Boba, Imre,* 1962, (International Studies),† Ph.D., 1962, Washington; medieval history and East European studies.

Bridgman, Jon,* 1961, Ph.D., 1960, Stanford; modern European history (especially military).

Burgess, Charles O.,* 1964, ‡(Education), M.S., 1958, Ph.D., 1962, Wisconsin; history of education.

Burke, Robert E.,* 1957, M.A., 1947, Ph.D., 1950, California (Berkeley); American political and social history in the twentieth century.

Butow, Robert J. C.,* 1960, (International Studies),† A.M., 1948, Ph.D., 1953, Stanford; history of modern Japan, diplomatic history of the Far East.

Bynum, Caroline W.,* 1976, (Women Studies), M.A., 1963, Ph.D., 1969, Harvard; medieval history.

Carstensen, Vernon, 1964, (Emeritus), M.A., 1932, Ph.D., 1936, State University of Iowa; history.

Chan, Hok-lam,* 1972, ‡(Asian Languages and Literature, International Studies), M.A., 1963, Hong Kong; M.A., 1965, Ph.D., 1967, Princeton; late traditional China.

Conlon, Frank F.,* 1968, (International Studies),† M.A., 1963, Ph.D., 1969, Minnesota; history of India.

Costigan, Giovanni, 1934, (Emeritus), M.A., 1930, Oxford (England); Ph.D., 1930, Wisconsin; history.

Ellison, Herbert J.,* 1968, (International Studies),† M.A., 1952, Washington; Ph.D., 1955, London; modern Russian history.

Ferrill, Arthur L.,* 1964, M.A., 1961, Ph.D., 1964, Illinois; ancient history.

Fowler, Wilton B.,* 1969, M.A., 1962, Ph.D., 1966, Yale; American history (especially diplomatic).

Freidel, Frank, 1981, (Emeritus), M.A., 1939, Southern California; Ph.D., 1942, Wisconsin (Madison); history.

Griffiths, Gordon, 1959, (Emeritus), M.A., 1946, Oxford (England); Ph.D., 1942, California (Berkeley); history.

Hankins, Thomas L.,* 1964, M.A.T., 1958, Harvard; Ph.D., 1964, Cornell; history of science.

Hanley, Susan B.,* 1972, ‡(International Studies), M.A., 1964, Ph.D., 1971, Yale; premodern Japanese history.

Katz, Solomon, 1936, (Emeritus), Ph.D., 1933, Cornell; history.

Levy, Fred J.,* 1960, A.M., 1956, Ph.D., 1960, Harvard; history of England in the sixteenth and seventeenth centuries, English historiography.

Palais, James B.,* 1968, (International Studies),† M.A., 1960, Yale; Ph.D., 1968, Harvard; modern Korean history.

Pease, Otis A.,* 1966, Ph.D., 1954, Yale; United States in the twentieth century.

Pinkney, David H.,* 1966, (Emeritus), A.M., 1937, Ph.D., 1941, Harvard; history.

Pressly, Thomas J.,* 1949, (Emeritus), M.A., 1941, Ph.D., 1950, Harvard; history.

Pyle, Kenneth B.,* 1965, (International Studies),† Ph.D., 1965, Johns Hopkins; modern Japanese history.

Rorabaugh, William J.,* 1976, M.A., 1970, Ph.D., 1976, California (Berkeley); United States social history.

Saum, Lewis O.,* 1965, M.A., 1959, Ph.D., 1962, Missouri (Columbia); American intellectual history.

Sugar, Peter F.,* 1959, (International Studies),† M.A., 1956, Ph.D., 1959, Princeton; political and economic history of eastern Europe and Near East since the eighteenth century.

Thomas, Carol G.,* 1964, M.A., 1961, Ph.D., 1965, Northwestern; ancient history.

Treadgold, Donald W.,* 1949, (International Studies),† M.A., 1947, Harvard; D.Phil., 1950, Oxford (England); modern Russia.

Ullman, Joan C.,* 1966, M.A., 1953, Ph.D., 1963, Bryn Mawr; modern Spain.

Associate Professors

Behlmer, George K.,* 1979, A.M., 1972, Ph.D., 1977, Stanford; modern English history.

Bell, Aldon D.,* 1969, D.Phil., 1961, Oxford (England); modern Britain, empire and commonwealth.

Benson, Keith R.,* 1981, ‡(Biomedical History), M.A., 1973, Ph.D., 1979, Oregon State; history of modern American biology, marine biology, evolutionary biology.

Dull, Jack L.,* 1963, (International Studies),† M.A., 1960, Ph.D., 1966, Washington; early Chinese history.

Emerson, Donald E.,* 1946, (Emeritus), A.M., 1938, Columbia; Ph.D., 1942, Johns Hopkins; history.

Gil, Carlos B.,* 1974, (American Ethnic Studies),† M.A., 1963, Georgetown; Ph.D., 1975, California (Los Angeles); Latin America and history of the Chicano people.

Johnson, Richard R.,* 1972, M.A., 1965, Ph.D., 1972, California (Berkeley); United States colonial history.

Kieval, Hillel J.,* 1980, (International Studies),† A.M., 1975, Ph.D., 1981, Harvard; modern Jewish history, central and eastern Europe.

Leiren, Terje I.,* 1977, ‡(Scandinavian Languages and Literature), M.A., 1970, California State (Los Angeles); Ph.D., 1978, North Texas State; Scandinavian history.

Lytle, Scott H.,* 1949, (Emeritus), Ph.D., 1948, Cornell; history.

Toews, John E.,* 1979, A.M., 1968, Ph.D., 1973, Harvard; modern European intellectual history.

Waugh, Daniel C.,* 1972, (International Studies),† A.M., 1965, Ph.D., 1972, Harvard; medieval Russian history.

Assistant Professors

Findlay, John M.,* 1987, M.A., 1978, Ph.D., 1982, California (Berkeley); American West, public history.

Guy, R. Kent,* 1980, (International Studies),† M.A., 1974, Ph.D., 1981, Harvard; modern Chinese history.

Jonas, Raymond A.,* 1986, M.A., 1980, California (Davis); Ph.D., 1985, California (Berkeley); modern France.

O'Neil, Mary R.,* 1980, M.A., 1971, Ph.D., 1982, Stanford; Renaissance and Reformation history, early modern Europe.

Ramet, Pedro,* 1983, ‡(International Studies), M.A., 1974, Arkansas; Ph.D., 1981, California (Los Angeles); Soviet and East European studies.

Travis, David J.,* 1986, M.A., 1980, California (Davis); Ph.D., 1985, Cambridge (England); modern Italy.

Course Descriptions

Upper-division courses (300 and 400 levels) in the Department of History do not generally require prerequisites. Most 400-level courses deal with a single nation during a limited period. The 300-level courses deal with broader subjects at a relatively advanced level. Both are primarily for juniors and seniors, but they are open to freshmen and sophomores with an interest or background in the subject of the course.

Courses for Undergraduates

General History

HST 111 The Ancient World (5) A *Bridgman, Ferrell, C. Thomas* Origins of Western civilization to the fall of Rome.

HST 112 The Medieval World (5) *Bacharach, Boba, Bridgman* Political, economic, social, and intellectual history of the Middle Ages. No credit toward a history major for students who have taken HSTAM 331 or 332 or 333.

HST 113 The Modern World (5) Sp *Bridgman, Sugar* Political, economic, social, and intellectual history of modern Europe. No credit toward a history major for students who have taken HSTEU 302 or 303.

HST 140 Russia from the Tenth Century to the Present (5) *Waugh* Russian political, social, and economic history from the tenth century to the present. Joint with SISRE 140.

HST 192 The Historian as Detective (5) Examples illustrate how "clues" from the past are used by historians to build inferential "cases"; collection, analysis, and interpretation of evidence as a historical method. Open to all students; recommended for history honors students.

HST 193 Introduction to World History, 1750-Present (5) Sp *Conlon, Johnson, Sugar* Tendencies toward uniformity caused by developmental focuses in the face of traditional patterns (e.g., ideology, urbanization, industrialization, nationalism). How the development of the world tended toward uniformity despite survival of traditional forces.

HST 204 Europe and America in the Era of the World Wars (5) *Bridgman, Burke* Declining role of Europe in the world and rise of the United States from 1914 to 1945.

HST 207 Introduction to Intellectual History (5) *Toews* Ideas in historical context. Comparative and developmental analysis of Western conceptions of "community," from Plato to Freud.

HST 215 The History of the Atomic Bomb (5) *Hankins* History of the atomic bomb from the beginning of nuclear physics to the security hearing of J. Robert Oppenheimer. Includes a study of the scientific achievements that made the bomb possible, the decision to deploy the bomb, the moral misgivings of the scientists involved.

HST 242 Europe Discovers the World (5) *Alden, Waugh* Great explorers and their discoveries from Marco Polo to Captain Cook. Impact of the discoveries on Europeans' perceptions of the world and on non-European peoples brought into contact with European civilization.

HST 250 The Jews in Western Civilization (5) *Kleval* Jewish historical experience in the Mediterranean and European world from ancient Greece to modern-day Israel. Condition of Jewish life in the larger societies of which Jews have always formed a part. Areas of contact between the Jewish and the gentile worlds. Joint with SISJE 250.

HST 261 Survey of the Muslim Near East (5) *Bacharach* The Middle East (the Arab countries, Israel, Turkey, Iran, and Afghanistan) from the emergence of Islam in A.D. 622 to the present: culture, economics, politics.

HST 283 Introduction to Women's History (5) Includes units on American, European, and Third World women that examine centers of women's activities (convents, women's clubs), women's place in male-dominated spheres (politics), women's impact on culture (health, arts), and the effect of larger changes on women's lives (technology, colonization). Joint with WOMEN 283.

HST 294 Honors Historiography (5) *Levy* Readings in the great historians, from the earliest time to the beginning of the twentieth century. Investigates how perception of the human past has altered our times. Recommended for students in the department's honors program, but also open to nonhonors students.

HST 304 European Expansion Overseas Since 1650 (5) *Bell* Expanding northern European empires (England, Holland, France) of the seventeenth and eighteenth centuries; British naval and economic preeminence in the early nineteenth century; height of European expansion and conflict overseas from 1870 to 1920; imperial disintegration and collapse in the mid-twentieth century; legacy of empires and imperialism. Recommended: survey course in modern European history.

HST 307 History of Christianity (5) *Treadgold* Christian religion, including doctrine, practice, church organization, and culture, from the time of Jesus Christ to the present. No attempt to avoid the controversial aspects of the topic is made, but the necessity of founding argument on knowledge is stressed.

HST 309 Marx and Nietzsche: The Assault on Bourgeois-Christian Civilization (5) *Toews* Major dilemmas and conflicts of modern Western consciousness through historical analysis of Marx, Nietzsche, and the movements they spawned. Emphasis on the relationship between sociocultural change, biography, and ideological innovation. Recommended: 113 or 207.

HST 310 Science and Religion in Historical Perspective (5) *Hankins* Scientific and religious ideas have been two of the major forces shaping our modern view of the world. Often regarded as being in conflict, they can equally well be seen as complementary and interdependent. Study of the relationship between scientific and religious ideas with focus on particular episodes of history from ancient to modern times.

HST 311 Science in Civilization: Antiquity to 1600 (5) *Hankins* From preclassical antiquity to the end of the Middle Ages, stressing the growth of scientific ideas, the cultural context in which they take shape, and their relationship to other movements of thought in the history of civilization.

HST 312 Science in Civilization: Science in Modern Society (5) *Hankins* Growth of modern science since the Renaissance, emphasizing the scientific revolution of the seventeenth century, the development of methodology, and the emergence of new fields of interest and new modes of thought.

HST 313 Science in Civilization: Physics and Astrophysics Since 1850 (5) *Hankins, Sullivan* Organization and pursuit of the physical and astrophysical sciences, focusing on the major unifying principles of physics and the social and cultural settings in which they were created.

HST 314 The Psychoanalytic Revolution in Historical Perspective (5) Genesis and evolution of Freudian theory in context of the crisis of liberal-bourgeois culture in central Europe and parallel developments in philosophy, literature, and social theory. Emergence and division of the psychoanalytic movement. Transformation of psychoanalysis as it was absorbed into British, French, and especially American cultural traditions. Recommended: 207 and 113 or HSTEU 303.

HST 335 The United States and Vietnam (5) American involvement in Vietnam, including: the complex of negotiations; strategies and objectives of both sides; military, political, and economic operations of the United States; efforts at pacification; impact of Vietnam on American affairs.

HST 345 War and Society (5) *Bridgman* Analysis of the techniques of war from the Renaissance to the present with consideration of the social, political, and economic consequences of war in the Western world.

HST 361 Slavery in History: A Comparative Study (5) *Bacharach* Slavery as a universal historical phenomenon lending itself to a comparative analysis is studied in terms of its philosophical justifications, economic importance, and local practices. The following historical periods are surveyed: the ancient Near East, Greece, Rome, Islam, Africa, Latin America, and North America.

HST 362 U.S. Reconstruction in Comparative Perspective (5) Reconstruction in the southern United States, 1865-77, compared with situations and conditions existing after slavery was formally abolished in the northern United States, Haiti, Jamaica, Canada, Russia, Cuba, Brazil, and Zaria (in northern Nigeria).

HST 363 Wars in the Modern Near East (3) *Bacharach* The Middle East, scene of some of the most significant military events in modern world history, with focus on the repercussions for participants in terms of political and psychological changes. Resident military specialists supplement the historical approach by analyzing the battles and wars on these terms.

HST 370 History of the Expansion of Islam (5) *Bacharach, Conlon* Comparative perspective on the expansion of the religion and community of Islam from its origins to the modern age. Patterns and processes of expansion, conversion, and social and cultural assimilation in a number of world regions (e.g., the Arab World, Iberia, Anatolia, West Africa, Iran, India, and Southeast Asia). Specific case studies of Islam in its regional setting (e.g., South Asia).

HST 390 Colloquium in History and Science (5) *Hankins* Study in the history of science to bridge the gap between the natural sciences and the humanities. Students should have a strong background both in history and in a natural science. Prerequisite: permission of instructor or adviser.

HST 391-392 Honors Colloquium in the History of Ideas (5-5) Discussion of selected topics in the history of ideas; writing of an interpretive essay.

HST 395 Modern Historical Writing, Honors Seminar (5) *Levy* New types of problems examined by historians and new techniques that have evolved for solution. Brief historiographical introduction, reaching back to the "scientific" historians of the mid-nineteenth century, then continues by examining the impact on historians of new disciplines such as psychology, sociology, and economics, and of new techniques such as statistics and prosopography. Readings are in the theorists and in those who followed their lead. Admission by departmental invitation only.

HST 412 Science and the Enlightenment (5) *Hankins* The role of science in relation to intellectual, social, economic, and religious forces in the eighteenth century, and growth of the international community in science during the same period.

HST 425 History of the British Empire and Commonwealth Since 1783 (5) *Bell* Britain in the Caribbean, Africa, India, Southeast Asia, and the Pacific; and the settlement, economic development, and political evolution of Canada, Australia, New Zealand, and South Africa.

HST 448 Franklin D. Roosevelt and His World, 1882-1945 (5) *Sp Butow* Life and times of the thirty-second President of the United States, with emphasis on American foreign relations—especially the role he played in the emergence of the United States as a world power. Joint with SIS 448.

HST 461 History of the Middle East: 622-1300 (5) *Bacharach* Political and economic analysis of the period circa A.D. 600, preliminary to rise of Islam, to arrival of the Turks. Muhammad's teaching and impact; Islamization and Arabization.

HST 482 History of the Middle East: 1258-1788 (5) *Bacharach* Conquests by successors of Ghengis Khan; creation in Egypt, Syria, and Iran of cavalry-based states; domination of political, social, and economic history by Ottoman and Safavid empires. The Napoleonic invasion.

HST 483 History of the Middle East Since 1789 (5) *Bacharach* Critical issues and themes in the changing Middle East, including Westernization, growth of nationalism, Arab-Israeli dispute, Iranian revolution, and the role of Islam.

HST 484 History of North Africa (5) *North Africa* (Libya, Tunisia, Algeria, and Morocco) from the time of the Muslim conquest to the establishment of independence from European colonial rule. Economic, social, and cultural developments are emphasized, as is the process by which separate states came into being. Relations with the rest of the Muslim world, with Africa to the south, and with Europe are examined.

HST 487 Nations and States in the Modern World (5) *Treadgold* Development of national consciousness in the "old nations" of Europe before the French Revolution. Replacement by new nationalism, spreading into East Central Europe, Russia, Ibero-America, Asia, and Africa. Joint with SIS 487.

HST 481 Economic History of Europe (5) *Origins* of the modern European economy; historical analysis of economic change and growth from medieval times that stresses the preconditions and consequences of industrialization. Joint with ECON 460. Recommended: ECON 200, 201.

HST 491-492 Honors Historical Method (5-5) *W, Sp* The purposes, materials, and techniques of historical scholarship. Theory, practice, and criticism.

HST 498 Colloquium in History (3-5, max. 15) Each seminar examines a different subject or problem. A list of the seminars and their instructors is available in the Department of History office. Students must have the permission of the instructor of the seminar in which they plan to enroll.

HST 499 Undergraduate Research (1-5, max. 15) *AWSp*

History of the Americas

HSTAA 135 The American People and Their Culture in the Modern Era: A History of the United States Since 1940 (5) *Kirkendall, Pease* Through study of documents, personal testimony, and other source materials, through written reports on historical problems, and through discussions, lectures, films, and audiovisual presentations, students are encouraged to examine evidence and to think "historically" about per-

sons, events, and movements within the memory of their own generation and that immediately preceding theirs. Primarily for first-year students.

HSTAA 150 Afro-American History (5) Introductory survey of topics and problems in Afro-American history with some attention to Africa as well as to America. Provides some general knowledge and serves as a basic introductory course for a sequence of lecture courses and seminars in Afro-American history. Joint with AFRAM 150.

HSTAA 180 History of the Chicano People to 1848 (5) *Gil* Historical survey of the Chicano people from pre-Hispanic times to the war between the United States and Mexico.

HSTAA 181 History of the Chicano People Since 1848 (5) *Gil* Historical survey of the Chicano people since the war between the United States and Mexico. Recommended: 180.

HSTAA 201 Survey of the History of the United States (5) *AWSp* Supplies the knowledge of American history that any intelligent and educated American citizen should have. Objective is to make the student aware of his heritage of the past and more intelligently conscious of the present.

HSTAA 202 Makers of American Foreign Policy, 1776 to the Present (5) *Fowler* Survey of the history of American foreign relations. Focus on the individuals responsible for initiating new foreign policies or for realigning old ones.

HSTAA 203 American Presidents in the Twentieth Century (3 or 5) American presidents and the presidency in the twentieth century. Problems and policies in domestic and foreign affairs, from the administration of Theodore Roosevelt through that of Richard Nixon.

HSTAA 211 American Indian Wars (5) *Saum* Through lectures and weekly discussions of readings, this course analyzes and describes the course of the Indian wars from the early seventeenth century to the late nineteenth century. Focus on military operations with attention to cultural differences and geopolitical considerations.

HSTAA 212 The Military History of the United States From Colonial Times to the Present (5) *A* Development of American military policies, organizational patterns, tactics, and weaponry, from beginnings as a seventeenth-century frontier defense force to the global conflicts and military commitments of the twentieth century. Interaction and tension between need for an effective military force and concept of civilian control of that force.

HSTAA 218 Americans and Revolutions, Seventeenth-Twentieth Centuries (5) Experiences and attitudes of Americans with respect to revolutions at home and abroad, from the seventeenth century to the present.

HSTAA 281 Introduction to Latin American History: From Columbus to Castro (5) Survey of political, economic, and social history of Latin America from the Iberian conquest to the present. Lectures, discussions, and films focus on developing understanding of Latin America's current problems through study of their historical roots. Designed for the beginning student and the nonspecialist.

HSTAA 301 Foundations of American Civilization (5) *Johnson* Early America from the sixteenth century to the end of the American Revolution: the founding years, social and religious development, race relations, development of the Atlantic world, origins and legacy of American independence.

HSTAA 302 American Civilization: The First Century of Independence (5) *McKenzie, Rorabaugh, Saum* Establishment of the constitutional system; national expansion; intellectual and cultural development; internal conflicts, the Civil War, and Reconstruction.

HSTAA 303 Modern American Civilization From 1877 (5) *Burke, Pease* Emergence of modern America, after the Civil War; interrelationships of economic, social, political, and intellectual developments.

HSTAA 333 The American South Since the 1920s (5) *Fowler* Political, social, and economic developments in the eleven states of the former Confederacy. Special attention to the questions of race relations, civil rights, and cultural distinctiveness. Recommended: 201.

HSTAA 351 Formation of the American Constitution to 1840 (3) *Johnson* English constitutionalism and its meaning for the colonies; the American Revolution; constitution making in the states; the Articles of Confederation and the Constitution of 1787; inauguration of the new government and adoption of the Bill of Rights; constitutional decisions of John Marshall; Jacksonian democracy and its constitutional implications. Credit cannot be received for both 351 and 451.

HSTAA 352 American Constitutional History, 1860 to the Present (3) *Sp Johnson* Modern American constitutional development since the Civil War; the Supreme Court and the shift from economic issues to civil rights; Congress, the presidency, and the Constitution.

HSTAA 373 Social History of American Women (5) *W* "Ordinary" women, colonial times to present: work at home, charitable activities, entrance into labor force. "The lady" ideology. Feminist movements—nineteenth century and post-World War II. Not open for credit if GIS 210, 383, 483, or 490 taken. Joint with WOMEN 383. Prerequisite: 201 or WOMEN 200 or 283 or permission of instructor.

HSTAA 377 History of Canada (5) General survey and analysis of political, economic, social, and cultural aspects of Canadian history from the foundation of New France to present; Canadian-American relations, the rise of Quebec nationalism, and the development of the Canadian West.

HSTAA 381 Latin America: The Early Colonial Period (5) *Alden* Discovery and founding of Spanish and Portuguese empires in the New World and their development until the eighteenth-century reorganizations.

HSTAA 382 Latin America: Late Colonial and Early National Periods (5) *Alden* Imperial reforms, the struggle for independence; the founding of new nations.

HSTAA 383 Modern Latin America (5) Analysis of economic problems, political and social changes, and intellectual trends in major Latin American republics since the late nineteenth century.

HSTAA 384 Latin America: Inter-American and Intra-Continental Relations (5) Inter-American relations, focusing on the United States' diplomatic and military responses to the problems of Latin America since 1776. Intra-Latin American relations and regional organizations (e.g., the Organization of American States).

HSTAA 401 American Revolution and Confederation (5) *Johnson* Causes of separation of the United States from the British empire; political theory of the Revolution; its military history; diplomacy of the Revolution; the Revolution as a social movement; intellectual aspects; readjustment after independence; the formation of the American union; the Constitution.

HSTAA 404 New England: From the Foundings to the Civil War (5) *Johnson* New England from colonial beginnings to the region's emergence to national leadership in the mid-nineteenth century. Emphasis on Puritanism, the New England town, adjustment to empire, revolution and constitution making, the growth of party, abolitionism, the flowering of a regional culture, and the personalities who embodied these key themes and periods.

HSTAA 407 Andrew Jackson's United States (5) *Rorabaugh* United States from 1820 to 1850, a period of unprecedented change in politics, society, and culture. Cities grew, factories were built, more people voted, and reformers advocated abolition, temperance, and women's rights. A basic knowledge of United States history is assumed.

HSTAA 409 American Social History: The Early Years (5) *Rorabaugh* Survey of American society and institutions from the colonial era through the Civil War, with special attention to reform, labor, immigration, education, law enforcement and the city.

HSTAA 410 American Social History: The Modern Era (5) *Rorabaugh* Survey of American society and institutions from Reconstruction to the present with special attention to reform, poverty, social mobility, immigrant and ethnic groups, the city and law enforcement.

HSTAA 411 The United States During the Era of Civil War and Reconstruction (5) *McKenzie* Conflicting interests, ideologies, and ways of life in the United States from the 1840s to the 1870s.

HSTAA 412 The Westward Movement, 1700-1850 (5) *Findlay* Anglo-American advance into interior of continental United States culminating in occupation of Far West. Rivalry with New France and New Spain in colonial period; role of federal government in westward expansion; land policy and land distribution; migration, settlement, and the pioneering experience; federal Indian policies and implementation; political evolution, urbanization, and economic development of trans-Appalachian West; shaping of national character and institutions.

HSTAA 413 History of the Trans-Mississippi West (5) *Findlay* Anglo-American exploration, conquest, occupation, and exploitation of the trans-Mississippi West, with emphasis on economic development into the twentieth century. Considers wide range of developmental themes (social, political, cultural) in historiography of American West. Recommended: 412.

HSTAA 415 History of Indian-White Relations in Anglo-America (5) *Indian-White* contact, conflict, and accommodation from the Atlantic colonies in the seventeenth century to the American nation in the twentieth century.

HSTAA 425 American Urban History Before 1870 (3 or 5) Early development of American cities.

HSTAA 426 American Urban History Since 1870 (3 or 5) Development of American cities for the past century. Topics include physical development, immigration, politics, and changes in society and culture.

HSTAA 431 American Politics and Society Since 1920 (5) *Burke, Pease* Political, social, economic, and intellectual developments in the United States from 1920 to the present.

HSTAA 432 History of Washington and the Pacific Northwest (5) *Findlay, Saum* Exploration and settlement; economic development; growth of government and social institutions; statehood.

HSTAA 436 American Jewish History Since 1885 (5) *Kieval* Political, social, economic, and religious history of the American Jewish community from the period of the great eastern European migration until the present. The integration of the immigrant community into the general American community; the rise of nativism; the development of American socialism; World War I and World War II; and the reactions of the American Jews to these events.

HSTAA 450 American Labor History (5) *Burke* American workers and their efforts to organize and bargain collectively with their employers. Post-Civil War period. Radical movements and trade unions.

HSTAA 451 Constitution Making in America, 1776-89 (5) *Johnson* Intensive study of the framing of the Articles of Confederation, the state constitutions, the territorial ordinances, the U.S. Constitution of 1787, and the Bill of Rights. Class discussions and term paper, in addition to required attendance at lectures offered in 351, which cover the English and colonial backgrounds and developments to 1840. Credit cannot be received for both 351 and 451.

HSTAA 454 The Intellectual History of the United States (5) *Saum* Lectures and discussions devoted to the development of the American mind, from historical beginnings to the present.

HSTAA 456 The American Character (5) *Pease* Explores prevailing explanations for the American character and tries to assess its historical consequences. Lectures, discussion, reading, reports. Recommended: two college-level courses in history, including study of the American people and of the people of at least one other modern nation or society.

HSTAA 458 History of American Education to 1865 (3) *Burgess* Development of American education in cultural context: colonial period, influence of enlightenment, and common school movement. Joint with EDPGA 458.

HSTAA 459 History of American Education Since 1865 (3) *Burgess* Development of American education in cultural context: progressive education, recent criticism, continuing issues and trends. Joint with EDPGA 459.

HSTAA 461 Diplomatic History of the United States, 1776-1901 (5) *Fowler* Foreign policy of the United States government prior to the twentieth century. Emphasis on international wars, territorial expansion, and the peculiarities of the American position in world politics. Prerequisite: 202 or graduate standing.

HSTAA 462 Diplomatic History of the United States, 1901-Present (5) *Fowler* Foreign policy of the United States government during the twentieth century. International wars and the other major episodes in diplomacy are emphasized. Prerequisite: 202 or graduate standing.

HSTAA 470 Colloquium in American History: the Progressive Era, 1900-1917 (5) *Burke* The principal problems and themes of the Progressive Era, emphasizing political, economic, social, and cultural aspects.

HSTAA 471 Colloquium in American History: the 1920s in America (5) *Burke* Achievements and issues of the New Era; causes and consequences of the stock-market crash and Great Depression, with emphasis on political, economic, social, and cultural analysis.

HSTAA 472 Colloquium in American History: Franklin D. Roosevelt and the New Deal (5) *Burke* Analysis of the key political, economic, social, and cultural factors in the New Deal, including the role played by President Roosevelt. Prerequisite: permission of instructor.

HSTAA 473 Colloquium in American History: Franklin D. Roosevelt and World War II (5) *Burke* Problems and policies of the United States in World War II, covering the home front, diplomacy, and strategy, with emphasis on the role of President Roosevelt. Prerequisite: permission of instructor.

HSTAA 482 The History of Brazil: Colonial Period to the Present (5) *Alden* Colonial foundations; the first and second empires; the old and new republics; current problems; prospects for the future.

HSTAA 483 Southern South America (5) *AWSPS* History of the four countries that form southern South America: Argentina, Uruguay, Paraguay, and Chile, focusing on economic, social, and political change in the nineteenth and twentieth centuries. Governments

of Juan Perón in Argentina and Salvador Allende in Chile. Relations of the four countries with Europe and the United States.

HSTAA 485 Social Revolution in Twentieth-Century Latin America: A Comparative Approach (3) Analyzes and compares major Latin American social revolutions, including Mexico (1910-20) and Cuba (since 1959). Backgrounds and causes; the impact of revolutionary change; relationships between United States and revolutionary and postrevolutionary governments.

HSTAA 486 History of Mexico: Colonial Origins to 1822 (5) *Gil* Political, social, and economic history of Mexico from its discovery by the Spanish to its independence from Spain.

HSTAA 487 History of Mexico: 1822 to the Present (5) *Gil* Political, social, and economic history of Mexico from its independence from Spain to the present. Recommended: 486.

HSTAA 488 History of the Caribbean and Central America (5) *Gil* Political, social, and economic history of principal countries in the Caribbean and Central America from their discovery to the present.

Ancient and Medieval History, Including Byzantine

HSTAM 201 Ancient History (5) *Ferrill, Thomas* Development and characteristics of ancient Greek civilization from the Bronze Age to the Roman conquest. Emphasizes interaction of cultures of the eastern Mediterranean.

HSTAM 202 Ancient History (5) *Ferrill, Thomas* Political, social, economic, and cultural development of Rome from the beginnings in the eighth century B.C. to the beginning of the Middle Ages.

HSTAM 203 Introduction to the Middle Ages: Medieval People (5) *Stacey* Introduction to the Western Middle Ages through a study of social roles and statuses as seen through documents and imaginative literature. The groups studied are rulers, aristocracy, peasants, townspeople, clergy, outcasts, and outsiders.

HSTAM 205 Military History of the Ancient World (5) *Ferrill* Military history from prehistoric times to the fall of the Roman Empire, with special emphasis on the Greco-Roman period and the campaigns of Alexander the Great, Hannibal, Scipio Africanus, and Julius Caesar.

HSTAM 331 Early Middle Ages (5) *Stacey* The Dark Ages, feudalism, emergence of the medieval order of civilization, and the development of Romanesque culture.

HSTAM 332 Central Middle Ages (5) *Stacey* Europe in the central Middle Ages: culture of cathedrals and universities, formation of national states, development of urban society.

HSTAM 333 Late Middle Ages (5) *Stacey* Disintegration of the medieval order under the impact of the national state, the secularization of society, and the decline of the church. Movements of reform and revolution. The culture of late gothic Europe.

HSTAM 336 The Humanist Ideal: From the Greeks to the Renaissance (3) *Ferrill, O'Neil, Thomas* Students read certain ancient, medieval, and Renaissance texts, selected to show the continuity and the transformations of the humanistic tradition, and write periodic essays on their reading as well as a term paper. Intended to supplement courses on the history of the respective periods.

HSTAM 351 Medieval Italy (5) *Italy*, from the barbarian invasions to the Renaissance, considered in the framework of European and Mediterranean cultures.

HSTAM 401 Early Greece (5) *Ferrill, Thomas* Bronze and Dark Age Greece: realities of the heroic age of ancient Greece.

HSTAM 402 Classical Greece (5) *Ferrill, Thomas* The classical civilization of ancient Greece, with special emphasis on the legacy of Greece to Western civilization.

HSTAM 403 Alexander the Great and the Hellenistic Age (5) *Ferrill, Thomas* Rise of Macedonia, conquest of Near East by Alexander, and division into lesser kingdoms after Alexander's death. Special emphasis on fusion of cultures and change from city-state to world-state.

HSTAM 405 Topics in Ancient History (3, max. 6) *Ferrill, Thomas* An umbrella course that makes it possible to treat a special topic in the history of the ancient world during the period from the Bronze Age to the fall of the Roman Empire. One topic is studied in depth during the quarter. Prerequisite: permission of instructor.

HSTAM 411 The Early Roman Republic (3) *Ferrill* Political, social, economic, and cultural history, with emphasis on the development of the constitution and territorial expansions.

HSTAM 412 The Late Roman Republic (3) *Ferrill* Political, social, and cultural history, with special emphasis on the period of Cicero and Caesar.

HSTAM 413 The Early Roman Empire (3) *Ferrill* Political, social, economic, and cultural history, with emphasis on the Julio-Claudians.

HSTAM 414 The Late Roman Empire (3) *Ferrill* Political, social, economic, and cultural history, with emphasis on the decline of ancient civilization.

HSTAM 421 The Byzantine Empire (5) *Waugh* Political, social, economic, and cultural history of the eastern Roman Empire from the fourth to fifteenth centuries.

HSTAM 426 Origins of European States (5) *Boba* From tribe to nation. Analysis of political, social, and cultural developments leading to the formation of territorial states in Europe. Prerequisite: some courses in medieval history or permission of instructor.

HSTAM 431 Topics in Medieval History, 500-1000 (5) *Boba, Stacey* Study in depth of one or more topics in the history of Europe during the early Middle Ages. Prerequisite: a course in medieval history.

HSTAM 432 Topics in Medieval History, 1000-1250 (5) *Boba, Stacey* Study in depth of one or more topics in the history of Europe during the High Middle Ages. Prerequisite: a course in medieval history.

HSTAM 441 Church and State in the Middle Ages (5) *Boba* Changing theories and realities of relationship between religious and secular elements of medieval civilization.

HSTAM 442 Central Europe in the Middle Ages (5) *Boba* Origins and medieval history of Germany, Austria, Bohemia, and Poland, considered as a region within the sphere of Western European civilization.

HSTAM 443 Kievan and Muscovite Russia: 850-1700 (5) *Waugh* Development of Russia from earliest times to the reign of Peter the Great.

HSTAM 445 Russian Culture to the Era of Peter the Great (5) *Waugh* Development of Kievan and Muscovite "high" culture (to the beginning of the eighteenth century): religion, political ideas, the arts in a broad sense; questions of cultural influences. Extensive use of audiovisual materials. Prerequisite: 443 or permission of instructor.

HSTAM 446 Medieval Russian Chronicles (5) *Waugh* History of Russian chronicle writing; study of the chronicles as literature and as historical sources,

with emphasis on the latter. Prerequisites: reading knowledge of Russian and permission; recommended: 443.

HSTAM 470 Intellectual and Religious History of the Later Roman Empire and Early Middle Ages (5) *A Stacey* Selected topics in intellectual and religious history A.D. 200 to 1000: the Apologists; Christian Platonism. The Latin Fathers with special attention to Augustine, Boethius, and Gregory the Great; the development of monasticism; the Carolingian and Ottonian revivals. Most reading in original sources in translation. Prerequisite: appropriate background in medieval history or intellectual history.

HSTAM 471 Intellectual and Religious History of the High Middle Ages (5) *W Stacey* Selected topics in intellectual and religious history A.D. 1000 to 1300: the religious revival of the eleventh and twelfth centuries; early scholasticism with special attention to Anselm's and Abelard's sacred and secular theories of love; heresy and popular religion; the friars, the women's religious movement of thirteenth century, and mysticism; high scholasticism with special attention to Thomas Aquinas and Bonaventure. Most reading in original sources in translation. Prerequisite: appropriate background in medieval history or intellectual history.

HSTAM 472 Intellectual and Religious History of the Later Middle Ages (5) *Sp Stacey* Selected topics in intellectual and religious history, 1250 to 1550. Concentration on Europe north of the Alps and on philosophical and theological issues rather than on "humanism" and the history of scholarship. Most reading in original sources in translation. Prerequisite: appropriate background in medieval history or intellectual history.

History of Asia

HSTAS 201 Ancient Indian Civilization (5) *Conlon* Religions, literature, philosophy, politics, arts, and history of India from earliest times to the Mughal empire.

HSTAS 202 Modern Indian Civilization (5) *Conlon* The Islamic impact, British conquest, and contemporary India. Emphasis on the rise of nationalism, social organization, and contemporary life and history.

HSTAS 211 History of Chinese Civilization (5) *Dull* Intensive survey of Chinese civilization from earliest times to today. Introduces all students, including East Asian history majors, to the general sweep of Chinese history. Social, cultural, and intellectual developments.

HSTAS 212 History of Korean Civilization (5) *Palais* From earliest times to the present. Development of Korean society and culture in terms of government organization, social and economic change, literature, and art. Joint with SISEA 212.

HSTAS 213 History of Japanese Civilization (5) *Hanley* Japanese civilization from prehistory to modern times. A survey of the most important developments in Japan's political, economic, and social history and Japanese literary, artistic, and religious traditions.

HSTAS 348 Alternative Routes to Modernity (5) *A Guy* Routes to modernity followed by non-Western societies between 1600 and 1900. Historical experiences of non-Western societies seen in the contexts of European history and of development theory. Primary sources and techniques for posing theoretical questions of historical data. Joint with SIS 348.

HSTAS 401 History of Ancient India (5) *Conlon* India in ancient times; emphasis on forms of political organizations and economic life, social organizations, and cultural developments.

HSTAS 402 History of Medieval and Mughal India (5) *Conlon* Medieval India; emphasis on forms of political organizations and economic life, social organizations, and cultural developments.

HSTAS 403 History of Modern India to 1900 (5) *Conlon* Modern India; emphasis on forms of political organizations and economic life, social organizations, and cultural developments.

HSTAS 404 History of Twentieth-Century India (5) *Conlon* Analysis of the problems in the fields of social life, international and domestic politics, education, economics, and other areas that confront India today.

HSTAS 405 Maharashtra in Indian History (5) *Conlon* Regional approach to medieval and modern Indian history through examination of the history of Maharashtra in western India. The rise of the Marathas; British rule; political and economic modernization; religious and social life; problems of contemporary society.

HSTAS 421 History of Early Japan (5) *Political, social, economic, and cultural development of Japan to the beginning of the Tokugawa period (seventeenth century).*

HSTAS 422 History of Tokugawa Japan (5) *Hanley* Background to the unification of Japan in 1600; establishment of the Tokugawa political structure; and the social, economic, and cultural history of the period 1600-1868.

HSTAS 423 History of Modern Japan (5) *Pyle* Political, social, economic, and cultural development of Japan from the late Tokugawa period to the present with special emphasis on the cultural impact of the West.

HSTAS 431 Tibetan History (3) Tibet from earliest times to the present. Emphasis on the status and relations of Tibet in Asian affairs and on the evolution of the political institutions of a lama-ruler state. Recommended: 211 or equivalent. (Offered alternate years.)

HSTAS 451 Chinese History: Earliest Times to 221 B.C. (5) *Dull* Preimperial China.

HSTAS 452 Chinese History: 221 B.C. to A.D. 908 (5) *Dull* Development of the imperial Chinese state.

HSTAS 453 Chinese History: A.D. 908 to 1840 (5) *Chan, Dull* The Wu, Tai, Sung, Yuan, Ming, and early Ch'ing periods.

HSTAS 454 History of Modern China (5) *Guy* Political, economic, social, and intellectual history of China from 1800 to the present. Processes of modernization and revolution and relationship between them.

HSTAS 476 Western Influences in Russian and Chinese Intellectual History (4) *Treadgold* Comparative analysis of stages of Western impact on Russian (1462-1917) and Chinese (1582-1949) thought previous to the proclamation of Marxism-Leninism as the official ideology.

HSTAS 481 History of Traditional Korea: Earliest Times to the Nineteenth Century (5) *Palais* Korean history from earliest times to the modern period.

HSTAS 482 History of Modern Korea: 1880 to the Present (5) *Palais* Traditional institutions and society, Japanese colonial rule, liberation and the Korean War, early Korean communist movement, and North Korea and South Korea since 1945.

Modern European History

HSTEU 275 Life in England (5) *AW Behlmer, Bell, Levy* Social history of England from the Norman conquest to the present, seen through letters, autobiographies, novels, and plays of the time. Life of the ordinary inhabitant—in the village and the manor house.

HSTEU 301 Early Modern European History: 1450-1648 (5) *Bridgman, Levy* Political, social, economic, and cultural history from the late Renaissance to the Peace of Westphalia.

HSTEU 302 Modern European History: 1648-1815 (5) *Bridgman, Hankins, Lytle, O'Neil, Sugar* Political, social, economic, and cultural history from the Peace of Westphalia to the fall of Napoleon.

HSTEU 303 Contemporary European History Since 1815 (5) *Bridgman, Ellison, Sugar* Political, social, economic, and cultural history from the fall of Napoleon to the present.

HSTEU 305 European Witch Trials (5) *O'Neil* Witchcraft and magical beliefs in Europe considered as a problem in intellectual, social, and legal history. Medieval background, systematization of witchcraft theory in fifteenth century; comparison of learned and popular beliefs; mechanisms of witch trials and inquisitorial procedure; the Faust legend; growth of skepticism and decline of witchcraft in seventeenth century.

HSTEU 369 The Destruction of European Jewry, 1933-45 (3 or 5) *Kieval* History of anti-Semitism; dimensions of the Holocaust; the Holocaust organization and the victims' responses; reactions of world to events in Europe, allied policies, refugee policy, and American actions. Legal, historical, and sociological questions raised by these events. Joint with SISJE 369.

HSTEU 370 The Vikings (5) *Boba, Leiren* The Vikings at home in Scandinavia and abroad, with particular emphasis on their activities as revealed in archaeological finds and in historical and literary sources. Joint with SCAND 370.

HSTEU 372 Social History of Early Modern Europe (5) *O'Neil* Central issues in the social history of western Europe between the fourteenth and eighteenth centuries: changes in the family, childhood, sex, and marriage; hierarchical social structures and social change; attitudes toward world wealth and poverty; organization of poor relief and social services; relationship between cultural levels and social milieu (rural, urban, clerical, and courtly).

HSTEU 378 The Making of Contemporary France (5) Historical origins and subsequent development of nine contemporary problems and characteristics of French government and politics, economy, and society. Prerequisite: FREN 203 or 222 or equivalent.

HSTEU 380 History of Scandinavia to 1521 (3) *Leiren* Survey of Scandinavian history from the Viking age to 1521, with emphasis on the efforts at unification between Iceland, Denmark, Norway, and Sweden, and their relationship to the European continent. Joint with SCAND 380.

HSTEU 381 History of Scandinavia to 1809 (3) *Leiren* Scandinavian history from 1521 to 1809, with special emphasis on the Lutheran Reformation, the Thirty Years' War, and the Napoleonic Wars. Joint with SCAND 381.

HSTEU 382 History of Scandinavia From 1809 to the Present (3) *Leiren* Scandinavian history from 1809 to the present, with major emphasis on the political, social, cultural, and economic development of the Scandinavian countries. Joint with SCAND 382.

HSTEU 401 The Reformation (5) *O'Neil* Origins of the disunity of Europe in the crisis of the sixteenth century with emphasis on the relations between religion and politics.

HSTEU 405 European Intellectual History: Eighteenth Century (5) *Toews* Development of the social sciences, moral theory, political theory, and religious thought in eighteenth-century Europe. Rationalism, empiricism, utilitarianism, and the sources of idealism.

HSTEU 406 European Intellectual History: Nineteenth Century (5) *Toews* Selected topics in intellectual history up to 1890. The philosophical consequences of the French Revolution, the development of idealism, conservatism, romanticism, and early social-

ist theory; positivism, the problems of historicism, new forms of Christian apologetics, utilitarianism in decline, liberalism as philosophy, the early Marx.

HSTEU 407 European Intellectual History: Twentieth Century (5) *Toews* Selected topics in the intellectual history of the late nineteenth and early twentieth centuries. The aftermath of Darwinism, the problems of methodology in modern social science, historicism and moral relativism, irrationalism in philosophy and social theory, revisionism in secular and orthodox religions.

HSTEU 410 The Renaissance (1300-1560) (5) *O'Neil* Conditions of Renaissance culture: Italian republics and despots, humanism, the classical ideal of the arts, Machiavelli and the foundations of modern political thought; the end of an era. Prerequisite: 301 or HST 112.

HSTEU 411 Europe: 1814-70 (5) *Bridgman, Lytle, Sugar* Development of Europe during the age of Metternich, the revolutions of 1848, and the emergence of new national states.

HSTEU 412 Europe: 1870-1914 (5) *Bridgman, Sugar* Impact of population increase and technological change on European society; stresses and strains in European life and outlook.

HSTEU 413 Europe: 1914-45 (5) *Bridgman, Travis* Politics and society of Europe in the age of the concentration camp.

HSTEU 414 Europe Since 1945 (5) *Ullman* Political, economic, and military developments in Europe under the impact of the Cold War.

HSTEU 415 Europe in the Six Years' War (1939-45) (5) Inquiry to discover what the war of 1939-45 was about and what it did to the more than five hundred million Europeans.

HSTEU 421 France: 1429-1789 (5) *Jonas* Political and cultural history, from Joan of Arc to the eve of the French Revolution. Villon, Rabelais, Montaigne, Molière, Voltaire, Rousseau, de Tocqueville.

HSTEU 422 The French Revolution and Napoleon: 1789-1815 (5) *Jonas* Transformation of France under the Revolution of 1789; the Reign of Terror and Napoleon; the impact of the revolution and Napoleon upon Europe.

HSTEU 423 France Since 1814 (5) *Jonas* Political, economic, and social history since the Congress of Vienna. Special emphasis upon the continuity of the revolutionary tradition.

HSTEU 431 Germany: 1648-1914 (5) *Bridgman* Society, economy, and political problems of central Europe from the Thirty Years' War to World War I, with particular emphasis on the nineteenth century.

HSTEU 432 Germany: 1914-45 (5) *Bridgman* Politics and society from the collapse of the Bismarckian empire to the collapse of Hitler's empire.

HSTEU 435 World War I (5) *Bridgman* Political, institutional, cultural, and military history of World War I, with emphasis on the impact of the war on European society.

HSTEU 438 Modern Russian Intellectual History (5) *Ellison, Treadgold* Development of Russian social and political thought and philosophy from the seventeenth century to the Revolution of 1917.

HSTEU 439 Soviet Union Since World War II (5) *Ellison* Domestic and foreign policy; political, economic, social, and cultural developments.

HSTEU 440 History of Communism (5) *Ellison* Communism from its origins in the Bolshevik faction of Russian social democracy to the present, treating the development of the ideology, the various communist parties, and the communist states. Joint with SIS 440. Prerequisites: two courses in modern European history or politics.

HSTEU 444 Imperial Russia: 1700-1900 (5) *Treadgold, Waugh* Development of Russia from Peter the Great to Nicholas II.

HSTEU 445 Twentieth-Century Russia (5) *Ellison, Treadgold* Russia and the USSR from Nicholas II to the present.

HSTEU 450 Ethnic History of Russia and East Europe (5) *Boba* Survey of races and ethnic groups in stages of acquiring national identity and political consciousness. Emphasis on processes of assimilation and alienation.

HSTEU 451 East-Central Europe Since 1342 (5) *Sugar* Focus on the lands of today's Poland, Czechoslovakia, Hungary, and East Germany from the time they were great powers to the present. Traces the major changes in the fortunes of these lands in both local and international settings.

HSTEU 452 Eastern Europe Since 1918 (5) *Sugar* Poland, Czechoslovakia, Hungary, Romania, Yugoslavia, Bulgaria, and Albania, from the end of World War I to the present. Prerequisite: 451 or permission of instructor.

HSTEU 453 History of the Balkans, 1400 to the Present (5) *Sugar* Centuries of Ottoman rule that produced a new basis for the reemergence of independent states in the nineteenth and twentieth centuries; history of these new states until the present.

HSTEU 461 Formation of the Spanish Nation: to 1700 (5) *Ullman* Major political, economic, and cultural events leading to the creation of the Spanish nation under Ferdinand and Isabel.

HSTEU 462 Spain: 1700 to the Present (5) *Ullman* Political, economic, and cultural attempts of Spain to adjust to capitalism, liberalism, and secularism.

HSTEU 464 The Jews in Spanish History (3 or 5) *Ullman* Sephardic Jews in Spanish politics, economy, and culture, emphasizing the medieval Golden Age and the Inquisition. Joint with SISJE 464.

HSTEU 465 The Jews of Eastern Europe (5) *Kieval* Jewish society in Poland, Russia, the Hapsburg Lands, and Romania from the late Middle Ages to the Holocaust. Joint with SISJE 465. Recommended: introductory course in European or Jewish history.

HSTEU 467 Medieval Jewish History (5) Social and intellectual history of the Jews in western Europe to the fifteenth century. Jews under Islam and Christianity; the church and the Jews; the Crusades and their legacy; intellectual achievements; conflict and cooperation. Joint with SISJE 467.

HSTEU 468 Early Modern Jewish History, 1492-1789 (5) *Kieval* Jews in the early-modern period. The Spanish expulsion in 1492 to the onset of political and social emancipation in western Europe and America. Joint with SISJE 468. Recommended: introductory course in European or Jewish history.

HSTEU 469 Modern Jewish History, 1770-1948 (5) *Kieval* History of the Jews from the era of the Enlightenment and the French Revolution to the founding of the state of Israel. Joint with SISJE 469. Recommended: introductory course in European or Jewish history.

HSTEU 470 The Jacobethan Age: England, 1580-1630 (5) *Levy* Emphasis on arts and society instead of the traditional kings, battles, and politics; the way people at all levels of society lived, in towns and in the countryside, within the bounds of the royal court or outside in the political wilderness. Classes on poetry, drama, music, architecture, painting, interior decoration, and some of the minor arts, as well as on demography and some of the traditional historical subjects. Not open for credit to students who have taken 471 or 472.

HSTEU 471 England in the Sixteenth Century (5) *Levy* Political, administrative, and social history from Henry VII to Elizabeth I, with emphasis on the Reformation and its effects and on conditions of life in Elizabethan England. Not open to students who have taken 470.

HSTEU 472 England in the Seventeenth Century (5) *Levy* Political, administrative, and social history from the accession of James I to the Glorious Revolution. Not open to students who have taken 470.

HSTEU 474 England in the Nineteenth Century (5) *Behlmer, Bell* Political, social, and cultural development; the agrarian, industrial, and French revolutions; the rise of parliamentary democracy; the Victorian age; political thought from utilitarianism to Fabianism; Irish home rule.

HSTEU 475 England in the Twentieth Century (5) *Behlmer, Bell* From the Boer War to the present; conservatism, liberalism, and socialism; England in two world wars; the decline of British imperialism.

HSTEU 476 Modern Irish History (5) *Behlmer* Political and social history from 1800 to the present; the Irish Question after the Act of Union; development of Irish nationalism in the Home Rule and Sinn Féin periods; the Irish Free State and Northern Ireland since 1921; current problems in Northern Ireland.

HSTEU 480 European Socialism (5) *Jonas* Origins and development of socialist theory and practice in Europe since the French Revolution. Socialism as a political movement. Prerequisite: at least one course in the history of Europe since 1789.

HSTEU 485 Italy Since 1890 (5) *Travis* History of politics and society in Italy from unification to the present. Liberal Italy and the great war, fascism and World War II, resistance and the Italian republic, social and economic changes since 1945, communism and Christian democracy. Special emphasis on political culture and traditions.

Courses for Graduates Only

General History

HST 501 Ancient Greece and Rome: Writings and Interpretations (3-6) *Thomas* Study of historians, development of historical study as a distinct pursuit, focus of attention in historical scholarship in the ancient world and comparison with modern interpretation of antiquity.

HST 502 Medieval Europe: Writings and Interpretations (3-6) *O'Neill, Waugh* Study of historians, schools of history, and interpretations of medieval European history.

HST 503 Modern Europe: Writings and Interpretations (3-6) *Sp Travis* Study of historians, schools of history, and interpretations of modern European history.

HST 511 History of Science (3-6) *Hankins*

HST 512-513-514 Seminar in the History of Science (3-6)-(3-6)-(3-6) *A,W,Sp Hankins*

HST 524 British Empire History (3-6) *Bell*

HST 543 American Diplomacy and the Far Eastern Crisis, 1931-41 (3-6) *Butow* Field course in the diplomacy of the decade preceding American entry into World War II, with emphasis on the Far Eastern crisis. Prerequisite: permission of instructor.

HST 544 Seminar in American Diplomacy and the Far Eastern Crisis, 1931-41 (3-6, max. 12) *Butow* Diplomacy of the decade preceding American entry into World War II, with emphasis on the Far Eastern crisis. Prerequisite: permission of instructor.

HST 551 Field Course in African History (3-6) Systematic examination of key historical writings and interpretive controversies in African history, with special attention to the growth of multidisciplinary approaches to historical reconstruction and the evaluation and use of oral historical data. Prerequisites: reading knowledge of one of the following: French, German, Portuguese, Arabic, or other African language.

HST 561 Islamic History (3-6) *Bacharach* Field course. Introduction to advanced study in the major periods and problems of Islam. Bibliographical guidance is stressed.

HST 562 Ottoman History (3-6) *Sugar* Field course. Introduction to the major periods and problems of Ottoman history, 1300-1914, by acquainting the student with the major works in at least two languages. An attempt is made to teach some use of Ottoman materials. A minor problem is investigated in detail by every student. Prerequisite: knowledge of at least one major language besides English (French, German, Russian, or other).

HST 563 Modern Near East (3-6) *Bacharach* Field course introducing the student to the major periods and problems of Near Eastern history, 1798 to the present. Prerequisite: permission of instructor.

HST 571 Orientation to an Academic Career in History (3) AS *Sugar* Course for prospective college and university history instructors, preparing them for the nonacademic aspects of their duties. Prerequisite: Master of Arts degree in history or permission of instructor.

HST 600 Independent Study or Research (*) *AWSpS*

HST 700 Master's Thesis (*) *AWSpS*

HST 800 Doctoral Dissertation (*) *AWSpS*

History of the Americas

HSTAA 501 American History: Early (3-6) *Johnson*

HSTAA 503 Seminar in American History: Early (3-6, max. 12) *Johnson*

HSTAA 512 American History: Western (3-6)

HSTAA 521 American History: Writings and Interpretations, 1770-1870 (4-6) A *McKenzie, Rorabaugh*

HSTAA 522 American History: Writings and Interpretations Since 1870 (4-6) W *Burke, Fowler, Pease*

HSTAA 524 American Social History Before 1860 (3-6) Field course. Survey of major problems and literature in American social history before 1860.

HSTAA 525 American Social History After 1860 (3-6) Field course. Survey of major problems and literature in American social history after 1860.

HSTAA 532-533-534 Seminar in American History: Recent Period (3-6, max. 12)-(3-6, max. 12)-(3-6, max. 12) A,W,Sp *Burke, Pease*

HSTAA 554 American History: Intellectual (3-6) *Saum*

HSTAA 555-556 Seminar: American Intellectual History (3-6)-(3-6) *Saum* Develops research and writing competence in American intellectual history. Prerequisite: permission of instructor or graduate program coordinator.

HSTAA 561 History of American Foreign Policy (3-6) *Fowler*

HSTAA 562-563 Seminar in American Diplomatic History (3-6)-(3-6) *Fowler*

HSTAA 577 History of Canada (3-6) Canadian historiography and bibliography from the foundation of New France to the present.

HSTAA 581 Latin American History: Colonial Period (3-6) *Alden*

HSTAA 582 Latin American History: National Period (3-6) *Alden, Gil*

HSTAA 583-584-585 Seminar in Latin American History (3-6, max. 12)-(3-6, max. 12)-(3-6, max. 12) *Alden, Gil* Problems of historical research in the history of Latin America from colonial beginnings to the present.

Ancient and Medieval History, Including Byzantine

HSTAM 501 Greek History (3-6) *Thomas* Problems in the history of the Athenian constitution.

HSTAM 511 Roman History (3-6) *Ferrill* Roman history, 31 B.C.-A.D. 37.

HSTAM 512-513 Seminar in Ancient History (3-6)-(3-6) *Ferrill, Thomas* Detailed study of special topics in ancient history. Prerequisite: permission of instructor or graduate program coordinator.

HSTAM 530 Early Middle Ages (3-6) *Boba* Field course. Survey of early European history through the times of tribal migrations and invasions from Asia. Problems and methods of research. Prerequisite: permission of instructor or graduate program coordinator.

HSTAM 531 Medieval European History (3-6)

HSTAM 532, 533 Medieval European Seminar (3-6,3-6) AWSp Prerequisite: reading knowledge of French or German or Latin.

HSTAM 540 Medieval Russian Documents (3-6) *Waugh* Introduction to the study of documentary sources for medieval Russian history; the methods and application of diplomatics, with an introduction to paleography and codicology. Prerequisites: reading knowledge of Russian and 443 or permission of instructor. Recommended: 441.

HSTAM 541 Medieval Russian History (3-6) *Waugh* Prerequisites: 443 or permission of instructor and reading knowledge of Russian.

HSTAM 543 Seminar in Medieval Russian History (3-6, max. 12) *Waugh* Prerequisite: reading knowledge of Russian.

HSTAM 591, 592, 593 Advanced Medieval and Renaissance Seminar (3-6,3-6,3-6) *Bacharach, Boba, Levy* A continuing seminar, running three quarters of every year. Provides a forum in which all students of medieval and Renaissance history who are writing their theses, dissertations, or any research projects may submit their work in progress to peer and faculty evaluation.

History of Asia

HSTAS 501 Indian History (3-6) *Conlon* Prerequisite: permission of instructor.

HSTAS 502, 503 Seminar: History of India (3-6, max. 12; 3-6, max. 12) *Conlon* Seminar on selected topics and problems in the history of medieval and modern India. Prerequisites: 501 and permission of instructor.

HSTAS 521 Modern Japanese History (3-6) *Pyle* Field course. Prerequisites: 422, 423, or permission of instructor.

HSTAS 551 Field Course in Chinese History: Pre-Sung Period (3-6) *Dull* Introduces Western language materials on traditional China in order to give the students bibliographical and other assistance in preparing for examinations in this field of history.

HSTAS 552-553-554 Seminar in Chinese History: Pre-Sung Period (3-6, max. 12)-(3-6, max. 12)-(3-6, max. 12) A,W,Sp Dull Prerequisite: reading knowledge of Chinese.

HSTAS 561 Field Course in Chinese History: Sung to Modern (3-6) Chan Introduces Western language materials on Chinese history from the Sung dynasty to the modern period in order to give students bibliographical and other assistance in preparing for examinations in this field of history.

HSTAS 562-563-564 Seminar in Chinese History: Sung to Modern (3-6)-(3-6)-(3-6) A,W,Sp Chan Professional writing seminar in Chinese history from Sung to modern times. Prerequisite: reading knowledge of Chinese.

HSTAS 571-572 Chinese History: Modern Period (3-6)-(3-6) W,Sp Guy Field course in modern Chinese history, emphasizing extensive reading in the secondary literature on modern China.

HSTAS 573-574-575 Seminar in Chinese History: Modern Period (3-6, max. 12)-(3-6, max. 12)-(3-6, max. 12) A,W,Sp Guy Research seminar in modern Chinese history. Training in the materials and methods of research, and preparation of extended research papers. Prerequisites: 571-572 or permission of instructor and reading knowledge of Chinese.

HSTAS 581 Modern Korean History (3-6) Sp Palais Field course. Prerequisite: permission of instructor.

HSTAS 582-583-584 Seminar in Korean History (3-6)-(3-6)-(3-6) A,W,Sp Palais Selected topics in Korean history and historiography.

HSTAS 585 Research Seminar: Modern Korea (3-6) Palais Advanced instruction in problems and methods of research in Korean history. Foreign language not required. Prerequisite: permission of instructor.

Modern European History

HSTEU 501 Renaissance Field Course (3-6) O'Neill Topics in the cultural, political, and social history of the Renaissance era.

HSTEU 502 Reformation Field Course (3-6) O'Neill Topics in the religious, political, and social history of the Reformation era.

HSTEU 503-504 Seminar in the Renaissance and Reformation (3-6, max. 12)-(3-6, max. 12) A,W,Sp O'Neill

HSTEU 515 Modern European Intellectual History (3-6)

HSTEU 516-517 Seminar: European Intellectual History (3-6)-(3-6)

HSTEU 521 Modern European History: France (3-6) Jonas

HSTEU 522-523-524 Seminar in French History (3-6)-(3-6)-(3-6) A,W,Sp Jonas

HSTEU 531 Modern European History: Germany (3-6) Bridgman

HSTEU 532-533-534 Seminar in Modern European History: Germany (3-6)-(3-6)-(3-6) A,W,Sp Bridgman

HSTEU 544 Modern Russian History (3-6) Treadgold

HSTEU 545-546-547 Seminar in Modern Russian History (3-6)-(3-6)-(3-6) A,W,Sp Ellison, Treadgold Prerequisite: reading knowledge of Russian and either French or German.

HSTEU 548 Field Course in Soviet History (3-6) Ellison Specialized course for graduate history students in the scholarly literature of Russian history since 1917. Intended for graduate students preparing for M.A. or Ph.D. field examination in Russian history of the Soviet period.

HSTEU 551 History of Eastern Europe: 1772-1939 (5) Sugar Study of the east-central European region: Poland, Czechoslovakia, Hungary, Romania, and the Balkan countries, from their rebirth to World War II. Prerequisite: reading knowledge of German, French, Russian, or one East European language.

HSTEU 552 History of Eastern Europe: 1939 to the Present (5) Sugar Prerequisite: reading knowledge of one major European or one East European language.

HSTEU 553-554-555 Seminar in Modern East European History (3-6)-(3-6)-(3-6) A,W,Sp Sugar Study and research involving special methods dealing with the histories of the East European countries in the modern period.

HSTEU 562 Early Spanish History (3-6) Ullman Problems in the history of Spain, antiquity through the Middle Ages.

HSTEU 563 Modern Spanish History (3-6) Ullman Problems in the history of Spain, 1500 to the present.

HSTEU 571 English History: Tudor and Stuart (3-6) Levy

HSTEU 572 English History (3-6) Bell

HSTEU 573-574 Seminar in Modern English History (3-6)-(3-6) Bell

HSTEU 575-576 Seminar in Tudor-Stuart History (3-6)-(3-6) Levy History of England under the Tudors and the Stuarts. Prerequisite: 571 or permission of instructor.

History of Science, Technology, and Medicine

See under History: History and Science Emphasis.

Honors—Arts and Sciences

B10 Padelford

The honors program offers outstanding students a special curriculum featuring small classes, challenging instruction, and close contact with faculty and other honors students. An emphasis on writing is incorporated into the honors core curriculum and honors seminars. Directed and independent study are particularly encouraged for upper-division students, commonly leading to a senior honors thesis or project.

Undergraduate Program

Randolph Hennes, Adviser
B25B Padelford

Admission Requirements: To be considered for admission to the College Honors Program at entrance, students must apply during their final high school semester to the Director of Honors. Selection is based on high school records, test scores, and recommendations from the secondary school. Students also may seek admission based on superior academic performance during their freshman year at the University.

Graduation Requirements: A college honors student will be counseled by honors associates and will satisfy the distribution requirement through a specially designed honors general education curriculum.

A student becomes a candidate for an honors degree upon acceptance, usually during the junior year, by a department that offers an honors curriculum. Such a student is graduated "With College Honors" in the appropriate discipline. A student who is not a member of the college honors program but who demonstrates superior abilities in a particular field of study may, at the invitation of that department, participate in a departmental honors curriculum and receive a degree "With Distinction" in the major field.

An honors degree can be earned through the following departments and programs within the College of Arts and Sciences: Anthropology, Asian Languages and Literature, Atmospheric Sciences, Chemistry, Classics, Comparative History of Ideas, Comparative Literature, Comparative Religion, Computer Science, Economics, English, General Studies, Geography, Germanics, History, International Studies, Japanese Regional Studies, Mathematics, Microbiology, Music, Philosophy, Physics, Political Science, Psychology, Romance Languages and Literature, Russian and East European Studies, Scandinavian Languages and Literature, Slavic Languages and Literature, Sociology, Speech and Hearing Sciences, Speech Communication, Women Studies, Zoology.

By special arrangement, it is possible for students to complete a degree "With College Honors" in departments not offering a formal honors option.

Course Descriptions

Courses for Undergraduates

H A&S 210, 211, 212 Humanities for Honors Students I, II, III (5,5,5) Evolution of an art form, an idea, or a discipline central to the humanities. Content varies from year to year. For college honors students only.

H A&S 220, 221, 222 Science for Honors Students I, II, III (5,5,5) Evolution of an idea or concept central to the natural sciences. Intended for non-science majors. Content varies from year to year. For college honors students only.

H A&S 230, 231, 232 Social Science for Honors Students I, II, III (5,5,5) Development of an idea, concept, or institution central to the social sciences. Content varies from year to year. For college honors students only.

H A&S 240 , 241, 242 Fine Arts for Honors Students (5,5,5) A,W,Sp Evolution of an art form, or an idea, or a discipline central to the fine arts. Focus on nonverbal subjects and esthetics. Content varies from year to year. For college honors students only.

H A&S 300 Introduction to the Professions (2-5, max. 15) Studies oriented toward professional work (law, medicine, public affairs, etc.). For college honors students only. Prerequisite: permission of honors office.

H A&S 350 Honors Seminar (2, max. 20) Discussion of selected topics in a variety of subject-matter fields. Topics and reading material vary from year to year. For college honors students only. Prerequisite: permission of honors office.

H A&S 386 Interdisciplinary Special Topics—Natural Science (1-5, max. 10) AWSp Special courses drawn from interdisciplinary groups in the natural sciences. Content varies. Prerequisite: one sequence of honors core courses.

H A&S 397 Interdisciplinary Special Topics—Social Science (1-5, max. 10) AWSp Special courses drawn from interdisciplinary groups in the social sciences. Content varies. Prerequisite: one sequence of honors core courses.

H A&S 398 Interdisciplinary Special Topics—Humanities (1-5, max. 10) AWSp Special courses drawn from interdisciplinary groups in the humanities. Content varies. Prerequisite: one sequence of honors core courses.

International Studies

303 Thomson

The Henry M. Jackson School of International Studies organizes and supports interdisciplinary teaching and research in international affairs. The school consists of a group of interdisciplinary language and area studies programs on major world regions. It also incorporates topical and comparative programs for the purpose of studies that transcend national and regional boundaries.

Undergraduate Programs

Students may concentrate on a major world area within the context of the humanities and social sciences, specialize in topical studies, or pursue a more general course of study within the major in International Studies. For all the programs listed below except Comparative Religion, the student receives a Bachelor of Arts degree with a major in International Studies.

Chinese Regional Studies

Nicholas R. Lardy, Chairperson

Chinese Studies offers a program that provides a broad understanding of the Chinese people and their culture, historical development, and contemporary problems. The program has particular strength in history and the social sciences.

Bachelor of Arts Degree

Major Requirements: 30 credits or equivalent Chinese language training; additional training recommended. HSTAS 211, 212; 213 or SISEA 241; SISEA 455; 25 credits in 300- and 400-level courses on China, including HSTAS 454, one course in premodern China, and one course in Chinese arts and literature. Specialization (at least three courses) in one of the three fields of modern China, premodern China, and Chinese arts and literature.

Comparative Religion

Michael Williams, Chairperson

The Comparative Religion program offers four possible curriculum tracks leading to the Bachelor of Arts degree: History of Religions, Western Emphasis; History of Religions, Eastern Emphasis; Religion and Society; and Religion in Symbolic Expression.

Bachelor of Arts Degree

Major Requirements: RELIG 201, 202, 380; 35 credits in additional courses appropriate to each of the four tracks.

International Studies

Joel S. Migdal, Chairperson

The major in International Studies gives students a comprehensive and interdisciplinary perspective on world problems, plus an ability to analyze the subtle interactions of politics, economics, and culture within the global system.

Bachelor of Arts Degree

Admission: Admission is competitive, based on overall grade-point average, grades in social science courses, a written statement of goals, language background, and any international experience. Before applying, stu-

dents must complete either ECON 200 or 201; in addition, they are strongly urged to complete SIS 200, 201, or 202. Grades in these courses will be given special consideration. Applications must be submitted April 1-12 for autumn admission and October 1-21 for winter admission. Sophomore standing is preferred.

Major Requirements: Foreign-language competency through end of second-year college level; SIS 200, 201, 202, 401, 495, 498; three or four upper-division courses in an approved track; three interdisciplinary courses in International Studies. Majors are required to maintain a grade-point average of at least 2.50, both overall and in the program.

Japanese Regional Studies

Kozo Yamamura, Chairperson

The Japanese program combines language training with interdisciplinary study. Courses to an advanced level are offered in interdisciplinary studies, economics, business, political science, geography, all periods of Japanese history, art, literature, and language.

Bachelor of Arts Degree

Major Requirements: Two years Japanese language training at UW or equivalent (additional training recommended); HSTAS 211; HSTAS 213 or SISEA 241; SISEA 451; 25 credits of 300- and 400-level courses in Japanese Studies, to include: one course from HSTAS 421, 422, 423; one SISEA course on postwar Japan (e.g., SISEA 440, 442, 475); a third course, either from HSTAS 421, 422, 423, or another SISEA course; and two or more additional courses (10 credits) on Japan that, together with one of the above, form a concentration in an area of Japanese Studies. One additional background course (5 credits) in a field other than Japan Studies, to be approved by the adviser.

Jewish Studies

Hillel J. Kieval, Chairperson

Jewish Studies brings the major disciplines of humanistic learning and the social sciences to bear on the historical entity known as the Jewish people. Courses in history, both modern and premodern, comparative religion, and Near Eastern languages and civilization enable the student to study the history of the Jewish people, their rich and varied culture, and the influence of this culture upon world civilizations.

Bachelor of Arts Degree

Major Requirements: Language competence in Hebrew through second year; 50 credits, including a senior thesis and two courses each in Jewish religion and Jewish history.

Korean Regional Studies

James B. Palais, Chairperson

The Korean program combines language instruction with history and interdisciplinary area training for students interested in the culture and history of Korea. The program focuses on Korea within the broader context of East Asia.

Bachelor of Arts Degree

Major Requirements: 30 credits or equivalent Korean language training; additional training recommended. HSTAS 211, 212; 213 or SISEA 241; HSTAS 481, 482; 25 credits in 300- and 400-level courses on East Asia.

Russian and East European Regional Studies

Herbert J. Ellison, Chairperson

The Russian and East European regional program is designed for students who wish to pursue concentrated study of these regions within an interdisciplinary framework. The curriculum covers most aspects of the historical and contemporary development of Russia, the Soviet Union, and Eastern Europe.

Bachelor of Arts Degree

Major Requirements: *Russian Option:* 30 credits or equivalent Russian language; SISRE 243, 324, 343, 457; 15 credits in 300- and 400-level courses in selected discipline of the area; 15 credits in 300- and 400-level courses on Russia in social sciences and humanities, approved by the program advisers. *East European Option:* 30 credits or equivalent in one East European language (Bulgarian, Czech, Hungarian, Polish, Romanian, or Serbo-Croatian); SISRE 220, 344, 458; 15 credits in 300- and 400-level courses in selected discipline of the area; 20 credits in 300- and 400-level courses on eastern Europe in social sciences and humanities as approved by the program adviser.

South Asian Studies

Frank F. Conlon, Chairperson

The South Asian Studies program combines language instruction with history and interdisciplinary area training for students interested in Bangladesh, India, Nepal, Pakistan, Sri Lanka, or Tibet.

Bachelor of Arts Degree

Major Requirements: 30 credits or equivalent in one of the languages of South Asia (Hindi, Sanskrit, Tamil, or Tibetan); HSTAS 201, 202; SISSA 498; 30 credits in the area in one of the following disciplines—anthropology, comparative religion, economics, history, linguistics, philosophy, or political science

Graduate Program

School of International Studies

The Jackson School offers four specialization tracks that lead to a Master of Arts in International Studies. These specialization tracks are East Asian Studies, Middle Eastern Studies, Russian and East European Studies, and South Asian Studies. Specific requirements vary from one program to another, but all stress interdisciplinary study within the context of the historical cultures, contemporary situations, and languages of the four world areas.

The Jackson School also offers a general International Studies track in the Master of Arts degree program that concentrates on the interaction of international economic, political, and cultural processes with states and societies around the world. In addition, the Jackson School offers a specialization track in comparative religion for the Master of Arts in International Studies degree. Within this track it is possible to develop major concentrations in Buddhism, Hinduism, Islam, Christianity, or religion and culture, in addition to a required core of more general courses and the possibility of minor concentrations in Greco-Roman religions, Judaism, and East Asian indigenous traditions.

Admission Requirements: Applicants must meet the requirements of the Graduate School. An undergraduate grade-point average of 3.00 in the junior and senior years is normally a prerequisite for admission. Submission of the scores of the aptitude section (verbal and quantitative) of the Graduate Record Examination is required for the East Asian and South Asian programs and the Comparative Religion program and is strongly recommended for the Russian and East European program.

Financial Aid: Financial support is available in the form of Title VI National Resource Fellowships. Graduate students are also eligible for a limited number of teaching or research assistantships and readerships through discipline departments.

East Asian Studies

Nicholas R. Lardy, Chairperson, Chinese Regional Studies

Kozo Yamamura, Chairperson, Japanese Regional Studies

Jack Dull, Graduate Program Coordinator and Chairperson, Korean Regional Studies

The East Asian Studies program is offered by faculty members from a number of disciplines cooperating within the Jackson School. Two-year regional programs in China, Japan, and Korea lead to the Master of Arts in International Studies degree. These programs are designed to prepare students with Bachelor of Arts degrees in a discipline for careers in government, journalism, business, or teaching, or as a transition to a doctoral program. Programs are structured to permit each student a maximum of individual faculty guidance plus group participation with other graduate students.

Admission Requirements

See above under School of International Studies.

Graduation Requirements

Chinese Regional: Chinese language training through the third year; 26 credits, of which 8 must be at the 500 level or above; SISEA 521-522; two seminar papers or a thesis; comprehensive oral examination.

Japanese Regional: Japanese language training through the third year (15 credits minimum training at this university); 26 credits, of which 8 must be at the 500 level or above; SISEA 555 and 559; essay of distinction; comprehensive oral examination.

Korean Regional: Korean language through the second year of instruction; 36 credits, of which 18 must be at the 500 level or above, including HSTAS 481, 482, POL S 544, and one graduate seminar in Korean history (either HSTAS 585 or HSTAS 582-583-584); essay of distinction or two seminar papers; comprehensive oral examination.

Financial Aid

National Resource Fellowships offering tuition and a stipend are available for all East Asian programs. Japan Endowment Fellowships for Japanese Studies and Gowen Fellowships, Hsiao Fellowships, Fritz Fellowships, and Jackson Fellowships for Chinese Studies also offer scholarship assistance. Research assistantships and teaching assistantships are occasionally available through individual members of the program faculty.

Research Facilities

Research and training facilities include the East Asia library, with a comprehensive collection of manuscripts, books, and serials on China, Japan, and Korea. The University is affiliated with the Inter-University Program for Chinese Language Studies in Taipei, language programs in the People's Republic of China sponsored by the Council on International Educational Exchange, and the Inter-University Center for Japanese Language Studies in Yokohama, which provide intensive language training for advanced undergraduate and graduate students. The school has ongoing projects on China, Japan, and Korea in which advanced graduate students and recognized scholars from the United States and foreign institutions regularly participate.

Correspondence and Information

Graduate Program Coordinator
300 Thomson, DR-05

International Studies

Joel S. Migdal, Chairperson and Graduate Program Coordinator

The Master of Arts in International Studies degree program provides students with broad knowledge and

skills in analyzing international affairs. Designed for students entering a variety of professional fields, the program trains them in international and comparative studies in a multidisciplinary setting. Students are prepared to undertake sophisticated analyses of international affairs and typically will hold positions after graduation with the international divisions of federal and state governments, international divisions of banks, trading companies, policy study institutes, corporations with international operations, and international development and educational organizations. The program usually entails concurrent enrollment in a graduate professional degree program and adds approximately one year to the student's course of study (see admission requirements below).

Admission Requirements

In addition to meeting the requirements of the Jackson School of International Studies, candidates are preferred who demonstrate previous professional experience and education or who enroll concurrently in another graduate or professional degree program. Arrangements have been made with the Graduate School of Business Administration, the Graduate School of Public Affairs, the Institute for Marine Studies, the College of Forest Resources, the School of Law, and School of Public Health and Community Medicine for such concurrent degrees. Applicants must have completed introductory-level micro- and macroeconomics courses and, preferably, an intermediate-level economics course. Prior study of a foreign language is highly recommended.

Graduation Requirements

36 credits, of which 18 must be at the 500 level or above. Students are required to take a series of core courses (SIS 500, 501, and 502—9 credits total), and complete two other fields (three classes of at least 3 credits each) from the following areas: a regional studies field, a functional field, a topical series field, or a special topics field. A practicum course in international studies (6 credits), which involves writing formats, document location and analysis, and methodologies in the study of international affairs, also is required, as is a graduate course in economic theory (3 credits). Students take an oral examination emphasizing the three fields of specialization; each student also must submit two seminar papers in program courses, which will be presented to the Master of Arts examining committee. All students must demonstrate a practical proficiency in a relevant modern language. Depending on the choice of language, this constitutes two to three years of college-level course work. Credit received from language courses is not counted toward satisfaction of degree requirements. Students in concurrent graduate degree programs also must meet Graduate School requirements for the second degree (please see Graduate School Memorandum No. 35, "Concurrent Degree Programs").

Correspondence and Information

Graduate Program Coordinator
303 Thomson, DR-05

Middle Eastern Studies

Jere L. Bacharach, Chairperson

The Middle East program is designed for students who wish to study the region within an interdisciplinary framework, focusing especially on the social, political, economic, and legal structure of the Middle East. A student is normally expected to complete the program in two years and one summer. Students interested in the M.A. in International Studies degree emphasizing literature and other humanistic aspects of the Middle East should inquire about the program in the Department of Near Eastern Languages and Civilization.

Admission Requirements

Admission requirements include a statement of purpose; a sample of written work; three letters of recom-

mendation, of which at least two must attest to scholarly ability. Although knowledge of a Near Eastern language is not a prerequisite for admission, applicants are generally expected to have had at least the equivalent of one year's study of the language in which they plan to concentrate. Students with no language training may wish to begin their language program in an intensive summer program.

Graduation Requirements

The Graduate School requires a minimum of 36 credits. The Middle Eastern Studies program requires at least two 5-credit or three 3-credit language courses beyond the second-year level (native as well as non-native speakers); N E 210 or HST 261 as a 400-level reading course if neither was taken while an undergraduate; three courses on Middle East, with at least two of the following disciplines represented—history, political science, international studies; N E 430/RELIG 430, N E 432/LAW B 543 or an advanced course related to modern literature, culture, or religious developments; one approved SIS-prefix course; two courses in one social science discipline or two courses in a professional school other than courses taken for preceding requirements; SISME 530, 531, and 532 or a program-sponsored seminar; 1 credit per quarter of N E 600. *Thesis option:* 9 credits of SISME 700. *Examination option:* submission of two seminar papers and a four-hour examination to be set by the supervisory committee.

Correspondence and Information

Chairperson
335 Thomson, DR-05

Russian and East European Studies

Herbert J. Ellison, Chairperson and Graduate Program Coordinator

The Russian and East European Studies programs may be completed in two years. Designed primarily for students with B.A. degrees in a discipline, the programs offer a background for professional pursuits in government, journalism, business, or teaching, or for those who plan to take advanced graduate study leading to the Ph.D. degree in a discipline. The program includes language training, a concentration of study in a chosen discipline, and a combination of courses in other disciplines that focus on the region.

Admission Requirements

See above under School of International Studies. Also *Russian Studies*—six quarters in Russian language (the equivalent of 30 credits); *East European Studies*—six quarters (equivalent of 30 credits) in one foreign language, either an East European language or one appropriate to the student's area interest (Russian, German, Ottoman Turkic, or French).

Graduation Requirements

39 credits in interdisciplinary course work (other than language) as follows: 15 or 20 credits in area-oriented courses in the discipline(s) or topic of concentration (at least 9 credits at the 500 level or above); 10 or 15 credits in at least two additional disciplines; 9 credits of thesis. Written examination; oral interdisciplinary examination on the area of specialization; thesis. *Russian Regional Option.* Instruction in Russian through the fourth year (30 credits required for admission). *East European Option—Knowledge of two languages* (30 credits required for admission), one of which must be a language of the area (exclusive of French, German, or Russian); the second language may be either an additional language of the area or a nonarea language that is useful to the area of concentration. Language competence in two languages may be satisfied either by passing the Language Proficiency Test or by the equivalent of two years' training (30 credits for each language).

Research Facilities

The University of Washington is one of the major centers for research in Russia and eastern Europe. In addition to extensive holdings in Russian language materials, the library has works in all major languages of eastern Europe.

Correspondence and Information

Graduate Program Coordinator
503 Thomson, DR-05

South Asian Studies

Frank F. Conlon, Chairperson and Graduate Program Coordinator

The South Asian Studies program has been designed for (1) students who have completed the Bachelor of Arts degree and are qualified to pursue graduate study, whose career objectives involve teaching and research, who plan to specialize in a traditional discipline but whose geographical area of interest lies within South Asia (i.e., India, Pakistan, Sri Lanka (Ceylon), Bangladesh, Nepal, and Tibet); (2) students planning to enter certain professional training programs at the graduate level (e.g., education, business administration, journalism, law, or public affairs) and whose career objectives are oriented toward South Asia; (3) students planning a career in government service (e.g., the diplomatic corps) and who wish to acquire a special understanding of the South Asia area. Through a cooperative program with the University of British Columbia, students may participate in South Asia courses offered by the UBC graduate faculty.

Admission Requirements

See above under School of International Studies.

Graduation Requirements

Training in a South Asia language through the third year. In addition, 45 credits of other academic instruction: SISSA 510 and 511 (5 credits each); 18 credits directly related to the study of South Asia chosen in consultation with adviser; electives: 10 credits. Up to 7 of the language credits at the 400 level may be applied toward fulfillment of the M.A. degree requirements. Two seminar papers in lieu of a master's thesis. Comprehensive oral examination.

Research Facilities

The University of Washington library holds an extensive collection of books and serials relating to South Asia. The library is a participant in the U.S. Library of Congress Public Law 480 program, which supplies current publications from India, Pakistan, and Sri Lanka (Ceylon). The library is also a member of the South Asian Microfilm Program of the Center for Research Libraries, which provides access to a large collection of microfilm newspapers, journals, and documents on South Asia.

Correspondence and Information

Graduate Program Coordinator
311 Thomson, DR-05

Faculty**Director**

Kenneth B. Pyle

Professors

Alden, Dauril,* 1959, (History),† M.A., 1952, Ph.D., 1959, California (Berkeley); Latin American history, comparative colonial history.

Augerot, James E.* 1969, (Linguistics), (Slavic Languages and Literature),† M.A., 1959, New Mexico Highland; Ph.D., 1968, Washington; Slavic linguistics, Romanian, Bulgarian.

Beckmann, George M.* 1969, Ph.D., 1952, Stanford; modern East Asian history.

Boba, Imre,* 1962, (History),† Ph.D., 1962, Washington; Russian and East European history.

Brass, Paul R.* 1965, (Political Science),† M.A., 1959, Ph.D., 1964, Chicago; South Asia.

Butow, Robert J. C.* 1960, (History),† A.M., 1948, Ph.D., 1953, Stanford; East Asian diplomatic history.

Chan, Hok-lam,* 1972, (Asian Languages and Literature, History), M.A., 1963, Hong Kong; M.A., 1965, Ph.D., 1967, Princeton; late Imperial Chinese history.

Chirot, Daniel,* 1974, (Sociology),† Ph.D., 1973, Columbia; modernization, political sociology, peasant societies.

Conlon, Frank F.* 1968, (History),† M.A., 1963, Ph.D., 1969, Minnesota; South Asia.

Ellison, Herbert J.* 1968, (History),† M.A., 1952, Washington; Ph.D., 1955, London; modern Russian history.

Haney, Jack A. V.* 1967, (Slavic Languages and Literature),† M.A., 1971, D.Phil., 1971, Oxford (England); medieval Russian literature, Slavic folklore.

Hanley, Susan B.* 1972, (History), M.A., 1964, Ph.D., 1971, Yale; premodern Japanese history.

Hellmann, Donald C.* 1967, (Political Science),† M.A., 1960, Ph.D., 1964, California (Berkeley); Japanese politics and international relations.

Jackson, W. A. Douglas,* 1955, (Environmental Studies), (Geography),† M.A., 1949, Toronto; Ph.D., 1953, Maryland; Russian geography.

Kapetanac, Davor,* 1972, (Slavic Languages and Literature),† M.A., 1954, D.Sc., 1972, Zagreb (Yugoslavia); Serbo-Croatian language, Yugoslavian literature.

Lardy, Nicholas R.* 1983, (Economics), Ph.D., 1975, Michigan; economics, Chinese economy.

Legters, Lyman H.* 1966, (Education), M.A., 1956, Boston; Ph.D., 1958, Free University (Berlin); Russian and East European studies.

Mah, Feng-hwa,* 1961, (Emeritus), (Economics),† A.M., 1956, Ph.D., 1959, Michigan; Chinese economy and foreign trade.

Micklesen, Lew R.* 1966, (Linguistics), (Slavic Languages and Literature),† Ph.D., 1951, Harvard; Slavic linguistics.

Migdal, Joel S.* 1980, (Political Science), M.A., 1968, Ph.D., 1972, Harvard; political science, international political economy.

Palais, James B.* 1968, (History),† M.A., 1960, Yale; Ph.D., 1968, Harvard; modern Korean history.

Perry, Elizabeth J.* 1978, (Political Science), M.A., 1971, Washington; Ph.D., 1978, Michigan; peasants and politics of China.

Potter, Karl H.* 1971, (Asian Languages and Literature), (Philosophy),† M.A., 1952, Ph.D., 1955, Harvard; South Asia.

Pyle, Kenneth B.* 1965, (History),† Ph.D., 1965, Johns Hopkins; modern Japanese history.

Spector, Ivar, 1931, (Emeritus), M.A., 1926, Northwestern; Ph.D., 1928, Chicago; Russian civilization.

Sugar, Peter,* 1959, (History),† M.A., 1956, Ph.D., 1959, Princeton; political and economic history of eastern Europe and Near East since the eighteenth century.

Taylor, George E., 1939, (Emeritus), M.A., 1928, D.Litt., 1957, Birmingham (England); East Asian studies.

Townsend, James R.* 1968, (Political Science),† M.A., 1957, Ph.D., 1965, California (Berkeley); Chinese government and politics.

Treadgold, Donald W.* 1949, (History),† M.A., 1947, Harvard; D.Phil., 1950, Oxford (England); modern Russian and Chinese history.

Webb, Eugene,* 1966, (English), (Comparative Literature),† M.A., 1962, Ph.D., 1965, Columbia; comparative literature, comparative religion.

Wittfogel, Karl A., 1947, (Emeritus), Ph.D., 1928, Frankfurt (Germany); Chinese history.

Yamamura, Kozo,* 1970, (Economics, Marketing and International Business), M.A., 1962, Ph.D., 1964, Northwestern; economic development and economic history of Japan, comparative economic history.

Associate Professors

Coats, Herbert S.* 1968, (Linguistics), (Slavic Languages and Literature),† M.A., 1964, Fordham; Ph.D., 1970, Illinois; Russian phonology and syntax, Slavic accentuation.

Dull, Jack L.* 1963, (History),† M.A., 1960, Ph.D., 1966, Washington; early Imperial Chinese history.

Harrell, Stevan,* 1974, (Anthropology),† M.A., 1971, Ph.D., 1974, Stanford; Chinese anthropology and society.

Jaffee, Martin S., 1987, ‡(Near Eastern Languages and Civilization), M.A., 1974, Florida State; Ph.D., 1980, Brown; Judaism in late antiquity.

Jones, Christopher R., 1984, M.A., 1969, Ph.D., 1975, Harvard; political science, Soviet foreign policy.

Kakiuchi, George H.* 1957, (Geography),† M.A., 1953, Ph.D., 1957, Michigan; geography of Japan.

Kieval, Hillel J., 1980, (History),† A.M., 1975, Ph.D., 1981, Harvard; modern Jewish history, Central and East European history.

Konick, Willis A.* 1961, (Comparative Literature, Slavic Languages and Literature),† M.A., 1954, Ph.D., 1964, Washington; modern Russian literature and language.

Kramer, Karl D.* 1971, (Comparative Literature, Slavic Languages and Literature),† M.A., 1957, Ph.D., 1964, Washington; late nineteenth-century Russian prose.

Pozanski, Kazimierz Z.* 1987, ‡(Economics), M.A., 1969, Ph.D., 1974, Warsaw; international trade, comparative economic systems, technological change.

Swayze, E. Harold,* 1963, (Slavic Languages and Literature),† M.A., 1954, Ph.D., 1959, Harvard; Soviet literature.

Waugh, Daniel C.* 1972, (History),† A.M., 1965, Ph.D., 1972, Harvard; medieval Russian history.

West, James D.* 1972, (Slavic Languages and Literature),† M.A., 1969, Ph.D., 1970, Cambridge; Russian and Soviet poetry and prose, Russian translation.

Williams, Michael A.* 1976, M.A., 1970, Miami; Ph.D., 1977, Harvard; early Christianity and religions of antiquity.

Assistant Professors

Gupta, Akhil, 1987, S.M., 1979, Massachusetts Institute of Technology; Ph.D., 1988, Stanford; political economy, anthropology, South Asia.

Guy, R. Kent,* 1980, (History),† M.A., 1974, Ph.D., 1981, Harvard; modern Chinese history.

Kasaba, Resat,* 1985, (Sociology), M.A., 1979, Ph.D., 1985, State University of New York (Binghamton); political economy of the world system and the Middle East.

Lavelly, William R.* 1985, (Sociology),† M.A., 1977, California (Berkeley); Ph.D., 1982, Michigan; demography, family, Chinese society.

Ramat, Pedro,* 1983, (History), M.A., 1974, Arkansas; Ph.D., 1981, California (Los Angeles); political science, Soviet and East European studies.

Lecturers

Ellings, Richard J., 1986, M.A., 1976, Ph.D., 1983, Washington; international relations and American foreign policy.

Haney, Barbara M., 1981, M.A., 1967, Ph.D., 1971, Washington; USSR, historical geography.

Lerner, Lawrence W., 1981, M.A., 1969, Southern California; Ph.D., 1976, Washington; Russian history.

Ryland, Shane, 1986, M.A., 1966, Ph.D., 1970, Duke; M.P.H., 1983, Washington; South Asia, population studies, international health.

Course Descriptions

Courses for Undergraduates

General

SIS 200 States and Capitalism: The Origins of the Modern Global System (5) A *Chirot, Kasaba, Migdal* Origins of the modern state system and of the world market in Europe. Interacting forces of politics and economics around the globe from the sixteenth century until World War II.

SIS 201 Introduction to International Political Economy (5) W *Migdal* International political economy through the examination of major facets of the post-World War II era. Analyzes the new postwar economic order and its crises in the 1970s and 1980s, North-South relations, the postwar political order and its East-West rivalry.

SIS 202 Cultural Interactions in an Interdependent World (5) Sp *Guy, Harrell, Perry* Cultural interaction among societies and civilizations, particularly Western versus non-Western. Intellectual, cultural, social, and artistic aspects; historical factors.

SIS 221 The Problem of Nuclear Arms I (3) Jones Properties and effects of nuclear weapons; delivery and command systems, interplay between technical and political factors in issues involving nuclear weapons systems, arms control, and proposals to reduce risk of nuclear war. Joint with ENV S 221.

SIS 222 The Problem of Nuclear Arms II (3) Jones Military-political nuclear weapons policies of U.S.A., USSR, France, Britain, China, India, and potential nuclear powers. Bilateral and multilateral arms control agreements and ongoing negotiations. Strategic implications of ballistic missile defense. Joint with ENV S 222. Recommended: 221.

SIS 301 War (5) Chirot Origins and conduct of war; readings from anthropology, political science, economics, and history, as well as novels and some recent works on the arms-control controversy. Modern forms of warfare, including guerrilla war, world war, and nuclear war. Joint with SOC 301.

SIS 302 Intercultural Relations (5) Webb Perspectives on foreign cultures through literary example. Interdisciplinary approaches to the study of culture as such and problems of intercultural relations. Prerequisite: 202 or ANTH 202.

SIS 330 Political Economy of Development (5) Poznanski Growth, income distribution, and economic development in less-developed countries today. Policies concerning trade, industrialization, the agricultural sector, human resources, and financing of development. Prerequisites: ECON 200, 201.

SIS 332 Political Economy of International Trade and Finance (5) Poznanski Theoretical and historical analysis to explore the causes and effects of the rise and decline of four major international trade and monetary regimes. Foundations and emerging features of the new international trade and monetary regime and its implications for the world economy.

SIS 335 Geography of the Developing World (5) Haney Characteristics and causes, external and internal, of Third World development and obstacles to that development. Special attention to demographic and agricultural patterns, resource development, industrialization, and urbanization, drawing on specific case studies from Asia, Africa, and Latin America. Joint with GEOG 335.

SIS 340 Comparative Communism (5) Ramet Nature of politics under communism, focusing on Soviet Union, China, Yugoslavia, and one other communist country. Relates communism to the broader subject of revolutionary transformation. Prerequisite: one previous course in international studies, political science, or history.

SIS 348 Alternative Routes to Modernity (5) Guy, Waugh Routes to modernity followed by non-Western societies between 1600 and 1900. Historical experiences of non-Western societies seen in the context of European history and of development theory. Emphasizes primary sources and techniques for posing theoretical questions of historical data. Joint with HSTAS 348.

SIS 355 Social Change in Latin America (5) Van den Bergh Problems of development and dependency in Latin America. Relations of power and production between social classes and ethnic groups, with special emphasis on Mesoamerica (Mexico, Guatemala) and the Andes (Peru, Bolivia). Joint with SOC 355. Prerequisite: introductory course in sociology, anthropology, political science, economics, or International Studies.

SIS 356 Canadian Society (5) Origins to the present in its North American setting; political development, cultural evolution, and emergence of multinationalism; economic base; arts and literature; problems of the environment; Canadian foreign relations.

SIS 375 Geopolitics (5) Jackson Spatial aspects of international politics, with attention to perceptions of national space, the way states organize territory, and the strategic use of geography to advance state goals. Joint with GEOG 375. Prerequisite: GEOG 100 or an introductory course in International Studies.

SIS 390 Political Economy of Industrialized Nations (5) Theoretical bases of various political-economic systems of industrialized nations. Several major issues these political economies currently face; usefulness and limits of economic analyses within broader perspective of political economy. Prerequisites: ECON 200, 201.

SIS 397 Junior Honors Seminar (5) Sp Intensive consideration of major works in international studies, with emphasis on the development of critical reading and writing skills. Required of honors candidates. Prerequisite: admission to honors program in International Studies.

SIS 401 International Political Economy (5) A Establishment, maintenance, and decay of the post-1945 international economic order. Political economy of international trade, monetary relations, inflation, and North-South relations. Prerequisites: 330 or 332, or ECON 370 or 391, or both ECON 300 and 301.

SIS 405 Political Economy of Religious Institutions (5) Sp Dull Comparative study of Buddhist, Taoist, Christian, and Islamic religious institutions as political and economic phenomena. Impact of wealth and power on religious institutions or religious ideas. Temporal coverage from the formative period to the present. Prerequisite: one course on China, Japan, Middle East, or Europe.

SIS 421 National Security and International Affairs (5) Jones Major military aspects of contemporary international politics. Uses and limitations of military capabilities for sustaining a stable international order and national security. Processes by which states detect and assess threats to their security; practice of deterrence; transfer of arms among states; pursuit of arms control. Recommended: course work in international relations.

SIS 422 The United States in the Contemporary International System (5) Hellmann United States in the world: ways in which international circumstances shape the political-strategic, economic, and cultural di-

mensions of America's policy. Case studies from post-1945 period. Recommended: background course work in international relations or American foreign policy.

SIS 426 World Politics (5) Modelski Nation-state system and its alternatives; world distributions of preferences and power; structures of international authority; historical world societies and their politics. Joint with POL S 426.

SIS 440 History of Communism (5) Ellison, Ramet Communism from its origins in Bolshevik faction of Russian social democracy to the present, treating the development of the ideology, the various communist parties, and the communist status. Joint with HSTEU 440. Prerequisites: two courses in modern European history or politics.

SIS 444 Peasants in Politics (5) Perry Interdisciplinary study of peasants, with special attention to questions of rural transformation. Peasant involvement in an increasingly independent world. Rebellion and revolution, impact of the international market, agricultural development. Joint with POL S 446.

SIS 448 Franklin D. Roosevelt and His World, 1882-1945 (5) Butow Life and times of the thirty-second President of the United States, with emphasis on American foreign relations—especially the role he played in the emergence of the United States as a world power. Joint with HST 448.

SIS 455 Industry and the State (5) Builds on states and markets approach of 200 and 201 through specific examination of effects of industry and industrial structure on political outcomes and roles of state. Emphasis on late-developing and newly developing economies: Japan, the two Koreas, Taiwan, China, Brazil, Mexico. Prerequisites: 200, 201.

SIS 456 State-Society Relations in Third World Countries (5) Kasaba, Migdal, Townsend Relationships among political, social, and economic changes in Asia, Africa, and Latin America. Problems of economic and political development, revolution and reform, state-society relations, imperialism and dependency. Joint with POL S 450.

SIS 467 Nations and States in the Modern World (5) Sugar, Treadgold Development of national consciousness in the "old nations" of Europe before the French Revolution. Replacement by the new nationalism and its spread into East Central Europe, Russia, Ibero-America, Asia, and Africa. Joint with HST 467.

SIS 475 Geography of International Relations (5) Jackson Selected problems of spatial patterns and dynamic relationships. Geographical problems of regional, national, and international organization. Joint with GEOG 475. Prerequisite: GEOG 375 or permission of instructor.

SIS 490 Special Topics (1-5, max. 15) AWSp Content varies from quarter to quarter. Prerequisite: permission of instructor.

SIS 491- Senior Honors Seminar (5-) A Study of issues related to students' thesis topics. Develops thesis-writing skills. Open only to International Studies honors students.

SIS 492 Senior Honors Seminar (5-) W Students write a senior thesis working with their individual writing advisers.

SIS 495 Task Force (5) W Small-group seminars address current problems in international affairs, each focusing on one specific policy question and producing a joint task force report. Restricted to senior majors in International Studies. Prerequisites: 200, 201, 202, 401.

SIS 498 Readings in International Studies (5) Reading and discussion of selected works of major importance in interdisciplinary international studies. Prerequisites: 200, 201, 202 and acceptance as a major in International Studies.

SIS 499 Undergraduate Research (3-5, max. 15) AWSp Prerequisite: permission of instructor.

African Studies

SISAF 444 African Studies Seminar (3, max. 9) Sp Interdisciplinary seminar focusing upon one particular aspect of the African continent. Emphasis may be humanistic, social scientific, or historical. African Studies faculty and visiting scholars lecture on areas of their own expertise.

SISAF 490 Special Topics (1-5, max. 15) AWSp Content varies. Prerequisites: three courses in the area.

SISAF 499 Undergraduate Research (3-5, max. 15) AWSp *Beaumann, Eastman, Ottenberg, Van den Bergh, Winans* Prerequisite: permission of instructor.

Chinese Regional Studies

SISEA 101 Contemporary China (5) Sp *Perry, Townsend* Concentrates on the post-1949 evolution of Chinese government, economy, society, and culture.

SISEA 234 Man, Morality, and the State in Chinese History (5) Concepts of Chinese civilization in its various stages from Confucius's time to the present. Morally based political philosophy of Confucianism with other conflicting or complementary views of man and state (e.g., Taoism, Chinese Marxism).

SISEA 235 Southeast Asian Civilization: Buddhist and Vietnamese (5) *Keyes* Civilizations of Theravada Buddhist societies in Burma, Thailand, Cambodia, and Laos, and Vietnamese societies of Southeast Asia. Culture of tribal peoples who live on peripheries of these societies. Cultural transformations consequent upon the war in Indochina and resettlement of Indochinese refugees in United States. Joint with ANTH 235.

SISEA 240 Chinese Civilization (5) Sp *Dull* China's material civilization—including fine arts, literature, religion, and thought—in relation to general development of Chinese society.

SISEA 314 Societies and Cultures of Insular Southeast Asia (5) Cultural, political, economic traditions of insular Southeast Asia, Indonesia, Malaysia, the Philippines. Early Indianized states; growing influence of Islam; Western European conquests; developed colonial societies, their legacies; modern nationalism, problems faced by newly independent states; important cultural continuities. Joint with ANTH 314. Prerequisite: one 200-level International Studies or anthropology course.

SISEA 330 The United States in Eastern Asia, 1784-1945 (5) A *Butow* The United States in eastern Asia from the arrival of the first American vessel at Canton to the end of the war in the Pacific, with emphasis on the Far Eastern policy of the United States during the first four decades of the twentieth century. Joint with HST 330.

SISEA 419 Asian Marxist Thought (3) Theory and practice of Marxist-Leninism in Asia from 1920 to present. Emphasizes the relation of Asian Marxist thought to the specific domestic and international conditions of the time and to the classical ideas of Marx and Lenin. Prerequisite: one course from either the nineteenth- or twentieth-century Marxism series or a course in modern Asian politics or history.

SISEA 424 Perspectives on East Asia for Teachers (3, max. 6) Substantive concepts, resources, and materials employed in teaching about East Asia. Requirements may vary in relation to the background of participants.

SISEA 443 Traditional Chinese Society (5) A *Harrell* Late traditional (Ming-Qing) China as a social system. Systematic analysis of temporal and spatial varia-

tion in family, kinship, local organization, social class, government, and antigovernment activity. Joint with ANTH 403. Prerequisite: ANTH 202, HSTAS 454, graduate standing or permission of instructor.

SISEA 444 Contemporary Chinese Society (5) W *Harrell* Society in the People's Republic of China as a product of traditional Chinese society and the changes wrought upon it by the impact of the West and by the revolutionary policies and practices of the Chinese Communist Party. Joint with ANTH 444. Prerequisite: 443 or ANTH 403 or permission of instructor.

SISEA 445 Religion in China (5) Sp *Harrell* Religion in Chinese society, doctrines, practices, and social consequences of the eclectic folk religion, the elite Confucian, Taoist, and Buddhist traditions, syncretistic sects, and imported Christianity. Joint with ANTH 447. Prerequisite: one course in Chinese society, politics, or history, or permission of instructor.

SISEA 446 Political Development in East Asia (5) Perry Comparative examination of political development in Japan and China from the nineteenth century to the present. Emphasis on theories of development and their applicability to the East Asian context. Prerequisite: one course in Chinese or Japanese history or in political development, or permission of instructor.

SISEA 455 Undergraduate Colloquium on China (5) Interdisciplinary study of China, with emphasis on the modern period. Prerequisite: permission of instructor.

SISEA 464 Contemporary Society in the People's Republic of China (5) *Lavelly* Separate evolution of rural and urban institutions of China since 1949. Nature of rural-urban relations. Reasons for divergence of Chinese rural and urban societies, including economic systems and control of mobility. Joint with SOC 464. Prerequisite: SOC 110 or HSTAS 454 or permission of instructor.

SISEA 488 China's Economic Reforms: Integration Into World Economy (5) *Lardy* A systematic survey of China's economic reforms since 1978, including China's increasing integration into world economy. Joint with ECON 488. Prerequisites: ECON 390 or 493 or permission of instructor.

SISEA 490 Special Topics (1-5, max. 15) AWSp Course content varies. Prerequisites: three courses in the area.

SISEA 499 Undergraduate Research (3-5, max. 15)

Comparative Religion

RELIG 201 Introduction to World Religions: Western Traditions (5) AWS *Jaffee, Webb, Williams* History of religions, concentrating on religious traditions that have developed west of the Indus. Primary attention to the Semitic religions (Judaism, Christianity, Islam) and to their ancient world background with emphasis on basic conceptual and symbolic structures.

RELIG 202 Introduction to World Religions: Eastern Traditions (5) W *Conlon, Cox* History of religions, concentrating on religions that have developed in South Asia and East Asia. Primary attention to Hinduism and Buddhism; other important Asian religions are discussed in relation to them, with emphasis on basic conceptual and symbolic structures.

RELIG 203 Comparing Religions (5) The world's major religious traditions. Major points of comparison: scripture, doctrine, ritual, religious community, the individual. Detailed investigation of a single theme in comparative perspective.

RELIG 210 Introduction to Judaism (5) A *Jaffee, Kieval* Basic ideas and motifs of Judaism: God, Covenant, Law, Life Cycle (birth, marriage, family life, sexual laws, role of women, death); Cycle of the Year (Sabbath, holidays, festivals); Holy Land, prayer, Messianism.

RELIG 220 Introduction to the New Testament (5) AS *Williams* Modern scholarly methods of research and analysis in dealing with New Testament books and their interpretation. Genres of various books (gospel, epistle, sacred history, apocalypse); problems of the relationships among author, material, and intended audience; relationships between theme and image.

RELIG 301 Religious Thought Since the Middle Ages (5) *Webb* Development of religious thought in the West from the Middle Ages to the twentieth century. History of focal ideas: God, man, knowledge, and authority during this period and the relation of changes in these ideas to the ways in which basic issues in religious thought have been conceived. Recommended: 201.

RELIG 310 Judaism From the Babylonian Exile to the Dead Sea Scrolls (5) *Jaffee* Religion of Israel from Babylonian exile to the normative religion of the rabbis and transition from Israelite religion to Judaism. Includes revelation and covenant; prophets and authority; priests and the temple; emergence of "sacred scripture," wisdom literature; Hellenism; apocalyptic and Messianic sects; the Dead Sea Scrolls; Roman rule and exile.

RELIG 311 Jewish Religious Thought From Philo to Maimonides (5) *Jaffee* Jewish religious thought—legal and philosophic—first to thirteenth centuries of the Common era. Evolution and consolidation of rabbinic Judaism; emergence and flowering of Jewish philosophy, including the contributions of Philo, Saadia, Judah ha-Levi, and Maimonides. Continuity and change within the tradition.

RELIG 313 Jewish Mystical Traditions: Kabbalah and Its Influence (5) *Jaffee* Jewish esoteric thought from Rabbi Moses Cordovero. Emergence of Safed as a center of this thought. The thought of Isaac Luria and its immense influence in Jewish history through other movements—specifically the mystical messiah. Sabbetal Sevi, and the rise of Hasidism. Recommended: 201 or 210.

RELIG 315 Modern Jewish Thought (5) *Kieval* Jewish thought since the mid-eighteenth century, focusing on major intellectual encounters between Judaism and the modern world. Includes impact of the European enlightenment; reform, conservatism, and neoorthodoxy; Jewish nationalism; and responses to the Holocaust in postwar Jewish thought. Recommended: 201 or 210.

RELIG 320 The World of the Early Church (5) W or Sp *Williams* Early Christian church within the context of the Greco-Roman sociopolitical, philosophical, and religious environment. Covers the period from about A.D. 100 to 300. Christian thinkers and documents studied include both the classical "orthodox" and the "heretical." Recommended: 201 or 220, or HST 307.

RELIG 321 The Age of St. Augustine (5) Sp *Williams* Christian church in the fourth and fifth centuries as a major institution in the Roman Empire. Great figures of patristic theology, such as Athanasius, Gregory Nazianzus, Gregory of Nyssa, and Augustine. Recommended: 201 or 320, or HST 307.

RELIG 322 The Gospels and Jesus of Nazareth (5) *Williams* Gospel material from early Christianity, including both canonical and noncanonical gospels. Relation of gospels to analogous literature from the Hellenistic-Roman period. Recommended: 220 or ENGL 309.

RELIG 327 Eastern Christian Traditions (5) *Ramet, Webb* Eastern Christian traditions, with principal focus on Eastern Orthodox tradition in Byzantium and Russia from time of the Council of Nicea to the twentieth century. Considers significant differences between eastern and western Christianity and their doctrinal and cultural origins; explores distinctive features of eastern tradition. Prerequisite: 201 or HST 307.

RELIG 349 Religious Movements: The Sociology of Cults and Sects (3) Sp Stark Understanding religion, what it is and what it does. Examines the formation of new religious movements, cults, and sects and the conditions under which they succeed or fail. Joint with SOC 349. Prerequisite: SOC 110.

RELIG 350 Buddhism and Society: The Theravada Buddhist Tradition in South and Southeast Asia (5) A Keyes Religious tradition of Theravada Buddhism (as practiced in Sri Lanka, Burma, Thailand, Laos, and Cambodia). Variations in ethical orientations developed through Theravada Buddhist ideas. Joint with ANTH 352. Recommended: 202 or knowledge of one Eastern religious tradition.

RELIG 352 Hinduism (5) Sp Entwistle Varieties of Hindu religious practice; the diverse patterns of religious thought and action among contemporary Hindus. Includes ritual behavior, village Hinduism, tantra, sadhus, yoga, sects, the major gods and their mythologies, religious art, and the adjustments of Hinduism to modernity. Recommended: 202 or other study of South Asian culture.

RELIG 354 Buddhism (3) Cox Buddhism as a religious way and as a way of thinking; the forms of Buddhism known in South Asia (India, Sri Lanka, etc.) and those introduced from there to Tibet and other parts of Central Asia. Includes the "Three Jewels" (i.e., the Buddha or Awakened Person, the Teaching [Dharma], and Community [Sangha]) around which Buddhism is traditionally articulated. Recommended: 202 or other study of Asian culture.

RELIG 380 The Nature of Religion and Its Study (5) W or Sp Webb Study of religion as a general human phenomenon. Manner in which different methods of inquiry (phenomenology, anthropology, sociology, psychology, literary criticism, archaeology, philosophy, theology, etc.) illuminate different aspects of religion and help to shape our conceptions of its nature. Recommended: 201 or 202 or other course in the history of religious traditions.

RELIG 428 Gnosticism and Early Christianity (5) W or Sp Williams Impact of Gnosticism on the development of Christianity and several other religious groups of that period. Readings dating from the first through the third centuries A.D. Recommended: 201 or 220, or HST 307.

RELIG 428 Modern Christian Theology (5) Modern Protestant and Catholic thought since the nineteenth century: Kierkegaard, Barth, Bultmann, Rahner, Lonergan, and other major figures. Prerequisite: 301.

RELIG 430 Islam (5) W Religious and cultural milieu of Arabia before Muhammad; Muhammad's call and struggles to establish the new faith; Qur'anic content and style; Western and Muslim scholarship and the Qur'an; place of traditions in the Islamic edifice; Muslim political and religious thought; sources of Muslim religious law; and modern Muslim movements. In English. Joint with N E 430.

RELIG 445 Greek and Roman Religion (3) Harmon, Langdon Religion in social life of Greeks and Romans; emphasis on their public rituals and festivals. Priesthoods, personal piety, rituals of purification and healing, and the conflict of religions in the early Roman Empire. Joint with CLAS 445. Prerequisite: one course in ancient history, classics, or religious studies; 201 preferred.

RELIG 490 Special Topics (1-5, max. 15) Topics vary with each offering. Prerequisites: 380 and permission of instructor.

RELIG 491 Seminar: Topics and Issues in Judaism (5) Topics vary. Recommended: 210.

RELIG 492 Seminar: Topics in Early Christianity (5) Williams Topics vary. Recommended: one course in early Christian history or literature.

RELIG 499 Undergraduate Research (1-5, max. 15) AWSp Primarily for comparative religion majors and majors in the School of International Studies. Prerequisite: permission of instructor.

Japanese Regional Studies

SISEA 241 Japanese Civilization (5) Hanley Japan's civilization, including fine arts, literature, economic institutions, legal system, material culture, social organization, religions, and government, in relation to the development of Japan as a society and nation.

SISEA 419 Asian Marxist Thought (3) (See Chinese Regional Studies for course description.)

SISEA 440 The Emergence of Postwar Japan (5) A Hellmann, Pyle, Yamamura The making of modern Japan; World War II and surrender; American occupation; postoccupation rebuilding; emergence as an industrial power.

SISEA 441 Economic and Social History of Japan to 1900 (5) A Hanley, Yamamura Lecture-seminar on Japanese economic and social history from 700 to 1900. Analyses of the rise and disintegration of the *shoen* system, the rise of commerce, the development of the monetary system, changes in the living standard, demographic changes, and the early phases of industrialization. Political and cultural developments as related to economic and social change. (Taught with 541.)

SISEA 442 Political Economy of Postwar Japan (5) Political and economic problems of Japan since 1945. Utility of competing theoretical approaches to analysis of government and economy of Japan. Policy-making processes and effects of policies adopted. Some knowledge of postwar Japan desirable. Recommended: 440.

SISEA 448 Political Development in East Asia (5) Perry Comparative examination of political development in Japan and China from the nineteenth century to the present. Theories of development and their applicability to the East Asian context. Prerequisite: one course in Chinese or Japanese history or in political development, or permission of instructor.

SISEA 451 Undergraduate Colloquium on Japan (5) Interdisciplinary study of Japan with emphasis on the modern period.

SISEA 475 Japanese Society (5) Hanley Discusses rapidly changing Japanese society and history of its unique aspects. Readings and lectures in sociology, anthropology, economics, and politics; emphasis on Japanese search for cultural identity and prevalent interpretations of Japanese society and behavior. Prerequisite: 241, HSTAS 213, or background in Japan studies.

SISEA 490 Special Topics (1-5, max. 15) AWSp Topics vary.

SISEA 499 Undergraduate Research (3-5, max. 15) AWSp

Jewish Studies

(See also Comparative Religion and Near Eastern Languages and Civilization.)

SISJE 250 The Jews in Western Civilization (5) Kieval Jewish historical experience in Mediterranean and European world from ancient Greece to modern-day Israel. Condition of Jewish life in the larger societies of which Jews have always formed a part. Areas of contact between the Jewish and Gentile worlds. Joint with HST 250.

SISJE 369 The Destruction of European Jewry, 1933-45 (3 or 5) Kieval History of anti-Semitism; dimensions of the Holocaust; the Holocaust organization and the victims' responses; reaction of world to events in Europe, allied policies, refugee policy, and American actions. Legal, historical, and sociological questions raised by these events. Joint with HSTEU 369.

SISJE 421 Hebrew Biblical Commentaries (3) Jaffee Examines Biblical commentaries of rabbinic and medieval period in Judaism, covering issues of major importance in such stories as sacrifice of Isaac, the Exodus, the golden calf. Includes selections from the midrash, Rashi, Ibn Ezra, Maimonides, Nahmanides. Joint with HEBR 421. Prerequisites: HEBR 323 or permission of instructor.

SISJE 464 The Jews in Spanish History (3 or 5) Ullman Sephardic Jews in Spanish politics, economy, and culture, emphasizing the medieval Golden Age and the Inquisition. Joint with HSTEU 464.

SISJE 465 The Jews of Eastern Europe (5) Kieval Jewish society in Poland, Russia, the Habsburg Lands, and Romania from the late Middle Ages to the Holocaust. Joint with HSTEU 465. Recommended: introductory course in European or Jewish history.

SISJE 467 Medieval Jewish History (5) Stacey Social and intellectual history of the Jews in Western Europe to fifteenth century. Jews under Islam and Christianity; the church and the Jews; the Crusades and their legacy; intellectual achievements; conflict and cooperation. Joint with HSTEU 467.

SISJE 468 Early Modern Jewish History, 1492-1789 (5) Kieval Jews in the early-modern period. The Spanish expulsion in 1492 to the onset of political and social emancipation in western Europe and America. Joint with HSTEU 468. Recommended: introductory course in European or Jewish history.

SISJE 469 Modern Jewish History, 1770-1948 (5) Kieval History of the Jews from the era of the Enlightenment and the French Revolution to the founding of the state of Israel. Joint with HSTEU 469. Recommended: introductory course in European or Jewish history.

SISJE 490 Special Topics (1-5, max. 15) AWSp Content varies.

SISJE 499 Undergraduate Research (3-5, max. 15) AWSp Prerequisite: permission of instructor.

Korean Regional Studies

SISEA 210 The Far East in the Modern World (5) Social, economic, and political problems of China, Japan, Korea, and Southeast Asia. Development of Russia as an Asiatic power as well as the role of Western powers in the Far East.

SISEA 212 History of Korean Civilization (5) From earliest times to present. Development of Korean society and culture in terms of government organization, social and economic change, literature, art. Joint with HSTAS 212.

SISEA 330 The United States in Eastern Asia, 1784-1945 (5) A Butow The United States in eastern Asia from the arrival of the first American vessel at Canton to the end of the war in the Pacific, with emphasis on the Far Eastern policy of the United States during the first four decades of the twentieth century. Joint with HST 330.

SISEA 419 Asian Marxist Thought (3) (See Chinese Regional Studies for course description.)

SISEA 424 Perspectives on East Asia for Teachers (3, max. 6) Examination and evaluation of substantive concepts, resources, and materials employed in teaching about East Asia. Requirements may vary in relation to the background of participants.

SISEA 439 Politics of Korea (5) AW Korean politics in the twentieth century, treating political legacy of ancient regime, colonial period, Korean War, and the politics of North and South Korea. Comparative treatment of both Koreas in light of the Chinese and Japanese experience. Includes the America-Korea relationship. Joint with POL S 439. Recommended: 210 or equivalent.

SISEA 446 Political Development in East Asia (5) *Perry* Comparative examination of political development in Japan and China from the nineteenth century to the present. Theories of development and their applicability to the East Asian context. Prerequisite: one course in Chinese or Japanese history or in political development, or permission of instructor.

SISEA 480 Special Topics (1-5, max. 15) Topics vary. Prerequisites: three courses in the area.

SISEA 499 Undergraduate Research (3-5, max. 15)

Middle Eastern Studies

SISME 210 Introduction to Islamic Civilization (5) *A Siddiq* Major developments in Islamic civilization from advent of Islam in seventh century to present. Islamic history, law, theology, and mysticism, as well as the politics, cultures, and literatures of the various Islamic societies. Joint with N E 210.

SISME 430 Economic Development of the Middle East (5) *Kasaba* Comparative examination of economic development in the Middle East. Includes population growth, agrarian change, industrialization, foreign trade, capital flows, and fiscal and monetary policies.

SISME 431 Political Economy of Middle Eastern Petroleum (5) *Kasaba* Role of Middle Eastern oil-exporting countries, international oil companies, and major oil-consuming nations in determination of supply and demand in the world petroleum market. Impact of oil upon economies of oil-exporting countries and the world economy.

SISME 432 The Middle East and the World Economy (5) *Kasaba* Early nineteenth century to the 1980s. Production and export of agricultural and raw materials, extension of loans and investments by Europeans, commercial exploitation and export of oil as major phases of economic interaction. These phases and their political repercussions; their significance and consequences.

SISME 490 Special Topics (1-5, max. 15) Content varies.

Russian and East European Regional Studies

RUSSIAN PROGRAM

SISRE 140 Russia From the Tenth Century to the Present (5) *Waugh* Russian political, social, and economic history from the tenth century to the present. Joint with HST 140.

SISRE 243 Russian Civilization (5) *Lerner, Waugh* Russia's civilization, including fine arts, literature, religion, and history; political, social, and legal institutions and thought in relation to the general development of Russian society from early times to 1917.

SISRE 248 Multiethnic States in the Soviet Union and Eastern Europe (5) *Boba* Nationality and multiethnic problems in the Soviet Union and East European states. Relevance and irrelevance of Marxist theory as applied to this problem.

SISRE 324 Soviet Society (5) *Ellison, Lerner* Political, economic, and social institutions, and the literature and fine arts of the Soviet Union.

SISRE 327 Dissent in the Soviet Bloc (5) *Legters* Phenomenon of widespread dissent in the USSR and countries of eastern Europe. Sources of dissident sentiment and the overall significance of dissent, both for states of the Soviet bloc and the world at large. Contemporary scene; historical antecedents.

SISRE 343 Interdisciplinary Seminar on Russia (5) Bridges the two basic requirements of the Russian Regional Studies baccalaureate program. Study in depth of two short periods in Russian history. Prerequisites: 243, two years of Russian language, and permission of Russian and East European undergraduate adviser.

SISRE 375 Turkic Peoples of the Soviet Union (3) *Cirtautas* History of the Turkic peoples, A.D. 552 to present. Emphasis on current status of Turkic peoples in USSR. Geographical distribution, demographic data, reactions and adaptations to changes resulting from the 1917 revolution. Turkic viewpoint on past and present developments.

SISRE 378 Russia and Asia (3) *Waugh* Russian expansion into Central Asia. Russian and Soviet policies toward nationalities and relations with adjacent Asian countries.

SISRE 401, 402, 403 History of Marxist Thought (5,5,5) A,W,Sp *Legters* 401, 402: teachings of Marx and Engels in the nineteenth century. Analysis of Marxism as a doctrine. 403: developments in Marxist thought since 1917. Emphasis on neo-Marxist theory in Europe. Prerequisite: permission of instructor.

SISRE 405 Peoples of the Soviet Union (5) W Traditional culture and social organization of Russians and some other USSR peoples, including larger nationalities (e.g., Ukrainians, Estonians) and some smaller ethnic groups in Siberia. Role of traditional culture in shaping contemporary lifestyles in a multiethnic, diversified setting. Joint with ANTH 405. Prerequisite: ANTH 202 or permission of instructor.

SISRE 410 Writers and Intellectuals of Soviet Central Asia (3) Covers modern native writers and intellectuals of Soviet central Asia and compares them with writers educated before the revolution. Prerequisite: 375 or permission of instructor.

SISRE 415 Soviet Marxism (5) *Legters* Social and intellectual process leading to a Soviet variant of Marxism; reception of Marxism in Russia and the revolutionary movement formed in its wake. Relationship between the revolution and the major spokesmen for Soviet Marxism. Prerequisite: 401, 402, or 403.

SISRE 416 Soviet Asia (5) Population, settlement, resource-use problems, agriculture, and industrialization of Soviet Asia, and the USSR's relations with its Asiatic neighbors.

SISRE 424 The Soviet Military at Home and Abroad (5) Sp *Jones* Red army in Civil War of 1918-21, federal organization of USSR (1922-38), collectivization and industrialization. Soviet military as instrument for political socialization of Russian and non-Russian populations, and as factor in Soviet economy and research and development. Internal and external functions of Soviet military alliance system in Europe and the Third World.

SISRE 425 Ethnicity and Nationality in the USSR (5) Creation of the Soviet Union: Leninist and Stalinist approaches to the "national question." Contemporary processes of ethnic assimilation and dissimilation. Formation of national elites, rise of various forms of nationalism, position of religion in national cultures. Specific cases include Russian nationalism, Islam in Central Asia. Joint with ANTH 425.

SISRE 450 Survey of the Cultures of the Turkic Peoples of the Soviet Union (3) A *Cirtautas* The nomadic and sedentary cultures of the Turkic peoples' cultural life (language, literature, adherence to traditional modes of life) under Soviet Russia's dominance.

SISRE 455 Marine Resource Policy of the Soviet Bloc (3) A *Kaczynski* Criteria applied by communist states in developing a strategy of ocean resource use and management. Problems and choices influencing communist ocean policy; areas of conflict with other ocean interests, including those of the West and developing countries. Joint with IMS 455. Prerequisites: understanding of communist bloc economic and political systems and approval of instructor.

SISRE 457 Undergraduate Colloquium on Russia (5) Interdisciplinary study of Russia, with emphasis on the historical period. Required of all undergraduate Russian Regional Studies majors. Prerequisite: permission of instructor.

SISRE 490 Special Topics (1-5, max. 15) AWSp Topics vary. Prerequisites: three courses in the area.

SISRE 499 Undergraduate Research (3-5, max. 15) AWSp

EAST EUROPEAN PROGRAM

SISRE 220 Introduction to East European Studies (5) Geographic setting, ethnic composition, religions, cultural patterns, economic problems, social and political institutions of eastern Europe in the past and present.

SISRE 248 Multiethnic States in the Soviet Union and Eastern Europe (5) *Boba* Nationality and multiethnic problems in the Soviet Union and East European states. Relevance and irrelevance of Marxist theory as applied to this problem.

SISRE 344 Interdisciplinary Seminar on Eastern Europe Today (5) Development of eastern Europe since 1948, responses of an economically and culturally diverse group of states to the imposition of the Soviet political and social system.

SISRE 347 Governments of Eastern Europe (5) W *Ramel* Survey of the Communist regimes of Poland, Hungary, Czechoslovakia, East Germany, and the Balkans. Joint with POL S 347.

SISRE 458 Undergraduate Colloquium on East Europe (5) Interdisciplinary study of eastern Europe. Prerequisite: permission of instructor.

SISRE 490 Special Topics (1-5, max. 15) Topics vary. Prerequisites: three courses in the area.

SISRE 499 Undergraduate Research (3-5, max. 15) AWSp

South Asian Studies

SISSA 210 Introduction to Indian Thought (5) Three major themes in Indian thought—time, truth, and temptation—as expressed in classical Hindu and Buddhist texts, and in traditional and modern art and drama. Field trips, films.

SISSA 386 Introduction to the Philosophical Systems of India (5) A *Potter* Fundamental views of classical Indian philosophical schools on epistemology and metaphysics through readings in translation of basic works. Nyaya, Vaisheshika, Samkhya, Yoga, Jain philosophy, Vijnanavada and Madhyamika Buddhism, Advaita Vedanta, and later developments. Joint with PHIL 386. Prerequisite: 210 or one course in philosophy.

SISSA 417 Political Economy of India (5) *Brass* Analysis of relationships among processes of economic change, political institutions, and structures of political power in contemporary India. Includes contrasting approaches to Indian economic development, land reform, radical and agrarian political movements, and role of foreign aid. Joint with POL S 417.

SISSA 434 International Relations of South Asia (5) Interrelationships of domestic, interstate, and extraregional forces and their effects upon the resolution or expansion of interstate conflicts in South Asia. Joint with POL S 434.

SISSA 490 Special Topics (1-5) Topics vary. Prerequisites: three courses in South Asia area or permission of instructor.

SISSA 498 Undergraduate Colloquium on South Asia (5) Interrelationship of the various social science disciplines in the study of South Asian history and culture. Prerequisite: permission of instructor.

SISSA 499 Undergraduate Research (3-5, max. 15) AWSp

Courses for Graduates Only

General

SIS 500 Seminar: Origins of the Modern Global System (3) A *Kasaba, Migdal* Development of global interdependence from the fifteenth century to World

War II. Interrelationship of politics and economics. International political economy from contextual, institutional, and historical perspectives.

SIS 501 Seminar: International Political Economy (3) W Lardy, Poznanski Institutional and historical perspective on the international political economy, focusing on the developing interrelationship of politics and economics. Prerequisites: ECON 200, 201.

SIS 502 Seminar: Change and Stability in International Affairs (3) Sp Jones Examines major differences in the nature of cultural and economic adaptation to the challenge of the West, as well as the tensions these differences have generated within particular societies. Regional phenomena in the context of powerful international forces.

SIS 511-512 Practicum: Methods in International Studies (3-3) W, Sp Gupta, Kasaba, Ryland Assumptions underlying leading methodologies for comparative study of societies and other large-scale social entities. Quantitative and nonquantitative methods illustrated by recent research. Recommended: course in introductory statistics.

SIS 590 Special Topics (2-5, max. 10) AWSp Seminar. Course content varies. Offered occasionally by visiting or resident faculty.

SIS 600 Independent Study or Research (*) AWSps

Chinese Regional Studies

ISEA 521-522 Seminar: Introduction to the Interdisciplinary Study of China (5-5) W, Sp Harrell, Perry, Townsend

ISEA 530 Seminar on China (3, max. 6) AWSp Chan, Dull, Harrell Problems of Chinese history. Prerequisite: permission of instructor.

ISEA 531 Chinese History: Research Methods and Bibliographic Guides (3, max. 6) Chan Introductory research seminar dealing with the methodological and bibliographical problems concerning all periods and aspects of Chinese history from the earliest times to the nineteenth century. Prerequisite: two years of classical or modern Chinese.

ISEA 543 Law in East Asia: China (3) Introduction to the basic institutions and processes of the Chinese legal system. Development and role of law in both the traditional and contemporary periods. Joint with LAW B 541.

ISEA 553 Chinese Legal Tradition (3) A Chan, Haley Concepts and principles of the legal tradition in China. Draws on primary and secondary sources in English and, for students with Chinese language competence, traces the concept and development of Chinese law as well as legal institutions in Chinese society. Joint with LAW B 553.

ISEA 564 Demographic Issues in the People's Republic of China (3-5) Lavelly Focuses on recently released demographic data to provide insights into China's recent social and economic history, regional variation, and prospects for social change. Demographic indicators of health, education, family structure, and fertility to assess the extent and character of regional variation in China. Joint with SOC 534.

ISEA 590 Special Topics (5, max. 10) AWSp Seminar. Course content varies. Offered occasionally by visiting or resident faculty.

ISEA 600 Independent Study or Research (*) AWSp

ISEA 700 Master's Thesis (*) AWSp

Comparative Religion

RELIG 501 Approaches to the Study of Religion (5) Major approaches employed by modern scholarship in the study of religion, including historical, phe-

nomenological, anthropological, sociological, and psychological. Prerequisite: admission to the comparative religion M.A. track or permission of instructor.

RELIG 502 Religion in Comparative Perspective (5) Analysis of selected theme or symbol(s) in relation to several different religious traditions. Topics vary. Prerequisite: admission to the comparative religion M.A. track or permission of instructor.

RELIG 600 Independent Study or Research (*)

Japanese Regional Studies

ISEA 540 Law in East Asia: Japan (3) Haley Basic institutions and processes of the Japanese legal system. Historical development and traditional role of law, reception of Western law, and cultural and structural factors that influence the function of law and legal institutions. Joint with LAW B 540.

ISEA 541 Economic and Social History of Japan to 1900 (5) A Hanley, Yamamura Analyses of the rise and disintegration of the *shoen* landholding system, the rise of commerce and industrialization, the development of the monetary system, demographic changes, urbanization. Economic and social change through empirical examination and social science techniques. Prerequisite: previous course work in Japanese history or economic history, or permission of instructor. Not open to students who have taken 441.

ISEA 548 Japanese Administrative Law (3) Haley Japanese public law system. Organization and role of bureaucracy in formulating, carrying out national policy; legal principles governing procedural, decision-making aspects; role of judiciary, judicial review. Introduces students with Japanese to basic sources for legal research. Open to students without Japanese. Joint with LAW B 548.

ISEA 555 Introduction to Modern Japanese Studies (3-6) Hanley Interdisciplinary introduction to the study of Japan.

ISEA 559 Interdisciplinary Seminar on Japan (5) Yamamura Research seminar, with emphasis on Japan's modern development and contemporary problems. Prerequisite: JAPAN 313 or equivalent.

ISEA 590 Special Topics (5, max. 10) AWSp Seminar. Course content varies. Offered occasionally by visiting or resident faculty.

ISEA 600 Independent Study or Research (*) AWSp

ISEA 700 Master's Thesis (*) AWSp

Korean Regional Studies

ISEA 600 Independent Study or Research (*) AWSp

ISEA 700 Master's Thesis (*) AWSp

Middle Eastern Studies

SISME 530, 531, 532 Reading Seminar on Middle East Studies (2,2,2) Middle Eastern historiography, Islamic law, Islamic theology, relations between the Middle East and the world economy, political structures, social movements in the Middle East.

SISME 590 Special Topics (3-5, max. 10) Content varies.

SISME 600 Independent Study or Research (*)

SISME 700 Master's Thesis (*)

Russian and East European Regional Studies

RUSSIAN PROGRAM

SISRE 500 Interdisciplinary Research Seminar (*) Contemporary problems in the societal, political, and economic development of Russia and East Europe.

Seminars are devoted to specific topics, such as comparative cultures and ethnic minorities; economic development and environmental degradation; comparative communism; and problems of a similar interdisciplinary nature. Prerequisite: permission of instructor.

SISRE 508 Seminar: Problems in the Study of Marxism (3-5, max. 15) AWSp Legters Investigation of the deeper and more complex historical and philosophical problems encountered in understanding Marxist thought of the nineteenth and twentieth centuries. Prerequisites: 401, 402, 403, or equivalent in other departments.

SISRE 555 Soviet Ocean Policy (3) W Kaczynski Problems of Soviet ocean policy and challenge of Soviet ocean expansion. How Soviet navy, fishing fleet, merchant marine, ocean research capability, and network of overseas land support bases have put USSR in front rank of military powers. Joint with IMS 555. Prerequisite: permission of instructor.

SISRE 590 Special Topics (5, max. 10) AWSp Course content varies. Offered occasionally by visitors or resident faculty.

SISRE 600 Independent Study or Research (*) AWSp

SISRE 700 Master's Thesis (*) AWSp

EAST EUROPEAN PROGRAM

SISRE 500 Interdisciplinary Research Seminar (*) Contemporary problems in the societal, political, and economic development of Russia and East Europe. Seminars are devoted to specific topics, such as comparative cultures and ethnic minorities; economic development and environmental degradation; comparative communism; and problems of a similar interdisciplinary nature. Prerequisite: permission of instructor.

SISRE 504 Approaches to East European Politics (3-5) W Selected concepts and methodologies useful for the analysis of politics and social structure in the socialist countries of east-central and southeastern Europe. Joint with POL S 537. Prerequisite: permission of instructor.

SISRE 505 Seminar: Problems of Social and Political Development in Eastern Europe (3-6) Research seminar dealing with selected problems of continuity and change in eastern Europe. Prerequisite: some previous course work on eastern Europe.

SISRE 600 Independent Study or Research (*) AWSp

SISRE 700 Master's Thesis (*) AWSp

South Asian Studies

SISSA 510 Introduction to Interdisciplinary Study of South Asia (5) Examines work done in the various disciplines focusing on South Asia.

SISSA 511 Seminar on South Asia (5) Interdisciplinary seminar for graduate students in which research and writing on individual research topics are critically developed. Designed to provide each student with an opportunity to synthesize his or her studies on South Asia. Prerequisite: 510 or permission of graduate program coordinator.

SISSA 590 Special Topics (5, max. 10) AWSp Seminar. Course content varies. Offered occasionally by visitors or resident faculty.

SISSA 600 Independent Study or Research (*) AWSp

SISSA 700 Master's Thesis (*) AWSp

Japanese Regional Studies

See *International Studies*.

Jewish Studies

See *International Studies*.

Korean Regional Studies

See *International Studies*.

Linguistics

A210 Padelford

Linguistics is the scientific study of language, which is one of the most characteristic human attributes. In contrast with other disciplines concerned with languages, linguistics deals with languages from the point of view of their internal structure as cognitive systems. Courses provide training in the method and theory of language analysis and description, as well as studies of language change and genetic relationships.

Undergraduate Program

Sol Saporta, Adviser
A210E Padelford

Bachelor of Arts Degree

Major Requirements: LING 200 or 400; 451, 452; 442 or 453 or 463; 461, 462; at least one year of a non-Indo-European language; at least one year of an Indo-European language; 20 credits of courses in linguistics or of related courses in other departments as listed in the Department of Linguistics office.

Graduate Program

Heles Contreras, Graduate Program Coordinator
A210F Padelford

The Department of Linguistics offers programs of studies for graduate students leading to the degrees of Master of Arts and Doctor of Philosophy. The program is administered by the departmental faculty.

The major interest of the core faculty lies in theoretical linguistics: syntax, semantics, and phonology. One of the core faculty members is the Supervisory Committee chairperson for each doctoral candidate.

In addition to syntax, phonology, semantics, and historical linguistics, some course work is available in various cooperating departments. Among those fields represented outside the department are anthropological linguistics; applied linguistics; computational linguistics; Chinese, English, Germanic, Japanese, and Korean linguistics; sociolinguistics; linguistic philosophy; psycholinguistics; Romance linguistics; Scandinavian linguistics; Semitic linguistics; Slavic linguistics; South-east Asian linguistics; and speech and phonetics.

Admission Requirements: At least one previous course in linguistics is highly recommended, as is proficiency in one language other than the student's native language. Three letters of recommendation. Graduate Record Examination scores are required for doctoral degree applicants, recommended for master's degree applicants. Doctoral degree applicants should send the department a copy of their master's thesis or a paper of high quality, or both.

Master of Arts Degree

Familiarity with one foreign language, usually a non-Indo-European language. 27 credits of course work are recommended in the core areas of syntax, phonology, semantics, and historical linguistics. At least 9 of these credits must be at the 500 level; 9 credits in LING 700; total credits, 36. In each of three core areas of linguistics and a specialized area, candidates must pass an examination question, do a research paper, or receive a 3.60 grade-point average in three courses numbered 401 or above; thesis. For the semantics or historical area, the student need show successful performance in only one of these subjects but must take at least one course in the area not chosen.

Doctor of Philosophy Degree

Direct admission to the Ph.D. program will be considered on an individual basis for applicants holding a degree from a comparable M.A. thesis program in linguistics or a closely related field. In addition to fulfilling the normal Ph.D. requirements, those admitted directly to the Ph.D. program must also, in each of three core areas of linguistics, either pass an examination question, do a research paper, or receive a 3.60 grade-point average in three courses numbered 401 or above.

Requirements for the Ph.D. degree are: 27 additional credits of course work, including two units in LING 599. Students who receive high pass on the M.A. examination or papers and who are exempted from writing an M.A. thesis will substitute 9 additional credits of course work in lieu of the M.A. thesis credits. 27 credits in LING 800; total credits, 54; supervised teaching; oral General Examination; Final Examination and a dissertation.

Faculty

Chairperson

Ellen M. Kaisse

Professors

Augerot, James E.,* 1969, ‡(Slavic Languages and Literature, International Studies), M.A., 1959, New Mexico Highlands; Ph.D., 1968, Washington; Slavic linguistics, Romanian, Bulgarian.

Brame, Michael K.,* 1971, Ph.D., 1970, Massachusetts Institute of Technology; syntax, phonology, structure of Arabic and English.

Contreras, Heles,* 1964, (Romance Languages and Literature), M.A., 1959, Ph.D., 1961, Indiana; Spanish linguistics, syntax, semantics.

Eastman, Carol M.,* 1967, ‡(Anthropology, Women Studies), Ph.D., 1967, Wisconsin; language and culture, sociolinguistics, and language planning.

Emonds, Joseph E.,* 1979, M.A., 1964, Kansas; Ph.D., 1970, Massachusetts Institute of Technology; syntax, structure of English and French.

Micklesen, Law R.,* 1966, ‡(International Studies, Slavic Languages and Literature), Ph.D., 1951, Harvard; Slavic linguistics.

Newmeyer, Frederick J.,* 1969, M.A., 1967, Rochester; Ph.D., 1969, Illinois; syntax, structure of English, language and society, history of linguistics.

Saporta, Sol,* 1960, (Romance Languages and Literature), ‡ M.A., 1952, Ph.D., 1955, Illinois; language and society, sociology of science, Spanish linguistics.

Schiffman, Harold F.,* 1967, ‡(Anthropology, Asian Languages and Literature), M.A., 1966, Ph.D., 1969, Chicago; Dravidian language and linguistics, sociolinguistic and language policy, phonetics.

Voyles, Joseph B.,* 1965, ‡(Germanics), M.A., 1962, Ph.D., 1965, Indiana; general and historical Germanic linguistics.

Associate Professors

Coats, Herbert S.,* 1968, ‡(International Studies, Slavic Languages and Literature), M.A., 1964, Fordham; Ph.D., 1970, Illinois; Slavic linguistics.

Dale, Philip S.,* 1968, ‡(Psychology, Speech and Hearing Sciences), M.A., 1964, M.S., 1966, Ph.D., 1968, Michigan; psycholinguistics, language development and disorder, cognitive development.

Kaisse, Ellen M.,* 1976, Ph.D., 1977, Harvard; phonology, historical linguistics, ancient and modern Greek, syntax-phonology interface.

Lukoff, Fred,* 1964, ‡(Asian Languages and Literature), M.A., 1948, Ph.D., 1954, Pennsylvania; Korean language and linguistics.

Shapiro, Michael C.,* 1970, ‡(Asian Languages and Literature, International Studies), M.A., 1970, Ph.D., 1974, Chicago; Indo-Aryan languages and linguistics.

Assistant Professor

ter Meulen, Alice,* 1984, Ph.D., 1980, Stanford; formal semantics.

Course Descriptions

Courses for Undergraduates

LING 200 Introduction to Linguistics (5) Language as the fundamental characteristic of the human species; diversity and complexity of human languages; phonological and grammatical analysis; dimensions of language use; language and writing; impact of historical linguistics on contemporary theory. Not open for credit to students who have taken 400.

LING 201 Language and Mind (5) Background and scope of modern linguistics; behaviorist *versus* rationalist theories of language; universal and cognitive aspects of language structure; interplay of genetic and social factors in language formation; linguistic analysis; language, dialect, and culture. Not open for credit to students who have taken 400.

LING 333 Linguistics and Society (3) *Newmeyer, Saporta, Williams* Interaction of language, culture, and society, and the relationship of linguistic theory to societal problems. Ethical and political considerations involved in the application of linguistic theory.

LING 400 Survey of Linguistic Method and Theory (4) Major linguistic theories in phonology, syntax and semantics; linguistic analysis and argumentation. Intended for students who plan to pursue further linguistic or language-related study; not open for credit to students who have taken 200 or 201.

LING 401 Linguistics and Related Disciplines (3) Relation of current work in Chomskyan linguistics to philosophical, psychological, political, and educational thought.

LING 402 Survey of the History of Linguistics (3) *Sp Newmeyer, Shapiro* Main trends in linguistic theory and philosophy of linguistics from ancient times through advent of transformational-generative grammar. Includes nineteenth-century comparative and historical grammar, Prague school grammar, American structuralist grammar, major concerns of linguistics today. Prerequisite: one linguistics course or permission of instructor.

LING 404, 405, 406 Indo-European (3,3,3) *Voyles* Overview of the Indo-European languages, of comparative method, and of the phonology, morphology, and

syntax of reconstructed Indo-European. Grammatical analyses and texts from various attested ancient and modern Indo-European languages, selected according to the interests of the students.

LING 432 Sociolinguistics (3) Sp *Eastman, Schiffman, Williams* Social variation in the phonology, morphology, syntax, lexicon of languages and dialects. Nonstandard language, diglossia, pidgins and creoles, gender differences, bi- and multilingualism, ethnography of speaking, pragmatics, and language attitudes. Joint with ANTH 432. Prerequisite: 400; recommended: prior or concurrent registration in 451 or permission of instructor.

LING 433 Language Policy and Cultural Identity (3) *Eastman, Schiffman* Decision making regarding language in sociopolitical contexts. Language and ethnicity, educational policy, use of language in developing nations. Plans to modernize, purify, standardize, reform, and revive language. Language loyalty and motives for second-language acquisition. Joint with ANTH 464. Prerequisite: 200 or 400.

LING 441 Linguistics and Poetic Language (3) Relationship between linguistic structures, linguistic universals, and the poetic uses of language; linguistic description in the analysis of literature. Prerequisite: 400 or permission of instructor.

LING 442 Introduction to Semantics (4) *ter Meulen* Semantic analysis and theory of meaning and interpretation of language. Relation of semantics to syntax and phonology, psycholinguistics, and language acquisition. Comparison of various linguistic theories of meaning. Prerequisite: 200 or 400.

LING 443 Philosophy and Linguistics (3) Philosophical problems that arise in the attempt to understand current linguistic theories and the implications of linguistics for philosophy. Joint with PHIL 443.

LING 444 Philosophy of Language—Pragmatics (3) *Potter* Language as communicative activity. Speech act theory in Austin, Grice, and contemporary writings. Applications to problems of reference, presupposition, metaphor, relativism. Joint with PHIL 444.

LING 445 Descriptive Aspects of English as a Foreign Language (3) W Linguistic analysis as a basis for the teaching of English as a foreign language; language as rule-governed behavior. Prerequisite: 200 or 400 or permission of instructor.

LING 447 Language Development (4) A *Dale* First-language acquisition and use by children. Emphasis on theoretical issues and research techniques. Joint with PSYCH 457. Prerequisites: 400 or PSYCH 306, and senior or graduate standing.

LING 449 Second-Language Learning (3) Sp Issues related to the psychological aspects of second-language learning. Prerequisite: 200 or 400 or permission of instructor.

LING 451, 452, 453 Phonology I, II, III (4,4,4) A,W,Sp *Contreras, Hargus, Kaisse, Saporta* Speech sounds, mechanism of their production, and structuring of sounds in languages; generative view of phonology. Joint with ANTH 451, 452, 453. Prerequisite: 200 or 400, either of which may be taken concurrently with 451.

LING 454 Methods in Comparative Linguistics (3) *Klausenburger, Shapiro, Voyles* Method and theory of historical and comparative linguistics. Problems of phonological, morphological, syntactic, and semantic change and reconstruction. Prerequisite: 400 or permission of instructor, undergraduate adviser, or graduate program coordinator.

LING 455 Areal Linguistics (3, max. 6) *Eastman* Issues involved in classification of languages. Systems of classification based on structure, word order, areal features. Ways in which languages may be classified for different purposes. Processes such as borrowing, vocabulary specialization, lexical change, language death and revival. Joint with ANTH 455.

LING 461, 462, 463 Syntax I, II, III (4,4,4) A,W,Sp *Brame, Contreras, Emonds, Newmeyer* Study of the structural properties of language; introduction to generative transformational syntax. Joint with ANTH 461, 462, 463. Prerequisite: 200 or 400 or permission of instructor.

LING 476 Philosophy of Language (5) Current theories of meaning, reference, predication, and related concepts. Joint with PHIL 453. Recommended: PHIL 120.

LING 479 Formal Semantics and Natural Language (3) *ter Meulen* Formal characterization of linguistic meaning. Emphasis on nature and purpose of formal semantics and on its relation to formal syntax. Typical topics: Tarskian definitions of truth; "truth theory" and theory of meaning; possible world semantics; Montague semantics; generative semantics; Chomsky on syntax and semantics. Joint with PHIL 479. Recommended: PHIL 120 or 370.

LING 481 Introduction to Morphology (4) *Brame, Kaisse, Newmeyer* Structure of words and the processes by which they are formed. Morphological processes in a wide variety of languages. Prerequisites: 451, 461.

LING 499 Undergraduate Research (1-5) AWSpS

Courses for Graduates Only

LING 501, 502, 503 Linguistic Analysis Laboratory (3,3,3) Guided analysis of a language unfamiliar to all students of the class; construction of a grammar based on material elicited from native informant. Prerequisites: 453, 463, or permission of instructor.

LING 504 Indo-European Comparative Phonology (2) *Kaisse* Sound systems of the principal families of Indo-European and the relation of these to a hypothetical parent tongue. Prerequisite: 406 or permission of instructor. (Offered alternate years.)

LING 505 Indo-European Comparative Grammar (2) Systematic treatment, with extensive surveys of individual language groups. Prerequisite: 504.

LING 514 Seminar in Comparative Linguistics (3) *Kaisse* Nineteenth- and twentieth-century theories of phonological change. Prerequisite: 404 or permission of instructor.

LING 519 Mathematical Models of Grammar (3) *Brame, ter Meulen* Study of some mathematical models of language recognition, emphasizing context-free and context-sensitive grammars. Prerequisite: graduate standing in mathematics, linguistics, or psychology, or permission of instructor.

LING 524 Seminar in Theoretical Linguistics (4, max. 8) Individual and joint research on selected topics in theoretical linguistics. Topics change each quarter. Typical topics are semantics, generative grammar, phonological theories. Prerequisites: 453, 463.

LING 525 Seminar in Theoretical Phonology (4, max. 12) Individual and joint research on selected topics in theoretical phonology. Topics vary. Typical offerings include phonology and the lexicon, syntax and phonology, phonological representations. Prerequisite: 453.

LING 530 Dialectology (3) *Schiffman, Williams* The principles of dialect deviation as related to linguistic structure and usage. Joint with ANTH 530. Prerequisite: 452 or permission of instructor.

LING 540 Phonological Development (3) Selected topics in the developmental sequence of phonological systems in normal-speaking children. Relationships between possible phonological inventories and rule systems in different languages. Joint with SPHSC 540. Prerequisites: 451, 452, or permission of instructor.

LING 541 Syntactic and Semantic Development (3) A *Dale* Selected topics in the study of child language (e.g., cognitive basis of language, early semantic systems, development in language-handicapped children). Topics vary. Joint with SPHSC 541. Prerequisites: one course in child language development and permission of instructor.

LING 550, 551, 552 Advanced Phonology (3,3,3) A,W,Sp *Brame, Kaisse* Problems in phonological theory, generative phonology, phonological change. Theories of prosody. Prerequisites: 451, 452, 453.

LING 553 Analysis of Linguistic Structures (3, max. 6) Syntactic, semantic, and/or phonological analysis. Languages to be analyzed vary. Joint with ANTH 553. Prerequisite: permission of instructor.

LING 561, 562, 563 Advanced Syntax (3,3,3) Advanced study in modern syntactic theory. Topics change each quarter. Typical topics are history of transformational grammar, anaphora, logical form. Prerequisites: 461, 462, 463.

LING 565 Contrastive Linguistics (3) The attempt to look across linguistic systems for comparable and contrastive classes and subclasses. Problems of subcategorization and universal grammar. Three conceptually distinct models: structural, transfer grammar, generative. Prerequisites: 452, 463.

LING 579 Comparative Altaic Linguistics (3) Comparative phonology and morphology of Mongolian, Turkic, and other Altaic languages. Joint with ALTAI 579. Prerequisite: permission of instructor.

LING 580 Problems in Linguistics (3, max. 12) Advanced study in current theories of syntax, semantics, phonology, or morphology. Prerequisite: permission of instructor.

LING 599 Linguistics Colloquium (1, max. 6) AWSp Seminar attended by faculty and graduate students to discuss research in progress and topics of general interest. Attendance is required for a minimum of two quarters during the student's residence. Prerequisite: permission of instructor.

LING 600 Independent Study or Research (*) AWSpS

LING 700 Master's Thesis (*) AWSpS

LING 800 Doctoral Dissertation (*) AWSpS

Mathematics

C138 Padelford

Mathematics is the basic language of physical science, with applications in engineering and business as well as the natural and social sciences. The department has introduced a Mathematical Sciences option in its Bachelor of Science degree program for those students who want to prepare for careers in industry, business, or graduate study in applied mathematics or natural science. For students who want to study mathematics as a discipline in its own right, the department continues to offer the Pure Mathematics option of the B.S. degree. The Bachelor of Arts degree is intended for those students who do not wish to continue studies in either mathematics or a mathematical science.

Undergraduate Program

Caspar Cufel, Director
Sandra Murray, Coordinator
Tina Vicia, Curriculum Adviser
C36 Padelford

In all options, 2.0 or higher grades must be obtained in all mathematics courses presented to satisfy the math-

ematics requirement, and a grade-point average of 2.00 or higher must be obtained in all mathematics courses taken.

Bachelor of Arts Degree

Admission Requirements: MATH 124, 125, 126, and at least one 200- or 300-level mathematics course required for the degree; 2.00 minimum cumulative grade-point average; 2.00 minimum grade-point average in all mathematics courses. Application to the program should be made at the end of the sophomore year.

LIBERAL ARTS OPTION

Major Requirements: A minimum of 50 approved credits in mathematics, including MATH 124, 125, 126; 205 or 302; 238; 328 and 25 additional credits at the 300 level and above. MATH 239 may count toward these 25 credits.

TEACHER PREPARATION OPTION

Major Requirements: 50 approved credits in mathematics, including MATH 124, 125, 126; 205 or 302; 411, 412; 444, 445; STAT 341, 342; either I S 200 or ENGR 141 or equivalent programming experience.

Bachelor of Science Degree

Admission Requirements: A minimum of 45 credits completed, including MATH 124, 125, 126 (or MATH 134, 135, 136); 238; PHYS 121, 122, 123. Application to the program should be made at the end of the sophomore year or the beginning of the junior year.

MATHEMATICAL SCIENCES OPTION

Major Requirements: Option has two components, mathematics and science. *Mathematics component* (minimum of 58 credits) must include the core (34 credits), a track (12 credits), and electives (12 credits). (1) Core: Must include MATH 124, 125, 126 (or 134, 135, 136); 238; 302, 303; 328, 329 (or 334, 335, 336); (2) Track: (choose one of the following four tracks, A-D.) in (A) MATH 239; 424; 425; 427; (B) 239; 424; 427, 428; (C) 394, 395; 402, 403; (D) 394, 395; 424, 425. (3) Electives: 12 credits of courses numbered 301 and higher (excluding 411, 412; 420; 444, 445; 498), and including at least one two-quarter sequence separate from the track and core requirements (i.e., neither of the two courses of the sequence may be used for either the track or core requirement). *Science component* must include (1) PHYS 121, 122, 123 (12 credits); (2) either C SCI 210, 211 (10 credits) or ENGR 141 (4 credits), and (3) 15 approved credits (at the 300 level or above) in the student's chosen area of concentration (must be in an area of natural or social science). Suggested areas of concentration include astronomy, atmospheric sciences, computer science, economics, geophysical sciences, physics, physical chemistry, and statistics. If C SCI 210, 211 are taken, only 12 credits in the area of concentration are required and only 9 credits in the mathematics elective component are required. If computer science is the chosen area of concentration, then (1) the computer science requirement must be satisfied with C SCI 210, 211, and (2) the 12 credits of the area of concentration requirement must include C SCI 373 (autumn), 410 (winter), and either 413 (spring) or 415 (spring). Students contemplating the mathematical sciences option should seek academic advice in C36 Padelford early in the sophomore year or immediately upon transferring to the University. In particular, students who plan to continue with graduate studies will need advice.

PURE MATHEMATICS OPTION

Major Requirements: (1) A minimum of 70 credits in mathematics. Courses must include MATH 124, 125, 126 (or 134, 135, 136); 238, 239; 302, 303, 304; 328, 329 (or 334, 335, 336); 402, 403, 404; 424, 425, 426, 427; 9 credits, including at least one two-quarter sequence chosen from the following: 394, 395; 407, 408; 414, 415; 428, 429; 441, 442, 443; 461, 462, 464, 465, 466. (2) PHYS 121, 122, 123. (3) A computer component such as ENGR 141 or C SCI 210, 211.

Graduate Program

Lutz Bungart, Graduate Program Coordinator

The degrees of Master of Arts, Master of Science, and Doctor of Philosophy are offered. Opportunities are available within the department for study of pure and applied mathematics for each of these degree programs. The two master's degrees are equivalent in rigor and quality, but they serve students with different needs. The Master of Arts degree is appropriate for students who need a broad background in advanced mathematics and who expect to continue working with mathematics of approximately the same level in their careers. A teacher preparation option is offered. The Master of Science degree is appropriate for students who expect to be working with more specialized mathematics of increasing order of complexity in their careers. The Doctor of Philosophy degree is the highest professional degree in mathematics. It is appropriate for students who plan on a career of research and/or teaching of mathematics at the highest levels.

Master of Arts Degree

MATHEMATICS OPTION

Admission Requirement: Bachelor of Arts degree with major in mathematics or equivalent background (minimum of 45 quarter credits, or 30 semester credits of mathematics beyond college algebra).

Graduation Requirements: *With Thesis*—36 credits, including 9 credits of thesis; a minimum of 27 approved credits in courses at the 400 or 500 level with at least 9 credits in courses numbered 500-599.

Without Thesis—36 credits in courses at the 400 or 500 level, of which 18 must be in courses at the 500 level or above. At least 6 credits each in algebra, analysis, and one other field. The 18 credits in courses numbered 500-599 should be distributed over no more than three sequences. Language requirement same as the thesis option.

TEACHER PREPARATION OPTION

Admission Requirement: Baccalaureate degree with background in mathematics.

Graduation Requirements: 36 credits; 33 at the 400 level or above, remaining 3 at the 400 level or above in mathematics or at the 300 level or above in another field; 18 credits must be at the 500 level or above, and at least 15 of these credits must be in mathematics courses; 9 credits must be in thesis. A foreign language is not required.

Master of Science Degree

Admission Requirement: Bachelor of Science degree with major in mathematics, Bachelor of Arts degree with strong major in mathematics or equivalent background.

Graduation Requirements: *With Thesis*—36 credits, including 9 credits of thesis; a minimum of 27 approved credits in courses numbered 400-599, with at least 18 credits in courses numbered 500-599. The courses must include at least 6 credits each in analysis, algebra, and one other field. Demonstration of proficiency in one of three languages—French, German, or Russian. Thesis should contain original research. *Without Thesis*—36 credits from MATH 102, 403, 404; 424, 425, 426; 427, 428, 429; any 500-level mathematics course, AMATH 584, 585, 586; 569. Courses to include 18 credits from MATH 504, 505, 506; 524, 525, 526; 534, 535, 536, and one other three-quarter sequence of advanced 500-level mathematics courses in an area of specialization approved by the graduate program adviser and the chairman of the student's examining committee. Demonstration of proficiency in one of three languages—French, German, Russian. Oral examination in area of specialization in a topic agreed upon by the student and the chairman of the examining committee. The General Examination for the doctorate may be substituted.

Numerical Analysis/Optimization Option—36 credits from MATH 424, 425, 426; 427, 428, 429; 438, 439; 461, 462; 491, 492; AMATH 584, 585, 586; 569, any 500-level mathematics course. Courses to include 18 credits at the 500 level with at least 12 credits from 594-599 (Numerical Analysis Option) or 514, 518; 509 (Optimization Option). Oral examination in a special topic agreed upon by the student and the chairman of the student's examining committee.

Doctor of Philosophy Degree

Admission Requirement: Mathematical training equivalent to a master's degree in mathematics.

Graduation Requirements: Satisfactory performance in MATH 504, 505; 524, 525; 534, 535; a set of preliminary exams on basic graduate material; General Examination on a special topic; demonstration of proficiency in one of the following languages: French, German, Russian; dissertation that is an original piece of work; and Final Examination.

Research Facilities

An excellent library and access to computing facilities are located in the same building as the department. The mathematics research library has an outstanding collection of monographs and subscribes to nearly all journals of significance to the mathematics community. The department shares with statistics and biostatistics a research-oriented UNIX-based VAX 11/750. Other accessible computers include a CDC Cyber 170/750, a VAX 11/785, several IBM PC RTs, and two AT&T 3B/2s.

Financial Support

More than half of the graduate students in mathematics are supported by teaching assistantships. The workload allows ample time for graduate courses and thesis work.

Correspondence and Information

Graduate Program Adviser
C36 Padelford, GN-50

Faculty

Chairperson

Robert B. Warfield

Professors

Arsove, Maynard G.,* 1951, (Emeritus), M.S., 1948, Ph.D., 1950, Brown; potential theory, complex function theory, theory of bases.
Beaumont, Ross A.,* 1940, (Emeritus), M.S., 1937, Michigan; Ph.D., 1940, Illinois; algebra (group theory).
Birnbaum, Z. William,* 1939, (Emeritus), (Statistics),† Ph.D., 1929, John Casimir (Lwow, Poland); statistics.
Blumenthal, Robert M.,* 1956, Ph.D., 1956, Cornell; probability.
Brownell, Francis H.,* 1950, (Emeritus), M.S., 1947, Yale; Ph.D., 1949, Princeton; differential equations, applied mathematics.
Corson, Harry H.,* 1958, M.A., 1954, Ph.D., 1957, Duke; topology, functional analysis.
Curler, Caspar R.,* 1964, Dr.Sc., Math., 1960, Eidg. Techn. Hochschule, Zurich (Switzerland); algebraic topology, algebra.
Curtis, Edward B.,* 1970, M.A., 1962, Ph.D., 1962, Harvard; algebraic topology.
Dubisch, Roy, 1961, (Emeritus), M.S., 1940, Ph.D., 1943, Chicago; mathematical education.
Erickson, K. Bruce,* 1973, M.S., 1966, Georgia Institute of Technology; Ph.D., 1970, Wisconsin; probability theory.
Folland, Gerald B.,* 1973, M.A., 1970, Ph.D., 1971, Princeton; partial differential equations.

Gangolli, Ramesh A.,* 1962, Ph.D., 1961, Massachusetts Institute of Technology; probability.

Goldstein, Allen A.,* 1964, M.A., 1952, Ph.D., 1954, Georgetown; approximation theory, nonlinear programming, control theory, calculus of variations.

Greenberg, Ralph,* 1978, Ph.D., 1970, Princeton; number theory.

Grunbaum, Branko,* 1966, M.A., 1954, Ph.D., 1958, Hebrew University; geometry.

Hewitt, Edwin,* 1948, (Emeritus), M.A., 1941, Ph.D., 1942, Harvard; harmonic analysis on groups, measure theory functional analysis.

Irving, Ronald S.,* 1980, Ph.D., 1977, Massachusetts Institute of Technology; ring theory.

Jans, James P.,* 1957, M.A., 1950, Ph.D., 1955, Michigan; ring structure and homological algebra.

Klee, Victor L.,* 1953, (Computer Science), Ph.D., 1949, Virginia; convex sets, analysis of algorithms, linear programming, combinatorics, functional analysis.

Koblitz, Neal I.,* 1979, Ph.D., 1974, Princeton; algebraic number theory.

Kottwitz, Robert E.,* 1979, Ph.D., 1977, Harvard; representation theory.

Lind, Douglas A.,* 1975, M.A., 1971, Ph.D., 1973, Stanford; ergodic theory.

Marshall, Donald E.,* 1976, M.A., 1972, Ph.D., 1976, California (Los Angeles); functional analysis.

McFarlan, Lee H., 1927, (Emeritus), M.A., 1921, Ph.D., 1924, Missouri; calculus of variations.

Michael, Ernest A.,* 1953, M.A., 1948, Harvard; Ph.D., 1951, Chicago; topology.

Morrow, James A.,* 1969, Ph.D., 1967, Stanford; complex analysis.

Namioka, Isaac,* 1963, M.A., 1953, Kansas; Ph.D., 1956, California (Berkeley); algebraic topology, functional analysis.

Nunke, Ronald J.,* 1958, M.S., 1951, Ph.D., 1955, Chicago; category theory, Abelian groups.

Osborne, M. Scott,* 1975, Ph.D., 1972, Yale; representation theory.

Phelps, Robert R.,* 1962, Ph.D., 1958, Washington; convexity, functional analysis, geometry of Banach spaces.

Pyke, Ronald,* 1960, M.Sc., 1955, Ph.D., 1956, Washington; statistics (nonparametric inference).

Ragozin, David L.,* 1969, A.M., 1963, Ph.D., 1967, Harvard; approximation theory.

Ravenel, Douglas C.,* 1976, M.A., 1969, Ph.D., 1972, Brandeis; algebraic topology.

Rockafellar, R. Tyrrell,* 1966, (Applied Mathematics),† M.S., 1959, Marquette; Ph.D., 1963, Harvard; convexity, linear programming.

Sarason, Leonard,* 1965, M.Mus., 1949, Yale; Ph.D., 1961, New York; partial differential equations.

Segal, Jack,* 1960, M.S., 1957, Miami; Ph.D., 1960, Georgia; topology.

Shorack, Galen R.,* 1966, ‡(Statistics), M.A., 1962, Oregon; Ph.D., 1965, Stanford; mathematical statistics (distribution-free statistics).

Stout, Edgar Lee,* 1969, M.A., 1961, Ph.D., 1964, Wisconsin; complex analysis.

Sullivan, John B.,* 1973, Ph.D., 1971, Cornell; algebraic groups.

Uhlmann, Gunther,* 1984, Ph.D., 1976, Massachusetts Institute of Technology; partial differential equations.

Wan, Frederick Y. M.,* 1983, (Applied Mathematics),† S.M., 1963, Ph.D., 1965, Massachusetts Institute of Technology; mathematical problems in shell theory, elasticity, resource and land economics, forest management and biomechanics, computational aspects of stochastic PDE and first exit time problems.

Warfield, Robert B.,* 1968, Ph.D., 1967, Harvard; algebra.

Warner, Garth W.,* 1966, Ph.D., 1966, Michigan; analysis.

Westwater, M. John,* 1970, Ph.D., 1967, Cambridge; mathematical physics.

Associate Professors

Arms, Judith M.,* 1980, M.A., 1974, Ph.D., 1977, California (Berkeley); mathematical physics.

Avann, Sherwin P., 1946, (Emeritus), M.S., 1940, Ph.D., 1942, California Institute of Technology; lattice theory.

Bass, Richard F.,* 1977, Ph.D., 1977, California (Berkeley); probability theory (Markov processes) and statistics.

Bube, Kenneth P., 1986, M.S., 1976, Ph.D., 1978, Stanford; numerical analysis, partial differential equations.

Burkart, Lutz L.,* 1966, Ph.D., 1962, Princeton; several complex variables.

Dekker, David B., 1948, (Emeritus), (Computer Science),† M.S., 1943, Illinois Institute of Technology; Ph.D., 1948, California (Berkeley); computers.

DuChamp, Thomas E.,* 1979, M.S., 1969, Ph.D., 1976, Illinois; differential geometry, foliations, characteristic classes, calculus of variations.

Hain, Richard,* 1985, M.Sc., 1977, Australian National; Ph.D., 1980, Illinois (Urbana); topology, geometry.

King, James R.,* 1974, M.A., 1967, Ph.D., 1969, California (Berkeley); several complex variables.

Kingston, J. Maurice,* 1940, (Emeritus), M.A., 1936, Ph.D., 1939, Toronto; mathematical education.

Le Veque, Randall J.,* 1985, (Applied Mathematics),† Ph.D., 1982, Stanford; numerical analysis.

Mitchell, Stephen A.,* 1985, Ph.D., 1981, Washington; algebraic topology.

Monk, G. Stephen,* 1964, Ph.D., 1966, Minnesota; algebra.

Moore, Robert T.,* 1968, Ph.D., 1964, Princeton; operator theory and group representation.

Assistant Professors

Amiran, Edoh Y., 1986, (Acting), Ph.D., 1986, Massachusetts Institute of Technology; partial differential equations.

Burke, James,* 1985, Ph.D., 1983, Illinois (Urbana); optimization.

Collingwood, David, 1987, Ph.D., 1983, Utah; representation theory of Lie groups and Lie algebras.

Graham, C. Robin,* 1984, M.A., 1976, Rice; Ph.D., 1981, Princeton; several complex variables, partial differential equations.

Harris, John C., 1986, (Acting), M.S., 1980, Ph.D., 1985, Chicago; algebraic topology.

Hatziafratis, Telemachos, 1987, (Acting), M.A., 1982, Ph.D., 1984, Wisconsin (Madison); several complex variables.

Lee, John M., 1986, Ph.D., 1982, Massachusetts Institute of Technology; partial differential equations.

Mizner, Robert, 1986, (Acting), Ph.D., 1986, Columbia; differential geometry.

Moy, Allen,* 1984, Ph.D., 1982, Chicago; representation theory, number theory.

Muhasky, Jerry L., 1986, (Acting), M.S., 1979, Ph.D., 1986, Utah; algebra.

Ozols, Vilnis,* 1968, M.A., 1965, Ph.D., 1967, California (Berkeley); Lie groups, Riemannian geometry.

Seeger, Alberto, 1987, (Acting), M.S., 1982, Ph.D., 1986, Paul Sabatier; optimization.

Smith, S. Paul, 1986, M.Sc., 1978, London (England); Ph.D., 1981, Leeds (England); algebra.

Tuncel, Selim, 1986, M.Sc., 1979, Ph.D., 1981, Warwick; ergodic theory and dynamical systems.

Zhu, Kehe, 1986, (Acting), M.A., 1984, Ph.D., 1986, State University of New York (Buffalo); functional analysis.

Lecturers

Warfield, Virginia M., 1973, M.A., 1965, Ph.D., 1971, Brown; probability and remedial mathematics.

Zuckerman, Helen C., 1935, (Emeritus), M.S., 1935, Washington; mathematics.

Course Descriptions

Courses for Undergraduates

Mathematics

MATH 100, 102 Algebra (5,5) AWSp,AWSp Similar to the first three terms of high school algebra. Assumes no previous experience in algebra. Open only to specially admitted students (i.e., [1] Educational Opportunity Program students, or [2] students admitted with an entrance deficiency in mathematics; not open to regularly admissible students).

MATH 101 Intermediate Algebra (0) Intermediate algebra equivalent to third semester of high school algebra. Instruction provided by community colleges on UW campus. Extra fee required.

MATH 103 Introduction to Elementary Functions (3) AWSp Continues the study of algebra begun in 100 and 102 with emphasis on functions (polynomial, rational, logarithmic, exponential, and trigonometric). Open only to specially admitted students (see definition under 100) who have completed 102.

MATH 105 Elementary Functions (5) AWSps Elementary functions with emphasis on the general nature of function, polynomial, rational, exponential, logarithmic, and trigonometric functions. Not open for credit to students who have taken 156. Prerequisites: 1½ years of high school algebra and placement test, or equivalent.

MATH 107 Mathematics: A Practical Art (5) AWSp For students not planning to take additional mathematics. The exponential function; how it applies to a wide variety of phenomena. Elementary probability and statistics; their use in a variety of applications. Prerequisites: 1½ years high school algebra and placement test, or equivalent.

MATH 124, 125, 126 Calculus With Analytic Geometry (5,5,5) AWSps,AWSps,AWSps Differentiation and integration of functions of one variable, Taylor series, vectors, partial derivatives, multiple integrals. Credit not allowed for both 124 and 134, or 125 and 135, or 126 and 136. Prerequisites: four years of college preparatory mathematics or equivalent (normally including precalculus or mathematical analysis and normally with B or better grades) and placement test or 105 or equivalent.

MATH 134, 135, 136 Honors Calculus (5,5,5) A,W,Sp Covers from an advanced viewpoint 124, 125, 126 (differential and integral calculus of one variable), 327 (multivariate calculus), and 238 (elementary differential equations). See credit restrictions under 124, 125, 126. Prerequisite: high school calculus with B grade or better.

MATH 156 Application of Algebra to Business and Economics (5) AWS Use of graphs and algebraic functions as found in business and economics. Algebraic and graphical manipulations to solve problems. Exponential and logarithm functions; various applications to growth of money. Not open for credit to students who have taken 105. Prerequisite: 1½ years of high school algebra and placement test.

MATH 157 Application of Calculus to Business and Economics (5) AWSpS Rates of change, tangent, derivative, accumulation, area, integrals in specific contexts, particularly economics. Techniques of differentiation and integration. Application to problem solving. Optimization. Credit does not apply toward a mathematics major. Prerequisite: 156 or equivalent.

MATH 170, 171 Mathematics for Elementary School Teachers (3,3) AWS,Sp Development of the systems of whole numbers, integers, and rational numbers; measurement; basic geometric concepts; functions; elementary probability and statistics. Ordinarily, credit may not apply toward a major in mathematics. Prospective elementary education students are required to take 170. Offered on credit/no credit basis only. Prerequisites: 1½ years of high school algebra and one year of geometry for 170; 170 for 171.

MATH 205 Elementary Linear Algebra (3) AWSpS Systems of equations, vector spaces, matrices, linear transformations, characteristic vectors. Not open for credit to students who have taken 302. Prerequisite: 124 or 157.

MATH 238, 239 Elements of Differential Equations (3,3) AWSpS, AWSpS Elementary methods of solution of first-order equations, linear equations of second and higher order, power series solutions. Laplace transforms, linear systems, stability theory. Prerequisite: 126 or 136 for 238; 238 and either 205 or 302 for 239.

MATH 301 Elementary Number Theory (3) AWS Brief introduction to some of the fundamental ideas of elementary number theory. Prerequisite: 126 or 136.

MATH 302, 303, 304 Linear Algebra (4,3,3) AWSpS, AWSpS, Sp Systems of linear equations. Vector spaces, equations, equivalence and similarity of matrices. Characteristic values and vectors. Jordan canonical form. Inner product spaces, linear functionals, application to linear programming and differential equations. For students who plan to take additional mathematics. Prerequisites: 126 or 136 for 302; 302 for 303; 303 for 304.

MATH 328, 329 Advanced Calculus (3,3) AWSpS, AWSpS Vector analysis in three dimensions, theorems of Gauss and Stokes. Infinite series, uniform convergence, improper integrals. Prerequisite: 126 or 327 for 328; 328 for 329.

MATH 334, 335, 336 Honors Advanced Calculus (5,5,5) A,W,Sp Covers from an advanced viewpoint 328, 329, functions of a complex variable, special functions, processes of analysis, orthogonal functions, Fourier series, and integrals with applications. Prerequisites: 136 or permission of instructor for 334; 334 for 335; 335 for 336.

MATH 351, 352 Quantitative Methods I, II (3,3) A,W Applications of mathematical techniques and basic principles of natural sciences to problems in engineering and oceanography. 351: ordinary differential equations; 352: approximate methods, Fourier series; partial differential equations; boundary value problems. Joint with AMATH 351, 352, and OCEAN 351, 352. Prerequisites: one year of physics and 126 for 351; 238 or 351 for 352.

MATH 381, 382, 383 Introduction to Mathematical Modeling (3,3,3) A,W,Sp Simple discrete and continuous models of diverse natural and social phenomena, with particular reference to the unity of the tools of mathematical analysis useful in their study. 381 devoted to discrete methods; 383, continuous methods; 382, a mixture. Mathematical topics and phenomena. Joint with AMATH 381, 382, 383. Prerequisites: 126 and either 205 or 302 for 381, 382; 327 and either 238 or AMATH 351 for 383.

MATH 402, 403, 404 Introduction to Modern Algebra (3,3,3) AS,WS,Sp Algebraic systems; elementary theory of groups, rings, and fields; polynomials; topics in linear algebra; reductions of forms. Prerequisites: 302 or 336 for 402; 402 for 403; 403 for 404.

MATH 407 Linear Optimization (3) AWS Maximization and minimization of linear functions subject to constraints consisting of linear equations and inequalities; linear programming and mathematical modeling. Simplex method, elementary games and duality. Prerequisite: 302.

MATH 408 Nonlinear Optimization (3) WSp Maximization and minimization of nonlinear functions, constrained and unconstrained; nonlinear programming problems and methods. Lagrange multipliers; Kuhn-Tucker conditions, convexity. Quadratic programming. Prerequisites: 329 or 336; 407 and ENGR 141, or C SCI 210, 211, or equivalent programming experience.

MATH 411, 412 Introduction to Modern Algebra for Teachers (3,3) AS,WS Development of the number systems of elementary algebra; groups, rings, integral domains and fields; polynomials. Designed for teaching majors; not open for credit to students who have taken 402, 403. Prerequisites: 205 or 302 for 411; 411 for 412.

MATH 414, 415 Number Theory (3,3) W,Sp Congruences, arithmetic of quadratic fields, binary quadratic forms, Dirichlet's theorem on primes in an arithmetic progression, Chebyshev's theorem on distribution of primes, the partition function, equations over finite fields. Prerequisites: 301 for 414; 414 for 415. (Offered even-numbered years.)

MATH 420 History of Mathematics (3) S Survey of the development of mathematics from its earliest beginnings through the first half of the twentieth century. Prerequisite: 402 or 411, which may be taken concurrently.

MATH 424, 425, 426 Fundamental Concepts of Analysis (3,3,3) A,W,Sp Sets, real numbers, topology of metric spaces, normed linear spaces, multivariate calculus from an advanced viewpoint. Introduction to Lebesgue measure and integration. Prerequisites: 329 or 336, and 303 or permission for 424; 424 for 425; 425 for 426.

MATH 427, 428, 429 Topics in Applied Analysis (3,3,3) AWS,WSpS,SpS Elementary functions of a complex variable; Cauchy integral formula. Taylor and Laurent series; conformal mapping. Fourier series; orthogonal functions; boundary value problems; application. Prerequisites: 329 or 336 for 427; 238 and either 329 or 336 for 428; 427 and 428 for 429.

MATH 438 Introduction to Partial Differential Equations (3) A Integral curves and surfaces of vector fields, initial value problems for first-order linear and quasi-linear equations, Cauchy-Kovalevsky theorem, general Cauchy problem characteristics, special equations. Prerequisites: 205 or 302; 238 and 329 or 336. (Offered odd-numbered years.)

MATH 439 Introduction to Partial Differential Equations (3) W Continuation of 438. Laplace's equation and general elliptic equations, wave equation and general hyperbolic equations, heat equation and general parabolic equations. Initial value problems and Dirichlet problems. Green's functions. Maximum principle. Prerequisite: 438. (Offered odd-numbered years.)

MATH 441, 442 Advanced Geometry (3,3) A,W Selected topics from among projective geometry, differential geometry, advanced analytic geometry, algebraic geometry, algebraic topology, and the geometry of convex bodies. Prerequisites: 302 and 329 or 336, or permission of departmental adviser for 441; 441 for 442. (Offered even-numbered years.)

MATH 444, 445 Foundations of Geometry (3,3) AS,WS Axiomatic treatment of the foundations of Euclidean geometry. Introduction to non-Euclidean geometry. Designed for teaching majors. Prerequisites: 126 or 136; 205 or 302 for 444; 444 for 445.

MATH 461, 462 Combinatorial Theory (3,3) WSp Selected topics from among: block designs and finite geometries, coding theory, generating functions and

other enumeration methods, graph theory, matroid theory, combinatorial algorithms, applications of combinatorics. Prerequisites: at least one 300-level course in mathematics, statistics, or computer science for 461; 461 for 462. (Offered odd-numbered years.)

MATH 464, 465, 466 Numerical Analysis I, II, III (4,4,4) AS,W,Sp Basic principles of numerical analysis, classical interpolation and approximation formulas, finite differences and difference equations. Numerical methods in algebra, systems of linear equations, matrix inversion, successive approximations, iterative and relaxation methods. Numerical differentiation and integration. Solution of differential equations and systems of such equations. Prerequisites: 302 and 329 or 336, ENGR 141, or C SCI 210, 211, or equivalent programming experience for 464; 464 for 465; 238 and 465 for 466.

MATH 496 Honors Seminar (*, max. 9) AWSp Problem seminar for senior honors students and first-year graduate students. Prerequisite: permission of instructor.

MATH 497 Special Topics in Mathematics for Teachers (2-9) S Study of selected areas of mathematics. Designed for the improvement of teachers of mathematics. Joint with EDC&I 478.

MATH 498 Special Topics in Mathematics (2-5, max. 15) AWSpS Reading and lecture course intended for special needs of advanced students. Prerequisite: permission of instructor.

Probability and Statistics

MATH 390 Probability and Statistics in Engineering and Science (4) AWSpS Concepts of probability and statistics. Conditional probability, independence, random variables, distribution functions. Descriptive statistics, transformations, sampling errors, confidence intervals, least squares and maximum likelihood. Exploratory data analysis and interactive computing. Joint with STAT 390. Students may not receive credit for both 390 and STAT 481. Prerequisites: 238 or 327, and 205 or 302.

MATH 394 Probability I (3) AWS Sample spaces; basic axioms of probability; combinatorial probability; conditional probability and independence; binomial, Poisson, and normal distributions. Joint with STAT 394. Prerequisite: 327.

MATH 395 Probability II (3) WSpS Random variables; expectation and variance; laws of large numbers; normal approximation and other limit theorems; multidimensional distributions and transformations. Joint with STAT 395. Prerequisite: 394.

MATH 396 Probability III (3) Sp Characteristic functions and generating functions; recurrent events and renewal theory; random walk. Joint with STAT 396. Prerequisite: 395 or STAT 511.

MATH 491, 492 Introduction to Stochastic Processes (3,3) A,W Random walks, Markov chains, branching processes, Poisson process, point processes, birth and death processes, queueing theory, stationary processes. Joint with STAT 491, 492. Prerequisites: 396 for 491; 491 for 492.

Courses for Graduates Only

Every year, additional courses are offered, and some of the courses listed are not offered every year. Inquiries about the currently offered courses should be addressed to the Graduate Secretary, Department of Mathematics.

Mathematics

MATH 504, 505, 506 Modern Algebra (3,3,3) A,W,Sp Theory of groups, rings, integral domains, and fields; polynomials; vector spaces, Galois theory, and theory of ideals. Prerequisites: 404 or equivalent for 504; 504 for 505; 505 for 506.

MATH 507, 508 Calculus of Variations I, II (3,3) A,W Necessary and sufficient conditions for a weak and strong extremum. Legendre transformation, Hamiltonian systems. Constraints and Lagrange multipliers. Space-time problems with examples from elasticity, electromagnetics, and fluid mechanics. Sturm-Liouville problems. Approximate methods. Joint with AMATH 507, 508. Prerequisites: 238 or AMATH 351, MATH 327, 328, 329 for 507; 507 for 508; recommended 428, 429 or AMATH 402, 403.

MATH 509 Theory of Optimal Control (3) Sp Trajectories from ordinary differential equations with control variables. Controllability, optimality, maximum principle. Relaxation and existence of solutions. Techniques of nonsmooth analysis. Joint with AMATH 509. Prerequisites: real analysis on the level of 426; background in optimization corresponding to 515. (Offered even-numbered years.)

MATH 511, 512, 513 Special Topics in Algebra (2-3, max. 15; 2-3, max. 15; 2-3, max. 15) A,W,Sp In recent years the following subjects have been covered: Abelian groups, algebraic function fields, algebraic number theory, classical groups, game theory, group extensions, lattice theory, Lie algebras, number theory, and structure of rings.

MATH 514 Networks and Combinatorial Optimization (3) A Networks and directed graphs. Paths and trees. Feasible and optimal flows and potentials. Transportation problems, matching and assignment problems. Algorithms and applications. Joint with AMATH 514. Prerequisites: 302 and 327, or equivalent.

MATH 515 Fundamentals of Optimization (3) W Maximization and minimization of functions of finitely many variables subject to constraints. Basic problem types and examples of applications; linear, convex, smooth and nonsmooth programming. Optimality conditions. Saddlepoints and dual problems. Penalties, decomposition. Overview of computational approaches. Joint with AMATH 515. Prerequisites: 303, 327, or equivalents.

MATH 516 Numerical Optimization (3) Sp Methods of solving optimization problems in finitely many variables, with or without constraints. Steepest descent, quasi-Newton methods. Quadratic programming and complementarity. Exact penalty methods, multiplier methods. Sequential quadratic programming. Cutting planes and nonsmooth optimization. Joint with AMATH 516. Prerequisite: 515.

MATH 517 Optimization Under Uncertainty (3) A Sequential optimization problems involving random variables. Dynamic programming, stochastic programming. Control of uncertain dynamic systems in finite, discrete time. Risk, feedback, adaptivity. Problems with imperfect state information. Applications such as to optimal stopping, inventory control, resource management. Joint with AMATH 517. Prerequisites: 302, 327 and an introduction to basic concepts of probability, such as 390 or 394, 395.

MATH 518 Topics in Applied Optimization (3) Sp Problems and techniques in special areas of optimization, such as engineering design, resource management, stochastic programming, games, variational inequalities and parameter identification in mathematical modeling. Joint with AMATH 518. Prerequisite: 515 or permission of instructor. (Offered odd-numbered years.)

MATH 519 Tensor Analysis (3) A Cartesian tensors; motivation, manipulation, applications. Riemannian space; Christoffel symbols, geodesics, covariant differentiation. Curvature tensor, geodesic deviations, flat space. Special local coordinate systems. Applications to classical mechanics, continuum mechanisms, electromagnetism, relativity. Special topics. Joint with AMATH 519. Prerequisite: 327 or AMATH 401, or permission of instructor.

MATH 524, 525, 526 Real Variable (3,3,3) A,W,Sp Metric spaces; general measures and integration; differentiation of set functions; real valued functions on the line; Banach spaces. Prerequisites: 426 or equivalent for 524; 524 for 525; 525 for 526.

MATH 530 Seminar in Analysis (*, max. 5) AWSp Prerequisite: permission of graduate program coordinator.

MATH 531, 532, 533 Special Topics in Analysis (2-3, max. 15; 2-3, max. 15; 2-3, max. 15) AS,WSp,S In recent years the following subjects have been covered: functional analysis, abstract harmonic analysis, linear operations in Hilbert space, group representations, Fourier series and integrals, topological linear spaces, potential theory, and numerical analysis.

MATH 534, 535, 536 Complex Variable (3,3,3) A,W,Sp Complex numbers, analytic functions, contour integration, power series, analytic continuation, sequences of analytic functions, conformal mapping of simply connected regions. Prerequisites: 426 for 534; 534 for 535; 535 for 536.

MATH 541, 542, 543 Special Topics in Applied Mathematics (2-3, max. 15; 2-3, max. 15; 2-3, max. 15) A,W,Sp Such topics as mathematical quantum theory, fluid mechanics, optimization and operations research, and control theory.

MATH 544, 545, 546 Differential Geometry (3,3,3) A,W,Sp 544: differential analysis in R^n , inverse function theorem, vector fields. Stoke's theorem, existence theorems concerning differential equations. Prerequisite: graduate standing or permission of instructor. 545, 546: differentiable manifolds, differential forms, differential geometry in the large. Prerequisites: 544 for 545; 545 for 546.

MATH 547, 548, 549 Functional Analysis (3,3,3) A,W,Sp Review of Banach, Hilbert, and L_p spaces. Locally convex spaces (duality and separation theory, distributions, and function spaces). Operators on locally convex spaces (adjoints, closed graph/open mapping and Banach-Steinhaus theorems). Banach algebras (spectral theory, elementary applications). Spectral theorem for Hilbert space operators. Additional topics chosen by instructor. A working knowledge of real variables, general topology, and complex variables is assumed.

MATH 550 Seminar in Geometry (*, max. 5) AWSp Prerequisite: permission of graduate program coordinator.

MATH 551, 552, 553 Special Topics in Geometry (2-3, max. 15; 2-3, max. 15; 2-3, max. 15) A,W,Sp In recent years, the following subjects have been covered: Riemannian geometry, differentiable manifolds, complex manifolds, geometry of convex bodies.

MATH 554, 555, 556 Several Complex Variables (3,3,3) A,W,Sp Weierstrass preparation theorem and its immediate consequences. Analytic continuation, domains of holomorphy, pseudoconvexity, Cartan-Oka-theory of coherence, embedding theorems; $\bar{\partial}$ -equation. Connections with algebraic geometry. Prerequisites: 534, 535.

MATH 557, 558, 559 Special Topics in Numerical Analysis (2-3, max. 15; 2-3, max. 15; 2-3, max. 15) A,W,Sp Such topics as linear systems, approximation theory, or the numerical solution of differential equations are covered.

MATH 561, 562, 563 General Topology (3,3,3) AS,W,Sp,S Theory of sets; metric spaces; topological spaces; compactness and other covering properties; function spaces; polyhedra; dimension theory. Prerequisites: 426 for 561; 561 for 562; 562 for 563.

MATH 564, 565, 566 Algebraic Topology (3,3,3) A,W,Sp Classical and modern approaches; complexes and their homology theory; applications. Fixed points, primary obstruction; products and Poincaré duality; axiomatic approach, covering spaces. Prerequisites: 506 for 564; 564 for 565; 565 for 566.

MATH 569 Partial Differential Equations (3) Sp Properties of diffusion, wave, and Laplace-type equations. Initial and boundary value problems. Series expansions, transform methods. Singularities, Green's functions. Classification of second-order equations; theory and applications of method of characteristics. Numerical techniques. Joint with A 569 and AMATH 569. Prerequisite: 428 or AMATH 403 or 568.

MATH 570 Seminar in Topology (*, max. 5) AWSp Prerequisite: permission of graduate program coordinator.

MATH 571, 572, 573 Special Topics in Topology (2-3, max. 15; 2-3, max. 15; 2-3, max. 15) A,W,Sp Special topics from general and algebraic topology.

MATH 574, 575, 576 Introduction to Partial Differential Equations (3) A,W,Sp Theory of distributions and the Fourier transform. Detailed study of main linear equations: wave equation, Laplace's equation, and the heat equation. Sobolev spaces and regularity of solutions of elliptic equations. Theory of pseudodifferential operators. Initial value problem for hyperbolic equations and methods of geometrical optics. Fourier integral operators. The Dirichlet problem and eigenfunction expansions for elliptic equations. Prerequisites: 424, 425, 426, or equivalent, including notion of Lebesgue integral.

MATH 584, 585, 586 Numerical Analysis (3,3,3) A,W,Sp Error analysis, linear systems, LU, QR, and SVD factorizations, eigenvalues, least squares, iterative methods for linear and nonlinear systems, optimization, interpolation, approximation, splines, Fourier series, FFTs. Joint with AMATH 584, 585, 586. Prerequisite: 465 or permission of instructor.

MATH 597, 598, 599 Numerical Solutions of Differential Equations (3,3,3) A,W,Sp Numerical quadrature and solution of ordinary differential equations, initial and boundary value problems, solution of partial differential equations by finite difference and finite element methods, stability analysis and boundary conditions, solution of large sparse linear systems. Joint with AMATH 597, 598, 599. Prerequisite: 466 or permission of instructor.

MATH 600 Independent Study or Research (*) AWSpS

MATH 700 Master's Thesis (*) AWSpS

MATH 800 Doctoral Dissertation (*)

Probability and Statistics

MATH 521, 522, 523 Advanced Probability (3,3,3) A,W,Sp Measure theory and integration, independence, laws of large numbers, Fourier analysis of distributions, central limit problem and infinitely divisible laws, conditional expectations, martingales. Joint with STAT 521, 522, 523. Prerequisite: 426.

MATH 590 Seminar in Probability (*, max. 5) AWSp Prerequisite: permission of instructor.

MATH 591, 592, 593 Special Topics in Probability (2-3, max. 15; 2-3, max. 15; 2-3, max. 15) A,W,Sp In recent years, the following subjects have been covered: advanced probability theory, stochastic processes, distribution-free inference, game and decision theory, advanced theory of estimation (including sequential estimation).

MATH 594, 595, 596 Numerical Analysis (3,3,3) A,W,Sp Error analysis, linear systems, LU, QR, and SVD factorizations, eigenvalues, least squares, iterative methods for linear and nonlinear systems, optimization, interpolation, approximation, splines, Fourier series, FFTs. Joint with AMATH 594, 595, 596. Prerequisite: 465 or permission of instructor.

MATH 597, 598, 599 Numerical Solutions of Differential Equations (3,3,3) A,W,Sp Numerical quadrature and solution of ordinary differential equations,

initial and boundary value problems, solution of partial differential equations by finite difference and finite element methods, stability analysis and boundary conditions, solution of large sparse linear systems. Joint with AMATH 597, 598, 599. Prerequisite: 466 or permission of instructor.

MATH 600 Independent Study or Research (*) AWSpS

MATH 700 Master's Thesis (*) AWSpS

MATH 800 Doctoral Dissertation (*)

Microbiology

G303 Health Sciences

Microbiology is a natural science that deals with microscopic organisms, including bacteria, viruses, fungi, protozoa, and algae. It is concerned with the nature and properties of these organisms, their effects on man and the environment, and how microorganisms can be exploited to provide useful products.

Undergraduate Program

Bachelor of Science Degree

Rosemary Foster, Adviser
G303 Health Sciences

Admission Requirements: A minimum of 75 credits with overall grade-point average of 2.25 in required chemistry and biology courses. Students should complete departmental requirements in biology and in inorganic and organic chemistry before applying for admission to the major.

Major Requirements: 45 credits in biological science: BIOL 210, 211, 212 (preferred) or an equivalent 10 to 15 credits in botany or zoology; a minimum of 30 credits in microbiology courses and approved electives, including MICRO 402, 410, 411, 412, 431, 441, 442, 443, and 496 (MICRO 301, 302, 319 cannot be used); a minimum grade-point average of 2.25 in the required chemistry and biology courses as well as in the entire 30 credits of microbiology and approved electives; PHYS 114, 115, 116 or 121, 122, 123; CHEM 140, 150, 151, 160; CHEM 231, 232 or 231, 235, 236 or 335, 336, 337 (three-quarter sequence preferred); CHEM 321; MATH 124 or 157 or Q SCI 291 or 381. Transfer students must complete at least 15 of the 30 credits of required microbiology courses at this university.

Students interested in majoring in microbiology should obtain the department undergraduate guide, available in G303 Health Sciences.

For faculty listing and course descriptions, see *School of Medicine* section.

Middle Eastern Studies

See *International Studies*.

Music

106 Music

The School of Music prepares students for careers as composers, performers, teachers, or researchers. It also offers general courses to nonmajors designed to enhance the student's understanding of the art of music.

Four-year undergraduate programs lead to the degrees of Bachelor of Arts and Bachelor of Music. The school also offers a five-year program leading to the concurrent Bachelor of Arts and Bachelor of Music degrees.

Two undergraduate music-related degree programs, ethnomusicology and music technology, are offered through General Studies. See music adviser for details.

Graduate programs lead to the degrees of Master of Arts, Master of Music, Doctor of Musical Arts, and Doctor of Philosophy.

Undergraduate Program

Admission Requirements: All students must audition and qualify at the 300 level or better in their principal performance areas in order to be admitted as music majors and to receive private instruction. They also must pass an examination in basic keyboard. Students who qualify on another instrument or voice may begin their musical studies, but they also must enroll in the MUSIC 133 series until keyboard proficiency is established.

CLARIFICATION OF MAJOR STATUS

Major status in performance areas is accorded when, after proper admission is acknowledged and the required School of Music audition is completed, the student commences Applied Music study in the major area with an approved faculty member of the School of Music. Such study must be undertaken during the first quarter of registration and during each subsequent quarter of registration until the minimum program requirements have been met. Applied Music study should continue as long as the student is registered and in residence until the final approved recital is given. Mere acceptance into a program does not constitute major status.

In academic areas and composition, the faculty members of the particular areas determine the status of individuals accepted. Any departure from the above requirements must have the recommendation of the appropriate divisional Chairperson and the written consent of the Director of the School of Music.

In order to retain major status, the student must make and demonstrate consistent and acceptable progress at the annual required jury. Participation in at least one School of Music ensemble is required each quarter in which a student receives Applied Music instruction.

Core Requirements: The music theory-history core, required in each of the undergraduate curricula, is as follows:

Courses	Credits
MUSIC 110, 111, 112 First-Year Theory (3,3,3) . . .	9
MUSIC 113, 114, 115 Ear Training (1,1,1)	3
MUSIC 210, 211, 212 Second-Year Theory (3,3,3) . . .	9
MUSIC 213, 214, 215 Music After 1750 (3,3,3) . . .	9
MUSIC 310 Modal Counterpoint (3)	3
MUSIC 311 Tonal Counterpoint (3)	3
MUSIC 312 Twentieth-Century Techniques (3) . . .	3
MUSIC 313, 314 Music Before 1750 (3,3)	6
Music upper-division theory or history electives. . .	9-10
	54-55

Bachelor of Arts Degree

General Requirements: A minimum of 180 credits, of which 90 must be taken in departments other than the School of Music. All College of Arts and Sciences graduation requirements must be met. A grade-point average of 2.50 in music courses is required for graduation.

MUSIC THEORY-HISTORY OPTION

Major Requirements: Music theory-history core, plus 9 credits in vocal or instrumental instruction, and six quarters of ensembles, for a minimum of 69 credits.

VOCAL OR INSTRUMENTAL OPTION

Major Requirements: Music theory-history core (excluding the 9-10 credits in theory or history electives), 18 credits in vocal or instrumental instruction, and seven quarters in ensembles, for a minimum of 70 credits.

Bachelor of Music Degree

Admission Requirements: Intended for specially qualified students who wish to emphasize professional training in performance or composition within a four-year program. Students should see the undergraduate adviser regarding special admission procedures for this program. Admission during the sophomore year is recommended.

General Requirements: A minimum of 180 credits, of which at least 60 must be taken in departments other than the School of Music. All College of Arts and Sciences degree requirements must be met (including linked sets and W courses as they apply), except that students must fulfill the distribution requirement in only two of the following three areas: humanities, social sciences, and natural sciences. Of the remaining 120 credits, 100 may be in the major within the School of Music, but the additional 20 must be outside the primary area of the major (e.g., for Applied Music majors in nonperformance music areas).

Major Requirements: Applied music major requirements to include: Music theory-history core (54-55 credits), applied music (36-48 credits), recitals (1-2 credits), and ensembles (12-30 credits). See undergraduate adviser for requirements in each major area (piano, organ, strings, voice, orchestral instruments, and guitar).

Composition major requirements to include: Music theory-history core (54-55 credits), including MUSIC 487 and MUSIC 490 among upper-division electives; composition (36 credits), applied music (18 credits), ensembles (9-18 credits), and conducting (3 credits).

Jazz Studies major requirements to include: Music theory-history core (54-55 credits), applied music (30 credits), ensembles (15 credits), additional requirements (14 credits). See undergraduate adviser for special requirements in this program.

A grade-point average of 3.20 in music courses is required for graduation.

Bachelor of Arts and Bachelor of Music Degrees (Concurrent)

General Requirements: A minimum of 225 credits, of which 90 must be in areas other than music; all College of Arts and Sciences graduation requirements must be met. Of the remaining 135 credits, 115 may be in the major within the School of Music, but the additional 20 must be outside the primary area of the major (e.g., for Applied Music majors, in nonperformance music areas).

Major Requirements: 2.50 grade-point average in music courses is required for graduation. See undergraduate adviser for special requirements in ensembles.

COMPOSITION MAJOR

Courses	Credits
Music theory-history core	54-55
MUSIC 191, 291, 391, 491 Composition (9,9,9,9)	36
MUSIC 487 Tonal Counterpoint (3)	3
MUSIC 490 Orchestration (3)	3
Vocal or instrumental instruction	24
MUSIC 380, 381, 382 Conducting (1,1,1) . . .	3
Ensembles	12-24
	135-148

MUSIC HISTORY MAJOR

Courses	Credits
Music theory-history core	54-55
5 credits from MUSIC 316, 317, 318	5

3 credits from MUSIC 400, 401, 402, 403 . . .	3
3 credits from MUSIC 404, 407, 410, 413, 417, 420	3
3 credits from MUSIC 405, 408, 411, 414, 418, 421	3
3 credits from MUSIC 406, 409, 412, 415, 419, 422, 423, 424, 425	3
Music history-literature electives	9
Music electives	9
Vocal or instrumental instruction	24
Ensembles	12-24
	125-138

Students who intend to pursue graduate studies are strongly advised to establish proficiency in German or French and to acquire some acquaintance with one or two additional foreign languages. For emphasis in ethnomusicology, consult the music adviser regarding suitable area studies other than music.

PIANO MAJOR

Courses	Credits
Music theory-history core	54-55
MUSAP 321, 371, 421 Private Instruction: Piano	27
MUSAP 471 (two years) Private Instruction: Piano	18
MUSIC 326, 327, 328 Repertoire (2,2,2)	6
MUSIC 434, 435, 436 Pedagogy (2,2,2)	6
MUSIC 479 Senior Recital	1
Ensembles	15-30
	127-143

STRING INSTRUMENT MAJOR

Courses	Credits
Music theory-history core to include MUSIC 487 Tonal Counterpoint	54-55
MUSAP 324 through 326; 374 through 376; 424 through 426 Private Instruction: Violin-Viola, Violoncello, Contrabass	27
MUSAP 474 through 476 (two years) Private Instruction: Violin-Viola, Violoncello, Contrabass	18
MUSIC 479 Senior Recital	1
MUSIC 434, 435, 436 Pedagogy (2,2,2)	6
MUSAP 301 Private Instruction: Piano or MUSIC 234, 235, 236 Secondary Piano (2,2,2)	6
MUSIC 380 Basic Principles of Conducting	1
Ensembles	21-42
	134-156

(Orchestra is required during each quarter of Music Applied instruction.)

Violinists should complete one quarter of viola.

VOICE MAJOR

Courses	Credits
Music theory-history core	54-55
MUSAP 320, 370, 420 Private Instruction: Voice	27
MUSAP 470 (two years) Private Instruction: Voice	18
MUSAP 301 Private Instruction: Piano or MUSIC 234, 235, 236 Secondary Piano (2,2,2)	6
MUSIC 302, 303 Music Theatre Technique (1,1)	2
MUSIC 380, 381, 382 Conducting (1,1,1)	3
MUSIC 326, 327, 328 Repertoire (2,2,2)	6
MUSIC 434, 435, 436 Pedagogy (2,2,2)	6
MUSIC 479 Senior Recital	1
Ensembles	15
	138-140

Voice majors should establish proficiency in French, German, or Italian and complete an additional 15 cred-

its in a second language from this group as well as 5 credits in SPHSC 300 (Speech Science).

ORGAN MAJOR

Courses	Credits
Music theory-history core to include MUSIC 487 Tonal Counterpoint	54-55
MUSAP 322, 372, 422 Private Instruction: Organ	27
MUSAP 472 (two years) Private Instruction: Organ	18
MUSIC 479 Senior Recital	1
MUSIC 458, 459 Repertoire (3,3)	6
MUSIC 380, 381, 382 Conducting (1,1,1)	3
MUSAP 301 Piano (2,2,2)	6
Ensembles	15-30
	130-146

ORCHESTRAL INSTRUMENT MAJOR

Courses	Credits
Music theory-history core	54-55
MUSAP 327 through 337; 377 through 387; 427 through 487 Private Instruction	27
MUSAP 477 through 487 (two years) Private Instruction	18
MUSIC 479 Senior Recital	1
MUSAP 301 Private Instruction: Piano or MUSIC 234, 235, 236 Secondary Piano (2,2,2)	6
MUSIC 380, 381, 382 Conducting (1,1,1)	3
Ensembles	21-42
	130-152

GUITAR MAJOR

Courses	Credits
Music theory-history core to include MUSIC 487 Tonal Counterpoint	54-55
MUSAP 338, 388, 438 Private Instruction: Guitar	27
MUSAP 488 (two years) Private Instruction: Guitar	18
MUSIC 326, 327, 328 Repertoire (2,2,2)	6
MUSIC 434, 435, 436 Pedagogy (2,2,2)	6
MUSAP 301 Private Instruction: Piano or MUSIC 234, 235, 236 Secondary Piano (2,2,2)	6
MUSIC 380, 381, 382 Conducting (1,1,1)	3
MUSIC 479 Senior Recital	1
Ensembles	12-18
	133-140

MUSIC EDUCATION MAJOR

Courses	Credits
Music theory-history core exclusive of MUSIC 310, but to include 12 credits in arranging, jazz, composition, and ethnomusicology	54
MUSIC 380, 381, 382 Conducting (1,1,1)	3
Two courses from the following	6
MUSIC 343, 344, 345 Music and Science I, II, III (3,3,3)	18
18 credits from the following:	18
MUSIC 340 Music in General Education (3)	
MUSIC 440 Music in Early Childhood (3)	
MUSIC 441 Music in Later Childhood (3) or MUSIC 432 The General Music Class (3)	
MUSIC 442 Instrumental Curriculum: Methods and Materials (3)	
MUSIC 443 Choral Curriculum: Methods and Materials (3)	
MUSIC 452 Ethnomusicology in the Public Schools (3)	
MUSIC 465 Introduction to Music Classroom Management (1-6, max. 6) or Major performance medium	22
Secondary performance medium(s) including	

MUSAP 489 (2-3), and analog or digital music synthesis (3)	18
Ensembles	12-24
	133-145

SYSTEMATIC MUSICOLOGY MAJOR

Courses	Credits
Music theory-history core to include MUSIC 316 or 317 or 318 Music Cultures of the World	55
MUSIC 380, 381, 382 Conducting (1,1,1)	3
MUSIC 343 Music and Science I: Acoustical Systems	3
MUSIC 344 Music and Science II: Psychological Systems	3
MUSIC 345 Music and Science III: Social Systems	3
MUSIC 456 Musical Applications of Digital Signal Processing or MUSIC 457 Audio Engineering	3
MUSIC 488 Computer Applications to Music	3
MUSIC 499 Undergraduate Research (Senior Project)	6
Music electives	9
Major performance medium	24
Secondary performance medium	8
Ensembles (12 quarters)	12-24
	132-144

JAZZ STUDIES MAJOR

Courses	Credits
Music theory-history core	54-55
exclusive of MUSIC 313, 314, but to include MUSIC 207, 208, 209, 425, and 9-10 credits of theory/history electives chosen from:	
MUSIC 216, 217, 218 Introductory Composition (2,2,2)	
MUSIC 313, 314 Music Before 1750 (3,3)	
MUSIC 316, 317, 318 Music Cultures of the World (5,5,5)	
MUSIC 367, 368, 369 Beginning Jazz Improvisation (1,1,1)	
MUSIC 423 Twentieth-Century Music: To 1945 (3)	
MUSIC 424 Twentieth-Century Music: After 1945 (3)	
Additional requirements	17-19
3-5 credits from the following:	
MUSIC 319 Afro-American Music (5) or MUSIC 317 Music Cultures of the World (5)	
or MUSIC 427 Music of Africa (3) or MUSIC 433 Music of Latin America (3)	
Remaining 14 credits to include:	
MUSIC 336 Jazz Arranging (2)	
MUSIC 467, 468, 469 Advanced Jazz Improvisation (1,1,1)	
MUSIC 388 Jazz Pedagogy (2)	
MUSAP 301 or MUSIC 234, 235, 236 Piano Instruction (2,2,2)	
MUSIC 479 Senior Recital (1)	
Applied instruction	39
MUSAP 301-318 First-year level (2,2,2)	
MUSAP 351-368 Second-year level (2,2,2)	
MUSAP 401-418 Third-year level (2,2,2)	
MUSAP 451-468 Fourth- and fifth-year levels (2,2,2,2,2)	
MUSIC 464 Jazz Laboratory (1,1,1,1,1,1,1,1)	
Ensembles	21
21 credits from the following:	

- MUSEN 340 Vocal Jazz Ensemble (1, max. 6)
 MUSEN 345 Jazz Workshop (1, max. 12)
 MUSEN 346 Studio Jazz Ensemble (1, max. 6)
 MUSEN 446 Advanced Studio Jazz Ensemble

(1, max. 9)
 131-134

Graduate Program

Graduate programs in the School of Music take into consideration the dual nature of music's subject matter. First, it is one of the creative arts, requiring constant renewal through the efforts of composers, performers, and teachers. Second, it is a branch of the humanities, subject to scholarly study and interpretation of its theoretical concepts and historical development. Advanced study presupposes an emphasis in one or the other direction without entirely neglecting the alternate aspect.

Special Requirements

Upon admission to the Graduate School as a music major, the student must further qualify for a specific area of specialization. See below.

Financial Aid

A limited number of teaching and staff assistantships are available in voice, theory and ear training, music history and literature, ethnomusicology, piano teaching and accompanying, and choral conducting. Accompanists are also employed at hourly rates. Competitive auditions for performance scholarships for new and returning students are held each year. The School of Music office may be contacted for details.

Research Facilities

The Music Building contains the music library, an electronic composition laboratory, a listening center, a systematic musicology laboratory, and the usual studio, practice, and classroom facilities of a modern music department. Ensembles available for student participation include opera, Contemporary Group, Collegium Musicum, and several non-Western ensembles among the many traditional large and small choral and instrumental groups.

Master of Music, Doctor of Musical Arts Degrees

The programs with more creative emphasis lead to the degrees of Master of Music and Doctor of Musical Arts. Areas of specialization: performance (piano, organ, voice, strings, other orchestral instruments), instrumental conducting, choral conducting, composition, opera production, and, at the doctoral level, music education. The Graduate Record Examination is not required for application to these graduate programs.

Master of Music Degree

Admission Requirements: Audition required for entrance to performance and composition. Entrance to other areas by permission. Details of requirements for each of the areas of specialization are available from the graduate program coordinator.

Graduation Requirements: 45 credits, of which 18 must be in courses at the 500 level or above. Demonstration of proficiency in one language from French, German, Italian, and Latin. *With thesis*—Program to include 9 credits in thesis. *Without thesis*—A final oral examination is required.

Doctor of Musical Arts Degree

Admission Requirements: Audition required for performance and composition. Entrance to other areas by permission. Details of requirements for each of the areas of specialization are available from the graduate program coordinator.

Graduation Requirements: Three academic years of study; dissertation: in lieu of a full-length dissertation, a thesis in three parts may be substituted, of which one must be a research paper and two may be additional research papers, or musical compositions, or documented public performances, or documented lecture demonstrations. Demonstration of proficiency in one language from among French, German, Italian, and Latin, as soon as possible, but, in any case, before taking the General Examination.

Master of Arts, Doctor of Philosophy Degrees

The research-oriented programs lead to the degrees of Master of Arts and Doctor of Philosophy. Areas of specialization: music theory, music history and literature, ethnomusicology, systematic musicology, and, at the master's level, music education. The Graduate Record Examination is not required for application to these graduate programs.

Master of Arts Degree

Admission Requirements: Requirements vary for the different areas of specialization. Details of requirements for each of the areas of specialization are available from the School of Music graduate program coordinator.

Graduation Requirements: 45 credits, of which 18 must be in courses at the 500 level or above and 9 in thesis. Demonstration of proficiency in one language from among French, German, Italian, and Latin.

Doctor of Philosophy Degree

Admission Requirements: Requirements vary for the different areas of specialization. Details of requirements for each of the areas of specialization are available from the School of Music graduate program coordinator.

Graduation Requirements: Three academic years of study; dissertation. Demonstration of proficiency in German and a second language from among French, Italian, and Latin, or another such language as is necessary for research, as soon as possible, but, in any case, before taking the General Examination.

Faculty

Director

Daniel M. Neuman

Professors

Beale, James M.,* 1948, M.Mus., 1947, Yale; theory/composition.

Bergsma, William,* 1963, (Emeritus), M.M., 1943, Eastman School of Music (Rochester); theory/composition.

Carlsen, James C.,* 1967, (Psychology), M.A., 1958, Washington; Ph.D., 1962, Northwestern; systematic musicology, psychomusicology, research methodology, theories of music instruction.

Clarke, Henry L., 1958, (Emeritus), A.M., 1929, Ph.D., 1947, Harvard; music history and literature.

Curtis-Verna, Mary V.,* 1969, A.B., 1943, Hollins; voice.

Dempster, Stuart R.,* 1968, M.A., 1967, San Francisco State; trombone.

Eichinger, Walter E., 1936, (Emeritus), M.Mus., 1933, Northwestern; organ.

Feist, Robert,* 1981, M.Mus., 1954, Indiana; conducting.

Grossman, Arthur, 1968, Diploma, 1955, Curtis; bassoon.

Guarrera, Frank P.,* 1979, Diploma, 1948, Curtis; voice.

Harman, R. Alec, 1967, (Emeritus), A.R.C.M., G.R., S.M., 1943-49, Royal Academy; music history and literature.

Heinitz, Eva Marie, 1948, (Emeritus), studied at State Academy of Music (Berlin); violoncello.

Hokanson, Randolph,* 1949, (Emeritus), studied with Dame Myra Hess, Howard Ferguson (London); piano.

Irvine, Demar, 1937, (Emeritus), M.A., 1931, California (Berkeley); Ph.D., 1937, Harvard; music history and literature.

Kaplan, Abraham,* 1977, Postgraduate Diploma, 1957, Juilliard; conducting.

Kechley, Gerald,* 1953, M.A., 1950, Washington; theory/composition.

Kind, Silvia E., 1969, (Emeritus), Konzert-Reifeprüfung, 1934, Hochschule für Musik (Berlin); harpsichord.

Lishner, Leon, 1964, (Emeritus), B.S.S., 1937, City College (New York); voice.

Lundquist, Barbara R.,* 1966, M.S., 1959, Montana State; D.M.A., 1973, Washington; music education, systematic musicology, sociomusicology, music instruction, ethnomusicology in school.

McColl, William D., 1968, Graduate, 1955, State Academy of Music (Vienna); clarinet.

Moore, John T., 1948, (Emeritus), M.Mus., 1941, Illinois; piano.

Munro, Kathleen, 1929, (Emeritus), M.A., 1927, Columbia; Ph.D., 1937, Washington; music history and literature.

Neuman, Daniel M.,* 1978, (Anthropology),† Ph.D., 1974, Illinois; ethnomusicology.

O'Doan, Neal D.,* 1966, M.Mus., 1961, University of the Pacific; Post Graduate Diploma, 1962, Juilliard; piano.

Rahn, John,* 1975, M.F.A., 1972, Ph.D., 1974, Princeton; theory/composition.

Siki, Bela,* 1966, dipl. de Virtuosity, 1948, Conservatoire de Musique (Switzerland); piano.

Skowronek, Felix E.,* 1968, B.Mus., 1956, Curtis; flute.

Smith, William O.,* 1966, M.A., 1952, California (Berkeley); theory/composition.

Sokol, Vilem,* 1948, (Emeritus), Grad. Cert., 1939, Conservatory of Music (Prague); M.Mus., 1946, Oberlin; violin, viola.

Staryk, Steven S.,* 1987, studied at the Royal Conservatory of Music (Toronto); violin.

Storch, Laila,* 1968, Diploma, 1945, Curtis; B.A., 1964, Wilkes; oboe.

Terry, Miriam, 1930, (Emeritus), M.A., 1948, Washington; music history and literature.

Tufts, Paul D., 1958, M.A., 1951, Washington; theory/composition.

Verrall, John W., 1948, (Emeritus), Cert. of Mus., 1932, Liszt Conservatory (Budapest); theory/composition.

Zsigmondy-Liedemann, Denes, 1972, (Emeritus), Masterclass, 1943, Liszt Academy (Budapest); violin.

Associate Professors

Alavedra, Montserrat, 1978, Diploma, 1973, Escuela Superior de Canto (Spain); voice.

Benshoof, Kenneth W., 1963, M.A., 1963, San Francisco State; theory/composition.

Bozarth, George S., Jr.,* 1978, M.F.A., 1973, Ph.D., 1978, Princeton; music history and literature.

Conlon, Joan C.,* 1977, M.A., 1967, D.M.A., 1975, Washington; conducting, choral literature.

Cooper, Elneta A.,* 1972, M.Ed., 1959, Wayne State; D.Ed., 1971, Oregon; music education.

Ellingson, Ter,* 1981, M.A., 1970, Chicago; Ph.D., 1979, Wisconsin (Madison); ethnomusicology.

Geissmar, Else Johanna-Marie, 1947, (Emeritus), M.Mus., 1944, Michigan; piano.

Jussila, Clyde F.,* 1971, (Emeritus), (Education), M.S., 1951, Kansas State; music education.

Kappy, David L., 1979, M.M., 1971, Wisconsin; horn.

Paglalunga, Augusto N., 1978, M.Mus., 1967, New England Conservatory; voice.

Rosinbum, Ralph R., 1948, (Emeritus), M.A., 1948, Washington; opera production.

Sakata, Hiromi Lorraine,* 1977, M.A., 1968, Ph.D., 1976, Washington; ethnomusicology.

Saks, Toby, 1976, M.S., 1966, Juilliard; violoncello.

Starr, Lawrence,* 1977, Ph.D., 1973, California (Berkeley); music history and literature.

Terry, Carole R.,* 1979, M.Mus., 1973, Eastman School of Music (Rochester); D.M.A., 1977, Stanford; organ, harpsichord.

Thome, Diane D.,* 1977, M.A., 1966, Pennsylvania; M.F.A., 1970, Ph.D., 1973, Princeton; theory/composition.

Assistant Professors

Bernard, Jonathan,* 1987, M.A., 1973, M.Phil., 1975, Ph.D., 1977, Yale; theory.

Keefe, Douglas H.,* 1984, M.S., 1977, Illinois Institute of Technology; Ph.D., 1981, Case Western Reserve; systematic musicology.

McCabe, Robin L., 1987, M.Mus., 1973, Washington; D.M.A., Juilliard; piano.

Michaelian, Patricia, 1984, Graduate Diploma, 1970, Curtis Institute of Music; piano.

Salzman, Timothy,* 1987, M.Mus., 1979, Northern Illinois; wind ensembles.

Taricani, JoAnn, 1980, M.A., 1977, Ph.D., 1986, Pennsylvania; music history and literature.

Troy, Charles E.,* 1965, A.M., 1961, Ph.D., 1972, Harvard; music history and literature.

Waterman, Christopher A.,* 1985, M.A., 1981, Ph.D., 1986, Illinois; ethnomusicology.

Lecturers

Blissell, William E., 1970, M.S., 1956, Illinois; marching band.

Brockman, Michael, 1987, M.Mus., 1982, New England Conservatory; saxophone.

Collier, Thomas, 1980, B.A., B.Mus., 1971, Washington; percussion.

Cummings, Roy M., 1970, B.A., 1961, Washington; trumpet, jazz.

Herbolshelmer, Bern H., 1984, M.Mus., 1973, Washington; vocal coaching.

Knapp, James, 1987, M.A., 1969, Illinois; jazz studies.

Liotta, Vincent J.,* 1983, M.S., 1975, Indiana; opera stage production.

Novacek, Stephen, 1984, B.Mus., 1975, California State (Northridge); guitar.

Porter, Neal, 1986, M.Ed., 1971, Seattle University; music education.

Schnebly-Black, Julia, 1987, M.Mus., 1950, Yale; Ph.D., 1984, Washington; theory.

Seales, Marc, 1987, B.A., 1978, Western Washington; jazz studies.

Seibert, Peter, 1971, M.A.T., 1958, Harvard; M.A., 1965, Rutgers; recorder.

Vokolek, Pamela C., 1968, M.Mus., 1965, Cleveland Institute; harp.

Warner, Ring, 1984, B.Mus.Ed., 1963, Northwestern; string bass.

Course Descriptions

Courses for Undergraduates

Music

Courses Primarily for Nonmajors

MUSIC 116, 117, 118 Elementary Music Theory (2,2,2) AW, WSp, Sp Prerequisites: 116 for 117; 117 for 118.

MUSIC 120 Survey of Music (5) AWSp Studies in listening with emphasis on the changing components of Western art music. Illustrated lectures, laboratory section meetings, and presentations by guest artists.

MUSIC 121 The Orchestra (2) Development of the orchestra and its literature.

MUSIC 160 Anglo-American Folk Music (5) W Genres and styles from earliest roots to the 1960s; Anglo-American ballads, dance music, French and other European immigrant groups.

MUSIC 161 American Musical Theater (5) Historical and stylistic study of the development of the American musical theater. European roots in opera and operetta. Contributions from jazz and popular music. Selected musicals studied.

MUSIC 162 American Popular Song (5) AWSp Historical, social, and stylistic study of popular idioms from the late nineteenth century to the present. Most attention to contemporary idioms (rock, country-Western, soul, disco). Influences of music industry on taste and style. Does not include jazz, blues, or folk music. Recommended: 160, 161.

MUSIC 200 Music and the Child (3) AWSp Cooper Introductory orientation to music designed to acquaint the student with the structural and esthetic elements in music and those music-related processes of self-expression and communication basic to a child's education. Prerequisite to the course in instructional methodology.

MUSIC 260 Orchestral Music (5) Orchestral music from its beginnings in the seventeenth century through recent developments; evolution of the symphony.

MUSIC 262 Introduction to Twentieth-Century Music (3) Starr Listeners' survey of important composers and trends, from Debussy through electronic music. Prerequisite: 120 or permission of instructor.

MUSIC 316, 317, 318 Music Cultures of the World (5,5,5) A,W,Sp 316: Near East, Central Asia, Far East, South and Southeast Asia, Indonesia, and the Philippines. 317: music of sub-Saharan Africa, Americas, and Oceania. 318: folk and popular music in western and eastern Europe and the Americas.

MUSIC 319 Afro-American Music (5) Centers on Black music in the United States, but also clarifies the relationship of this music to the musics of other Afro-American cultures as well as to their African roots.

MUSIC 330 Music in the United States (5) Contribution of music to the development of American culture.

MUSIC 331 History of Jazz (3) AWSp Development of jazz in the United States, from its beginnings to its present trends.

MUSIC 332 Music in European Society: Antiquity to 1700 (5) Taricani Music and its relationship to aspects of European culture and society—philosophy, politics, social conditions, and the visual arts from antiquity to 1700. Prerequisite: 120 or equivalent background.

MUSIC 333 Music in European Society: 1700 to Present (5) Sp Bozarth Music as related to other aspects of modern European culture and society—philosophy, politics, social conditions, and the visual arts. Prerequisite: 120 or equivalent.

MUSIC 339 Opera (5) W Troy Contributions of music, text, and staging; study of representative works concentrating on problems of combining these elements into a composite work of art.

MUSIC 386 Multimedia Music (3) W Dempster Survey tracing the development of multimedia music since 1950 (experimental combinations of music with other art forms in unfamiliar circumstances).

MUSIC 429 Music, Literature, and the Arts (3) Literary and visual art works that include musical subject matter and forms; musical genres that incorporate such other arts as opera and ballet. Related philosophical writings. Includes works of a particular time period or investigation of a specific problem in comparative arts. Prerequisite: major in one of the arts, comparative arts, or related humanities field, or permission of instructor.

Courses Primarily for Music Majors

Permission of undergraduate adviser required for all courses.

MUSIC 110, 111, 112 First-Year Theory (3,3,3) A,W,Sp Study of basic musical concepts and terminology through a program of listening, analysis, and keyboard practice. To be taken concurrently with 113, 114, 115.

MUSIC 113, 114, 115 Ear Training (1,1,1) A,W,Sp To be taken concurrently with 110, 111, 112.

MUSIC 133, 134, 135 Basic Keyboard (2,2,2) Keyboard harmony and simple keyboard pieces. Class/private instruction. Prerequisites: ability to read notes (treble and bass clefs) for 133; 133 for 134; 134 for 135.

MUSIC 137, 138, 139 Class Instruction: Voice (1,1,1) A,W,Sp Primarily for music majors.

MUSIC 191 Composition (3, max. 9) AWSp One-hour private lesson and one-hour laboratory session each week. Intended to develop skill in creative musical expression.

MUSIC 207, 208, 209 Second-Year Ear Training (1,1,1) A,W,Sp To be taken concurrently with 210, 211, 212. Prerequisites: 112, 115.

MUSIC 210, 211, 212 Second-Year Theory (3,3,3) A,W,Sp Beale, Benshoof, Kechley, Thome, Tufts Practical writing and analytic experience in diatonic and chromatic harmony as it was used during the eighteenth and nineteenth centuries. To be taken concurrently with 213, 214, 215. Prerequisites: 112, 115.

MUSIC 213, 214, 215 Music After 1750 (3,3,3) A,W,Sp Starr To be taken concurrently with 210, 211, 212.

MUSIC 216, 217, 218 Introductory Composition (2,2,2) A,W,Sp Smith For students not majoring in composition. Prerequisite: 112.

MUSIC 234, 235, 236 Secondary Piano (2,2,2) Keyboard harmony, harmonization of melodies; lower-intermediate keyboard pieces. Class/private instruction. Prerequisites: 135 for 234; 234 for 235; 235 for 236.

MUSIC 237 Class Instruction: Voice (2, max. 6) AWSp For music majors only.

MUSIC 291 Composition (3, max. 9) AWSp One-hour private lesson and one-hour laboratory session per week. Prerequisite: 191.

MUSIC 301 Piano Technology (3) Evolution of the piano; intonation and temperament theory; principles of tuning, voicing, regulating, and evaluating pianos. Prerequisite: permission of instructor.

MUSIC 310 Modal Counterpoint (3) A *Kechley, Thome* Sixteenth-century style. To be taken concurrently with 313. Prerequisites: 212, 215.

MUSIC 311 Tonal Counterpoint (3) W *Beale, Benshoof, Kechley, Thome* Basic techniques of baroque counterpoint and introduction to the fugue. To be taken concurrently with 314. Prerequisites: 212, 215.

MUSIC 312 Twentieth-Century Techniques (3) Sp *Benshoof, Smith* Practical writing and analytical study of twentieth-century composition techniques from Debussy to the present.

MUSIC 313, 314 Music Before 1750 (3,3) A,W *Bozarth, Taricani* 313: before 1600. 314: 1600-1750. To be taken concurrently with 310, 311. Prerequisites: 212, 215 for 313; 313 for 314.

MUSIC 326, 327, 328 Repertoire (2,2,2) A,W,Sp For applied music majors.

MUSIC 334 Band Arranging (2) W Prerequisite: 212.

MUSIC 336 Jazz Arranging (2) A *Smith* Writing in jazz style for various instrumental combinations.

MUSIC 338 Baroque Ornamentation (2) *Terry* Musical ornamentation in France, Spain, England, Italy, and Germany from 1608 to 1800, with special reference to the harpsichord.

MUSIC 340 Music in General Education (3) AW An orientation to the broad scope of music in schools (K-12), including identification of musical concepts and skills and the development of teaching strategies and evaluation techniques.

MUSIC 343⁺ Music and Science I: Acoustical Systems (3) A *Keefe* How musical instruments function and interact with acoustics of rooms, with particular emphasis upon musical aspects of acoustics.

MUSIC 344 Music and Science II: Psychological Systems (3) W *Carlsen* Human response to musical phenomena, with particular emphasis on perception, learning, measurement, and functional applications.

MUSIC 345 Music and Science III: Social Systems (3) Sp *Lundquist* Interrelationships between music and its social context. Specific musical phenomena and the social factors influencing their development.

MUSIC 367 Beginning Jazz Improvisation I (1) A *Collier, Cummings, Smith* Techniques used in the performance of basic jazz styles such as the blues. Prerequisite: 212 or permission of instructor.

MUSIC 368 Beginning Jazz Improvisation II (1) W *Collier, Cummings, Smith* Techniques used in the performance of basic jazz standard compositions. Prerequisite: 367 or permission of instructor.

MUSIC 369 Beginning Jazz Improvisation III (1) Sp *Collier, Cummings, Smith* Techniques used in the performance of intermediate level jazz standard composition. Prerequisite: 368 or permission of instructor.

MUSIC 379 Junior Recital (1) AWSp For participants in the Bachelor of Music degree program only.

MUSIC 380, 381, 382 Conducting (1,1,1) A,W,Sp Prerequisite: 212 or permission of instructor.

MUSIC 388 Jazz Pedagogy (2) Stylistic and esthetic developments in the performance of jazz. Key musical ingredients in the evolution of jazz as an art form and the skills commensurate with teaching them.

MUSIC 391 Composition (3, max. 9) AWSp One-hour private lesson and one-hour laboratory session each week. Prerequisite: 291.

MUSIC 395 Composition with Synthesizers (3, max. 9) Musical composition using special-purpose hardware music synthesizers, which may be interfaced to microcomputers in a music workstation system. Prerequisite: permission of instructor.

Courses 400 through 424—Prerequisite: 314.

MUSIC 400 Medieval Music: To 1400 (3) *Taricani* Gregorian chant through Machaut and Landini.

MUSIC 401 Early Renaissance Music: 1400-1525 (3) *Taricani* Dunstable through Josquin.

MUSIC 402 Late Renaissance Secular Music: 1525-1630 (3) *Taricani* The madrigal in Italy, England, and Germany. The Chanson, Jannequin through Lassus.

MUSIC 403 Late Renaissance Sacred and Instrumental Music: 1525-1630 (3) *Taricani* Latin church music. Willaert through G. Gabrieli; early Reformation church music. Walther through Gibbons; instrumental music, Cabezón, the English virginal school, and Sweelinck.

MUSIC 404 Keyboard Music: 1630-1770 (3) Forms and styles: Frescobaldi through J. S. Bach and C. P. E. Bach.

MUSIC 405 Keyboard Music: 1770-1850 (3) Haydn through Schumann.

MUSIC 406 Keyboard Music: 1850-1920 (3) Liszt through Debussy.

MUSIC 407 Baroque Solo Song (3) Monody and cantata, Caccini through Handel.

MUSIC 408 The German Lied (3) *Bozarth* Schubert through Strauss.

MUSIC 409 French Art-Song: 1850 to the Present (3) Faure through Poulenc.

MUSIC 410 Chamber Music: 1680-1770 (3) Frescobaldi through Bach.

MUSIC 411 Chamber Music: 1770-1830 (3) Haydn through Schubert.

MUSIC 412 Chamber Music: 1830-1920 (3) Schumann through Ravel.

MUSIC 413 Orchestral Music: 1620-1760 (3) Corelli through the Mannheim School.

MUSIC 414 Orchestral Music: 1760-1850 (3) Haydn through Berlioz.

MUSIC 415 Orchestral Music: 1850-1920 (3) Liszt and Brahms through early Schoenberg and Stravinsky.

MUSIC 417 Choral Music: 1600-1770 (3) *Bozarth* Monteverdi through Handel.

MUSIC 418 Choral Music: 1770-1850 (3) Large works for chorus and orchestra. Haydn through Berlioz.

MUSIC 419 Choral Music: 1850 to the Present (3) *Bozarth* Selected choral masterpieces. Brahms through Britten.

MUSIC 420 Opera: 1600-1750 (3) *Troy*

MUSIC 421 Opera: 1750-1850 (3) *Troy* Gluck through Bellini.

MUSIC 422 Opera: 1850-1920 (3) *Troy* Wagner through Puccini.

MUSIC 423 Twentieth-Century Music: to 1945 (3) *Starr* Intensive study of selected composers and works exemplifying the new vocabularies, grammars, and styles of the early part of the century.

MUSIC 424 Music Since 1945 (3) *Starr* Diversity of the contemporary musical scene. Vocabularies appropriate for the description and understanding of the new music developed through study of representative composers and works, and appropriate readings. Prerequisite: 314.

MUSIC 425 Jazz History and Analysis (3) W *Collier* Major eras and styles of jazz with emphasis on technical aspects of jazz music: composition, arranging, improvisation practices. Prerequisite: music major or permission of instructor.

MUSIC 431 The Curriculum in Music Education (3, max. 6) WS *Cooper* Principles and practices of curriculum design applied to the development of the music curriculum. Individual or group work on elementary and secondary school music curriculum projects. Prerequisite: music teaching, student teaching, or permission of instructor.

MUSIC 432 The General Music Class (3) Sp *Lundquist* The teaching of music and its literature in nonperforming classes on the junior and senior high school level.

MUSIC 434, 435, 436 Pedagogy (2,2,2) A,W,Sp Principles of effective studio teaching; survey and evaluation of teaching materials.

MUSIC 440 Music in Early Childhood (3) A *Cooper* Identification and selection of appropriate objectives, materials, teaching strategies and evaluation techniques used in music teaching from nursery school through grade three, with consideration of various methods (e.g., Kodaly, Orff) for early childhood development in music.

MUSIC 441 Music in Later Childhood (3) Sp *Cooper* The identification and selection of appropriate objectives, materials, teaching strategies, and evaluation techniques used in music teaching in grades four through six, with consideration of various methods (e.g., Kodaly, Orff) for later childhood development in music.

MUSIC 442 Instrumental Curriculum: Methods and Materials (3) Study of the organization and administration of school instrumental music; the selection and use of materials and teaching strategies from beginning to advanced levels of instrumental instruction.

MUSIC 443 Choral Curriculum: Methods and Materials (3) W *Conlon, Lundquist* Study of the organization and administration of school choral music; the selection and use of materials and teaching strategies from beginning to advanced levels of choral instruction.

MUSIC 452 Ethnomusicology in the Public Schools (3) W *Lundquist* Issues, teaching materials, and techniques involved in incorporating music of world cultures in public school classrooms.

MUSIC 454 Organ Pedagogy (3) *Terry* Various pedagogical approaches to organ techniques and performance practice, providing opportunity for practical application by means of student teaching.

MUSIC 455 Choral Arranging (3) Sp *Kechley* Primarily for choral conductors who need to modify or arrange material to suit the capabilities of specific choral groups and performance situations. Prerequisite: senior standing or permission of instructor.

MUSIC 456 Musical Applications of Digital Signal Processing (3) *Keefe* Digital signal processing applied to scientific investigations of musical systems, computer music, and digital audio. Applications using the music workstation. Prerequisites: 485 or 488 or programming competency and MATH 126.

MUSIC 457 Audio Engineering (3) *Keefe* Acoustical and electrical circuit analysis. Audio instrumentation: physical models, computer-aided testing procedures, and audio applications. Prerequisite: MATH 126.

MUSIC 458 Organ Repertoire: Middle Ages Through Baroque (3) *Terry* Analysis and performance practices of organ literature, Middle Ages through baroque period. Development of the organ as musical instrument. Prerequisites: one 400-level history course, pre-1750, in addition to history core.

MUSIC 459 Organ Repertoire: Bach to Present (3) *Terry* Analysis and performance practices of organ literature, Classic period through the twentieth century. Development of the organ as a musical instrument. Prerequisites: one 400-level history course, post-1750, in addition to history core.

MUSIC 465 Introduction to Music Classroom Management (1-6, max. 6) Observation and analysis of teaching skills and management of music classes. Prearranged assignment includes twenty hours of observation for each credit. Supervised teaching participation required when appropriate. Prerequisite: entrance application in Music Education Office.

MUSIC 467 Advanced Jazz Improvisation I (1) A *Collier, Smith* Performance techniques in jazz improvisation for the advanced student. Prerequisite: 369 or permission of the instructor.

MUSIC 468 Advanced Jazz Improvisation II (1) W *Collier, Smith* Performance techniques in jazz improvisation for the advanced student. Prerequisite: 467 or permission of the instructor.

MUSIC 469 Advanced Jazz Improvisation III (1) Sp *Collier, Smith* Performance techniques in jazz improvisation for the advanced student. Prerequisite: 468 or permission of the instructor.

MUSIC 470 Contemporary Theories I: Tonal Music (3) *Rahn* Recent tonal theories, including introduction to the various developments of the theories of Heinrich Schenker; not restricted to music written before 1900. Prerequisites: 215 and 312, or permission of instructor.

MUSIC 471 Contemporary Theories II: Non-Tonal Music, 1900-1950 (3) *Rahn* Includes both "free atonal" and "classical serial" music. Systematic analysis of works of Schoenberg, Webern, Berg, and others. Prerequisites: 215 and 312, or permission of instructor.

MUSIC 472 Contemporary Theories III: Seminar in New Music (3, max. 6) *Rahn* Continuation of 471. Emphasis on the many organizational systems aspiring to extend or replace tonality: late Stravinsky and other semiserial matrix systems; "total serialism" and "systematic serialism" developed by and from Milton Babbitt; recent developments in nonserial "pitch-centric" and "set-centric" systems. Prerequisite: 471 or permission of instructor.

MUSIC 473 Keyboard Harmony and Transposition (3) A *Terry* Keyboard harmonization from the baroque period to present; transposition of vocal and instrumental pieces to different pitch levels. Prerequisite: 312 or permission of instructor. (Offered alternate years.)

MUSIC 474 Keyboard Harmony and Transposition (3) W *Terry* Keyboard harmonization from baroque period to present; transposition of vocal and instrumental pieces to different pitch levels. Prerequisite: 473 or permission of instructor. (Offered alternate years.)

MUSIC 475 Figured Bass Realization (3) Sp *Terry* Various styles of continuo realization for keyboardists, emphasizing Bach cantatas, Haydn symphonies, and Mozart operas. Prerequisite: 473 or permission of instructor. (Offered alternate years.)

MUSIC 476 Advanced Vocal Repertoire: Seventeenth and Eighteenth Centuries (2) Professional preparation of pre-nineteenth century songs with a view to total artistic-musical realization in performance. Appropriate style, character, balance, phrasing, diction, and projection for vocalists and pianists. Prerequisites: 326, 327, 328, or permission of instructor.

MUSIC 477 Advanced Vocal Repertoire: Nineteenth Century (2) Professional preparation of works from the literature of nineteenth-century German lieder, with a view to total artistic-musical realization in performance. Appropriate style, character, balance, phrasing, diction, and projection for vocalists and pianists. Prerequisites: 326, 327, 328, or permission of instructor.

MUSIC 478 Advanced Vocal Repertoire: Twentieth Century (2) Preparation of works from the twentieth-century repertoire of French, German, Italian, Spanish, and English songs, with a view to total artistic-musical realization in performance. Appropriate style, character, balance, phrasing, diction, and projection for vocalists and pianists. Prerequisites: 326, 327, 328, or permission of instructor.

MUSIC 479 Senior Recital (1) AWSp

MUSIC 481 Choral Repertoire: Sixteenth and Seventeenth Centuries (3) *Conlon* Sacred and secular choral literature from Renaissance through early baroque, covering Europe and England. Various genres and styles of major composers, including performance practice, rehearsal, and conducting. Prerequisite: senior standing or above or permission of instructor.

MUSIC 482 Choral Repertoire: Eighteenth Century (3) *Conlon* Sacred and secular choral literature of the baroque, covering mainland Europe and England. Choral works of Bach, his predecessors, and contemporaries. Stylistic analysis and study of performance practice. Prerequisite: senior standing or above or permission of instructor.

MUSIC 483 Choral Repertoire: Nineteenth Century (3) *Conlon* Sacred and secular choral literature of the nineteenth century, covering mainland Europe and England. Analysis of accompanied and *a cappella* choral works by major composers with implications for conducting and programming of literature. Prerequisite: senior standing or above or permission of instructor.

MUSIC 484 Choral Repertoire: Twentieth Century (3) *Conlon* Choral literature of the twentieth century, covering America, England, and mainland Europe. Various genres and styles, including score study and teaching strategies. Prerequisite: senior standing or above or permission of instructor.

MUSIC 485 Computer Music Seminar (3, max. 9) *AWSp Rahn* Use of computers in musical composition, software digital sound synthesis, score generation, theoretical investigations. Prerequisites: 212 or 456 or PHYS 207 or programming experience; permission of instructor.

MUSIC 487 Tonal Counterpoint (3) Sp *Beale* Evaluation of fugal practice from the baroque era to the present. Prerequisite: 311.

MUSIC 488 Computer Applications to Music (3) *Keefe* Music workstation applications using microcomputers, music synthesizers, and analog-to-digital converters: music editing and score production, transcription, waveform and spectral analysis, and introduction to programming.

MUSIC 489 Special Topics in Music Theory (3, max. 9) Prerequisites: 312, 314.

MUSIC 490 Orchestration (3)

MUSIC 491 Composition (3, max. 18) AWSp One-hour private lesson and one-hour laboratory session each week. Prerequisite: 391.

MUSIC 492, 493 Opera Direction and Production (4,4) A,W *Liotta* Practical experience with problems of the theater. Prerequisite: permission of instructor; 492 for 493.

MUSIC 496 Special Topics in Music Education (1-3, max. 10) S Special studies designed to reflect contemporary emphases and concerns in the music education profession.

MUSIC 497 Special Topics in Music History (1-3, max. 6) Topics vary each quarter.

MUSIC 499 Undergraduate Research (*, max. 6) AWSp

Ethnomusicology

Courses are open to both majors and nonmajors.

MUSIC 300 Music of Greater Mexico (3) Regional styles of Mexico; consideration of pre-Hispanic Indian origins and the music of Chicanos in the American Southwest.

MUSIC 426 Music of Korea (3) Classical instrumental and vocal genres of Korea. Examines both court and folk traditions. Open to students in music and East Asian Area Studies. Prerequisites: 316, 317, 318, or permission of instructor.

MUSIC 427 Music of Africa (3) Music cultures of sub-Saharan Africa. Traditional styles and more recent developments. Open to all students with an interest in the area. Prerequisite: 317 or permission of instructor.

MUSIC 428 Music of North India (3) Classical music of North India, the Hindustani tradition with emphasis on the Dhrupad and Khyal styles. Recommended: some background in either ethnomusicology or South Asian Studies.

MUSIC 430 Organology (3) Systematic study of musical instruments, involving the history, acoustical phenomena, and physical typologies of instruments from around the world, with emphasis on non-Western music. Prerequisite: Ethnomusicology major or permission of instructor.

MUSIC 433 Music of Latin America (3) The Indian, African, and European music of the Spanish-, French-, and Portuguese-speaking New World countries. Prerequisite: 318 or permission of instructor.

MUSIC 439 Music of Indonesia and the Philippines (3) Includes the gong culture traditions of Sumatra, Sunda, Java, Bali, Sunda Islands, and the Philippines. Open to students in music and to students with an interest in the area. Prerequisite: 316 or permission of instructor.

MUSIC 444 Music of the Near East (3) *Sakata* Classical and folk musical traditions of Iran, Turkey, and the Arab world. Prerequisite: 316 or permission of instructor.

MUSIC 445 Selected Topics in Ethnomusicology (3) AWSp Deals with topics not covered by regular courses in ethnomusicology. Frequently taught by visiting lecturers. Content varies with different instructors. Prerequisite: permission of instructor.

MUSIC 447 Music of Southern India (3) Classical music of South India, the Karnaik tradition, with emphasis on the concert repertoire. Recommended: background in either ethnomusicology or South Asian Studies.

MUSIC 448 Instrumental Music of China (3) Instrumental traditions of China from the earliest times to the present. Confucian philosophies that relate to music, theory, scale systems, cosmology. Recommended: background in either ethnomusicology or East Asian Studies.

MUSIC 449 Vocal and Dramatic Music of China (3) Vocal and dramatic traditions of China from the earliest times to the present, including the relationship of music and language. Recommended: background in either ethnomusicology or East Asian Studies.

MUSIC 480 The Anthropology of Music (3) Analysis of aspects of anthropological thought influential in ethnomusicology. Critical evaluation of dominant theoretical schools and modes of explanation (e.g., evolutionist, diffusionist, historical particularist, structuralist, functionalist, symbolist, semiotic) through detailed examination of seminal texts. Joint with ANTH 430. Prerequisite: ethnomusicology major or permission of instructor.

MUSIC 494 Music of Japan Until 1700 (3) Gagaku, Biwa, shakuhachi, koto, and Noh genres. Open to students in music and East Asian Area Studies. Prerequisite: 316 or permission of instructor.

MUSIC 495 Music of Japan After 1700 (3) Shamisen, Bunraku, Kabuki, and Sankyoku traditions. Open to students in music and East Asian area studies. Prerequisite: 316 or permission of instructor.

MUSIC 498 Music of Spain (3) The major stylistic periods of the music of Spain, with a consideration of the social and historical contexts that formed the music; the music of Islam in terms of its influence in Spain and the vestiges of early Spanish music in the folk and popular music of Spain and Latin America.

Courses for Undergraduates and Graduates

Music ensemble and music applied courses are open to majors and nonmajors.

Music Ensemble

MUSEN 100 is open to all students without audition. All other ensembles require an audition or permission of instructor. Graduate students should register for the 500-level ensemble courses.

MUSEN 100 University Singers (1, max. 15) AWSp

MUSEN 300, 500 University Symphony Orchestra (1, max. 15 for 300; 1, max. 9 for 500) AWSp Feist

MUSEN 301, 501 Woodwind Sinfonietta (1, max. 15 for 301; 1, max. 9 for 501) AWSp Salzman

MUSEN 302, 502 University Band (1, max. 10 for 302; 1, max. 6 for 502) WSp Salzman

MUSEN 303, 503 Marching Band (2, max. 10 for 303; 2, max. 6 for 503) A Bissell

MUSEN 304, 504 Percussion Ensemble (1, max. 12 for 304; 1, max. 9 for 504) AWSp Collier

MUSEN 305, 505 Brass Ensemble (1, max. 12 for 305; 1, max. 9 for 505)

MUSEN 308, 508 Woodwind Ensemble (1, max. 12 for 308; 1, max. 9 for 508)

MUSEN 307, 507 University Oratorio Chorus (1, max. 15 for 307; 1, max. 9 for 507) AWSp Kaplan

MUSEN 325, 525 Accompanying (2, max. 30 for 325; 2, max. 18 for 525) AWSp Michaelian

MUSEN 340, 540 Vocal Jazz Ensemble (1, max. 6 for 340; 1, max. 9 for 540) AWSp

MUSEN 345, 545 Jazz Workshop (1, max. 12 for 345; 1, max. 9 for 545) AWSp Collier

MUSEN 348, 548 Studio Jazz Ensemble (1, max. 6 for 348; 1, max. 9 for 548) AWSp Cummings

MUSEN 347, 547 Opera Chorus (1, max. 12 for 347; 1, max. 9 for 547) AWSp

MUSEN 350, 550 University Chorale (1, max. 12 for 350; 1, max. 9 for 550) AWSp Conlon

MUSEN 351, 551 Madrigal Singers (1, max. 15 for 351; 1, max. 9 for 551) AWSp Conlon

MUSEN 361, 561 Piano Ensemble (1, max. 3 for 361; 1, max. 9 for 561) AWSp O'Doan Study and performance of works for four hands at one or two pianos. Designed for upper-level piano majors or students with equivalent ability. Prerequisite: permission of instructor.

MUSEN 368, 568 Harp Ensemble (1, max. 12 for 368; 1, max. 9 for 568) AWSp Vokalek

MUSEN 369, 569 Baroque Chamber Ensemble (1, max. 12 for 369; 1, max. 9 for 569) AWSp Terry Prerequisite: permission of instructor.

MUSEN 375, 575 Opera Workshop (1, max. 6 for 375; 1, max. 9 for 575) AWSp Preparation of music theatre repertoire. Intended for the mature voice student. Prerequisite: 373 or permission of instructor.

MUSEN 380, 580 Sinfonietta (1, max. 6 for 380; 1, max. 9 for 580) AWSp Feist

MUSEN 381, 581 Chamber Music (1, max. 18 for 381; 1, max. 9 for 581) AWSp Prerequisite: student is at MUSAP 300 level or above.

MUSEN 382, 582 Opera Theatre (2, max. 6 for 382; 2, max. 18 for 582) AWSp Public performance of roles in opera.

MUSEN 383, 583 Collegium Musicum (1, max. 6 for 383; 1, max. 9 for 583) AWSp

MUSEN 384, 584 Contemporary Group (1, max. 6 for 384; 1, max. 9 for 584) AWSp Dempster, Smith Exploration of notation and performance problems in today's music; preparation for public performance.

MUSEN 448 Advanced Studio Jazz Ensemble (1, max. 9) AWSp Cummings Preparation and performance of material appropriate to large jazz ensemble concerts, clinics, and radio and television broadcasts. Prerequisite: permission of instructor. Recommended: three quarters of 348.

MUSEN 485, 486, 487 Duo-Sonata Repertoire (2,2,2) A,W,Sp 485: the classical period; 486: the romantic period; 487: the twentieth century. Prerequisite: undergraduate piano performance degree or permission of instructor.

Music Applied

Admission by Audition—Courses 300-318, 350-368, 400-418, and 450-468 are private instruction primarily for majors not specializing in performance. Also available to qualified nonmajors. Prerequisites: audition and permission of instructor. Courses 500-517 are for graduate performance majors who have not yet been formally admitted by jury examination for the 520-537 series.

MUSAP 205 String Techniques (2, max. 12) AWSp Group instruction of performance techniques, methods, and materials for orchestral string instruments.

MUSAP 210 Wind Techniques (2, max. 12) AWSp Group instruction of performance techniques, methods, and materials for orchestral wind and brass instruments.

MUSAP 217 Percussion Techniques (2, max. 4) A Collier Introduction to basic concepts of percussion playing.

MUSAP 218 Guitar Techniques (1, max. 3) AWSp Novacek

MUSAP 219 Recorder Techniques (1) W Seibert

MUSAP 239 Secondary Piano (2, max. 8) Intermediate-level keyboard repertory. Private instruction. Prerequisite: MUSIC 236.

MUSAP 300, 350, 400, 450, 500 Private Instruction: Voice (2-3 each, max. 9 each for 300, 350, 400; max. 18 for 450; 3, max. 9 for 500) AWSpS Alavedra, Curtis-Verna, Guarera, Paglialunga

MUSAP 301, 351, 401, 451, 501 Private Instruction: Piano (2-3 each, max. 9 each for 301, 351, 401; max. 18 for 451; 3, max. 9 for 501) AWSpS McCabe, Michaelian, O'Doan, Siki

MUSAP 302, 352, 402, 452, 502 Private Instruction: Organ (2-3 each, max. 9 each for 302, 352, 402; max. 18 for 452; 3, max. 9 for 502) AWSp Terry

MUSAP 303, 353, 403, 453, 503 Private Instruction: Harpsichord (2-3 each, max. 9 each for 303, 353, 403; max. 18 for 453; 3, max. 9 for 503) AWSp Terry

MUSAP 304, 354, 404, 454, 504 Private Instruction: Violin-Viola (2-3 each, max. 9 each for 304, 354, 404; max. 18 for 454; 3, max. 9 for 504) AWSp Staryk

MUSAP 305, 355, 405, 455, 505 Private Instruction: Violoncello (2-3 each, max. 9 each for 305, 355, 405; max. 18 for 455; 3, max. 9 for 505) AWSp Saks

MUSAP 306, 356, 406, 456, 506 Private Instruction: Double Bass (2-3 each, max. 9 each for 306, 356, 406; max. 18 for 456; 3, max. 9 for 506) AWSp

MUSAP 307, 357, 407, 457, 507 Private Instruction: Flute (2-3 each, max. 9 each for 307, 357, 407; max. 18 for 457; 3, max. 9 for 507) AWSp Skowronek

MUSAP 308, 358, 408, 458, 508 Private Instruction: Oboe (2-3 each, max. 9 each for 308, 358, 408; max. 18 for 458; 3, max. 9 for 508) AWSp Storch

MUSAP 309, 359, 409, 459, 509 Private Instruction: Clarinet (2-3 each, max. 9 each for 309, 359, 409; max. 18 for 459; 3, max. 9 for 509) AWSp McCall

MUSAP 310, 360, 410, 460, 510 Private Instruction: Bassoon (2-3 each, max. 9 each for 310, 360, 410; max. 18 for 460; 3, max. 9 for 510) AWSp Grossman

MUSAP 311, 361, 411, 461, 511 Private Instruction: Saxophone (2-3 each, max. 9 each for 311, 361, 411; max. 18 for 461; 3, max. 9 for 511) AWSp Brockman

MUSAP 312, 362, 412, 462, 512 Private Instruction: Horn (2-3 each, max. 9 each for 312, 362, 412; max. 18 for 462; 3, max. 9 for 512) AWSp Kappy

MUSAP 313, 363, 413, 463, 513 Private Instruction: Trumpet (2-3 each, max. 9 each for 313, 363, 413; max. 18 for 463; 3, max. 9 for 513) AWSpS Cummings

MUSAP 314, 364, 414, 464, 514 Private Instruction: Trombone (2-3 each, max. 9 each for 314, 364, 414; max. 18 for 464; 3, max. 9 for 514) AWSp Dempster

MUSAP 315, 365, 415, 465, 515 Private Instruction: Tuba (2-3 each, max. 9 each for 315, 365, 415; max. 18 for 465; 3, max. 9 for 515) AWSp Salzman

MUSAP 316, 366, 416, 466, 516 Private Instruction: Harp (2-3 each, max. 9 each for 316, 366, 416; max. 18 for 466; 3, max. 9 for 516) AWSp Vokalek

MUSAP 317, 367, 417, 467, 517 Private Instruction: Percussion (2-3 each, max. 9 each for 317, 367, 417; max. 18 for 467; 3, max. 9 for 517) AWSpS Collier

MUSAP 318, 368, 418, 468 Private Instruction: Guitar (2-3 each, max. 9 each for 318, 368, 418; max. 18 for 468) **AWSpS Novacek**

Courses 320-338, 370-388, 420-438, and 470-488 are for music majors specializing in performance. Courses 520-537 are primarily for graduate performance majors in the M.Mus. degree program. Courses 570-587 are for graduate performance majors who have been formally admitted by jury examination to the D.M.A. degree program.

MUSAP 320, 370, 420, 470, 520, 570 Private Instruction: Voice (3-4 each, max. 12 each for 320, 370, 420; 3-4, max. 18 for 470; 3, max. 12 for 520; 3, max. 27 for 570) **AWSpS Alavedra, Curtis-Verna, Guarrera, Paglialunga**

MUSAP 321, 371, 421, 471, 521, 571 Private Instruction: Piano (3-4 each, max. 12 each for 321, 371, 421; 3-4, max. 18 for 471; 3, max. 12 for 521; 3, max. 27 for 571) **AWSpS McCabe, Michaelian, O'Doan, Siki**

MUSAP 322, 372, 422, 472, 522, 572 Private Instruction: Organ (3-4 each, max. 12 each for 322, 372, 422; 3-4, max. 18 for 472; 3, max. 12 for 522; 3, max. 27 for 572) **AWSpS Terry**

MUSAP 323, 373, 423, 473, 523, 573 Private Instruction: Harpsichord (3-4 each, max. 12 each for 323, 373, 423; 3-4, max. 18 for 473; 3, max. 12 for 523; 3, max. 27 for 573) **AWSp Terry**

MUSAP 324, 374, 424, 474, 524, 574 Private Instruction: Violin-Viola (3-4 each, max. 12 each for 324, 374, 424; 3-4, max. 18 for 474; 3, max. 12 for 524; 3, max. 27 for 574) **AWSp Staryk**

MUSAP 325, 375, 425, 475, 525, 575 Private Instruction: Violoncello (3-4 each, max. 12 each for 325, 375, 425; 3-4, max. 18 for 475; 3, max. 12 for 525; 3, max. 27 for 575) **AWSp Saks**

MUSAP 326, 376, 426, 476, 526, 576 Private Instruction: Double Bass (3-4 each, max. 12 each for 326, 376, 426; 3-4, max. 18 for 476; 3, max. 12 for 526; 3, max. 27 for 576) **AWSp**

MUSAP 327, 377, 427, 477, 527, 577 Private Instruction: Flute (3-4 each, max. 12 each for 327, 377, 427; 3-4, max. 18 for 477; 3, max. 12 for 527; 3, max. 27 for 577) **AWSp Skowronek**

MUSAP 328, 378, 428, 478, 528, 578 Private Instruction: Oboe (3-4 each, max. 12 each for 328, 378, 428; 3-4, max. 18 for 478; 3, max. 12 for 528; 3, max. 27 for 578) **AWSp Storch**

MUSAP 329, 379, 429, 479, 529, 579 Private Instruction: Clarinet (3-4 each, max. 12 each for 329, 379, 429; 3-4, max. 18 for 479; 3, max. 12 for 529; 3, max. 27 for 579) **AWSp McColl**

MUSAP 330, 380, 430, 480, 530, 580 Private Instruction: Bassoon (3-4 each, max. 12 each for 330, 380, 430; 3-4, max. 18 for 480; 3, max. 12 for 530; 3, max. 27 for 580) **AWSp Grossman**

MUSAP 331, 381, 431, 481, 531, 581 Private Instruction: Saxophone (3-4 each, max. 12 each for 331, 381, 431; 3-4, max. 18 for 481; 3, max. 12 for 531; 3, max. 27 for 581) **AWSp Brockman**

MUSAP 332, 382, 432, 482, 532, 582 Private Instruction: Horn (3-4 each, max. 12 each for 332, 382, 432; 3-4, max. 18 for 482; 3, max. 12 for 532; 3, max. 27 for 582) **AWSp Kappy**

MUSAP 333, 383, 433, 483, 533, 583 Private Instruction: Trumpet (3-4 each, max. 12 each for 333, 383, 433; 3-4, max. 18 for 483; 3, max. 12 for 533; 3, max. 27 for 583) **AWSpS Cummings**

MUSAP 334, 384, 434, 484, 534, 584 Private Instruction: Trombone (3-4 each, max. 12 each for 334, 384, 434; 3-4, max. 18 for 484; 3, max. 12 for 534; 3, max. 27 for 584) **AWSp Dempster**

MUSAP 335, 385, 435, 485, 535, 585 Private Instruction: Tuba (3-4 each, max. 12 each for 335, 385, 435; 3-4, max. 18 for 485; 3, max. 12 for 535; 3, max. 27 for 585) **AWSp Salzman**

MUSAP 336, 386, 436, 486, 536, 586 Private Instruction: Harp (3-4 each, max. 12 each for 336, 386, 436; 3-4, max. 18 for 486; 3, max. 12 for 536; 3, max. 27 for 586) **AWSp Vokolek**

MUSAP 337, 387, 437, 487, 537, 587 Private Instruction: Percussion (3-4 each, max. 12 each for 337, 387, 437; 3-4, max. 18 for 487; 3, max. 12 for 537; 3, max. 27 for 587) **AWSpS Collier**

MUSAP 338, 388, 438, 488 Private Instruction: Guitar (3-4 each, max. 12 each for 338, 388, 438; 3-4, max. 18 for 488) **AWSpS Novacek**

MUSAP 489 World Music (2-3, max. 18) AWSp World music traditions taught by visiting native artists. Consult ethnomusicology staff for current offerings. Primarily for majors; nonmajors on a space-available basis.

MUSAP 589 World Music Laboratory (3) AWSp World music traditions taught by visiting artists with emphasis on cultural pedagogy and traditional theory. The particular culture studied changes from year to year. Required of all graduate students in ethnomusicology.

Courses for Graduates Only

Music

MUSIC 500 Seminar in Methods of Musical Research (3) AW Taricani

MUSIC 501, 502, 503 Seminar in Musical Analysis (3,3,3) Beale, Kechley, Thorne 501: chant to middle baroque. 502: high baroque through nineteenth century. 503: Impressionists to present.

MUSIC 504 Seminar in Medieval Music (3, max. 6) Taricani Prerequisite: 500.

MUSIC 505 Seminar in Renaissance Music (3, max. 6) Taricani Prerequisite: 500.

MUSIC 506 Seminar in Baroque Music (3, max. 6) Bozarth Prerequisite: 500.

MUSIC 507 Seminar in Rococo and Pre-Classical Music: 1700-1760 (3, max. 6) Prerequisite: 500.

MUSIC 508 Seminar in the Viennese Classical Period: 1760-1830 (3, max. 6) Starr Prerequisite: 500.

MUSIC 509 Seminar in Nineteenth-Century Music: 1830-90 (3, max. 6) Bozarth Prerequisite: 500.

MUSIC 510 Seminar in Music Since 1890 (3, max. 6) Starr Prerequisite: 500.

MUSIC 514 Proseminar in Systematic Musicology (3) Carlsen Examination of the principal research literature in the areas of systematic musicology.

MUSIC 515 Seminar in Medieval and Renaissance Notation (5) Taricani Gregorian chant through sixteenth-century prints.

MUSIC 517 Seminar in Musical Styles (3, max. 6) Investigations into the stylistic criteria for specific composers and groups of composers.

MUSIC 519 Seminar in Modern Editorial Procedures (5) Bozarth Study of modern procedures for preparing critical editions. Related areas of study may include analysis of musical style and historical and performance problems inherent in works being edited.

MUSIC 520 Seminar in American Music (3, max. 6) Starr, Taricani Research in the life, works, and times of composers in the United States from colonial days to the present. Prerequisite: 500.

MUSIC 521 Seminar in Music Perception (3, max. 9) Carlsen Current state of research in the aural perception of musical sounds in context. May be repeated for credit. Prerequisite: 344 or 544 or permission of instructor.

MUSIC 523 Seminar in Music and Socialization (3, max. 9) A Lundquist The socialization process and music, including the interaction whereby music culture is learned. Prerequisite: 345 or 545 or permission of instructor.

MUSIC 524 Seminar in Music Education (3) Cooper Special problems in the teaching and supervision of music in the elementary grades. Prerequisite: one year of teaching experience.

MUSIC 525 Seminar in Music Education (3) Special problems in the teaching and administration of music in the secondary school and community college. Prerequisite: one year of teaching experience.

MUSIC 526, 527, 528 History of Theory (3,3,3) 526: ancient, medieval, early Renaissance. 527: Renaissance, baroque, early classic. 528: classic, romantic, twentieth century.

MUSIC 530 Seminar in Music Cognition (3, max. 9) Carlsen Study of research literature in cognition and music cognition, particularly as it relates to nonverbal musical experience. Prerequisite: 344 or 544 or permission of instructor.

MUSIC 532 Opera Direction and Production (4 or 6, max. 12) AWSp Liotta Practical experience with problems of the opera theatre.

MUSIC 537 Seminar on Opera (3, max. 6) Troy Seminar in music history, providing a complement to history of opera series (420, 421, and 422). Prerequisite: 500.

MUSIC 540 History of Music Education (3) A Chronological examination of contributions, events, philosophies, and people that characterize the development of music education in the schools of the United States.

MUSIC 541 Seminar in Music and Society (3, max. 9) Lundquist Examination of human needs and prototypes of trends in current society and the potential of music to satisfy those needs. Prerequisite: 345 or 545 or permission of instructor.

MUSIC 542 Comparative Music Education (3) Cooper Comparative examination of the philosophy and practice of music education in the United States and in other countries.

MUSIC 543, 544, 545 Preceptorial Readings in Systematic Musicology I, II, III (3,3,3) A,W,S Carlsen, Keefe, Lundquist Examines the significant research literature on acoustical, psychological, and social systems operating in music.

MUSIC 551 Practicum in Music Instruction (3, max. 9) AWSp Practical application and validation of results of investigation in curriculum, music teaching and learning, performance and theoretical studies. Prerequisite: teaching experience or permission of instructor.

MUSIC 555 Systematic Methods of Music Research (3) Carlsen Seminar in problem identification and definition, theory development, research design, data analysis and interpretation; an examination of the philosophy of science in music research.

MUSIC 556 Seminar in Music Acoustics (3, max. 9) Keefe Current research issues selected from acoustics of rooms and instruments, subjective musical acoustics, and computer applications to music research. Prerequisite: permission of instructor.

MUSIC 559 Master's Recital (3) AWSp Public performance for students in the Master of Music degree program.

MUSIC 561 Seminar in Theories of Music Instruction (3, max. 9) *Carlsen, Lundquist* Theories of music instruction, with special attention to curriculum, instructional procedures, and assessment of learning. Prerequisite: 555 or permission of instructor.

MUSIC 570 Seminar in Tonality (3, max. 9) *Rahn* Advanced theoretical and analytical work in triadical music and related systems. Prerequisite: 470 or equivalent.

MUSIC 571 Seminar in Serialism (3, max. 9) *Rahn* Advanced theoretical and analytical work in serialism and other nontonal systems. Prerequisite: 471 or equivalent.

MUSIC 575 Seminar in Theory (3, max. 18) *Rahn* Development and discussion of current student and faculty research in compositional/analytical theory and metatheory.

MUSIC 580, 581, 582 Advanced Conducting (3, max. 9; 3, max. 9; 3, max. 9) *A,W,Sp Feist*

MUSIC 583 Advanced Choral Conducting (3, max. 27) *AWSp Kaplan*

MUSIC 590 Doctoral Recital (2-6, max. 18) *AWSp* Public performance for students in the Doctor of Musical Arts degree program.

MUSIC 591 Graduate Composition (*) *AWSp Beale, Benshoof, Bergsma, Kechley, Rahn, Smith, Thome, Tufts*

MUSIC 595, 596, 597 Seminar in Systematic Field and Laboratory Research (3, max. 9; 3, max. 9; 3, max. 9) *A,W,Sp Carlsen, Keefe, Lundquist* Various methodologies of research in systematic musicology: state of the science in specific musical problems. Practical experience in data collection and analysis for seminar presentations. Prerequisite: 555, which may be taken concurrently.

MUSIC 600 Independent Study or Research (*) *AWSp*

MUSIC 700 Master's Thesis (*) *AWSp*

MUSIC 800 Doctoral Dissertation (*) *AWSp*

Ethnomusicology

MUSIC 511 Seminar in Field and Laboratory Methods (3) Methodology of research in ethnomusicology along with practical experience in recording and processing field and laboratory materials. Prerequisite: graduate student standing in ethnomusicology or permission of instructor.

MUSIC 512 Seminar in Ethnomusicology (3) Study of methodological procedures in ethnomusicology applied to specific research problems. Prerequisite: graduate student standing in ethnomusicology or permission of instructor.

MUSIC 531 Proseminar in Ethnomusicology (3) Theoretical and methodological practices in ethnomusicology, based on existing major writings. Critical evaluations of works with a view toward developing ethnomusicological graduate research. Prerequisite: graduate student standing in ethnomusicology or permission of instructor.

MUSIC 533, 534, 535 Preceptorial Readings in Ethnomusicology (5,5,5) *A,W,Sp* Significant ethnomusicological literature on the major music cultures. Prerequisite: graduate student standing in ethnomusicology or permission of instructor.

MUSIC 536 Transcription and Analysis (3) Study of practice in different notational analytical systems used in non-Western music. Prerequisite: graduate student standing in ethnomusicology or permission of instructor.

Near Eastern Languages and Civilization

229B Denny

Undergraduate Program

The program focuses on the languages and civilizations of the Islamic and Semitic Near East, with an emphasis on the ancient and medieval roots of these civilizations as well as more recent cultural developments. Each of the languages offered represents a major literary tradition. Arabic, Persian, Turkish, and Central Asian Turkic are the languages of the most significant literary manifestations of Islamic civilization, while Hebrew is the language of the Old Testament and Judaism. The languages are taught in conjunction with their sociocultural context, so that linguistic skills will be formed and enhanced by a broad and sympathetic understanding, and a firm foundation will be laid for both intellectual exploration and practical experience.

Bachelor of Arts Degree

Major Requirements: An approved program of 30 credits, excluding language courses, in courses offered by the department or courses on the Near East offered by other departments, or both, plus at least 9 credits in literature courses at the 400 level in the major language for which courses numbered 311, 312, 313, and 321, 322, and 323 are usually prerequisites. Study opportunities in the Near East are available on a competitive basis for a limited number of students.

Graduate Program

The Department of Near Eastern Languages and Civilization offers a graduate program of studies leading to the Master of Arts degree. The program is designed to provide students with advanced training in at least one Near Eastern language and in a specific field of specialization. Students may concentrate in Arabic, Hebrew, Persian, or Turkish and Central Asian Turkic and may choose as their field of specialization a civilization or literature related to their language of concentration. The program is intended not only for those students who wish to continue their studies at the doctoral level but also for students who wish to pursue careers in government or business.

Research Facilities

The University of Washington libraries hold an extensive collection of books and materials in the languages of the Near East and in European languages on Near Eastern subjects. Candidates for the master's degree as well as doctoral students will find in the collection adequate resources for their research.

Admission Requirements

Statement of purpose; a sample of written work; three letters of recommendation, of which at least two must attest to scholarly ability. Although knowledge of a Near Eastern language is not a prerequisite for admission, applicants are generally expected to have had the equivalent of two years' study of the language in which they plan to concentrate.

Graduation Requirements

Departmental requirements, in addition to those required by the Graduate School for the Master of Arts degree, include a reading knowledge of French or German; a seminar paper representing the student's best work; a written examination consisting of four parts: (1) on the general culture of the Near East, (2) on the student's field of specialization, (3) on the student's language of concentration, (4) on a second Near Eastern language related to the language concentration.

Fulfillment of these requirements will normally entail the completion of two years of study.

Financial Aid

Teaching assistantships are available for graduate students in the department who are fluent in speaking and writing a Near Eastern language. A limited number of graduate fellowships are also available.

Correspondence and Information

Chairperson
229B Denny, DH-20

Faculty

Chairperson

Ilse D. Cirtautas

Professors

Andrews, Walter G.* 1968, M.A., 1963, M.A., 1965, Ph.D., 1970, Michigan; Turkish language and literature, Ottoman Turkish.

Cirtautas, Ilse D.* 1968, (Asian Languages and Literature), Ph.D., 1958, Hamburg; Turkic languages and literatures.

Heer, Nicholas L.* 1985, Ph.D., 1955, Princeton; Arabic language and literature, Islamic theology and philosophy.

MacKay, Pierre A.* 1966, (Computer Science), (Classics, Comparative Literature), M.A., 1959, Ph.D., 1964, California (Berkeley); topography of the Near East, Ottoman Turkish and classical Arabic literatures.

Ziadeh, Farhat J.* 1966, (Emeritus), LL.B., 1940, London; Arabic language and literature, Islamic law, Islamic institutions.

Associate Professor

Siddiq, Muhammad.* 1979, M.A., 1974, Ph.D., 1981, California (Berkeley); Arabic language and literature.

Assistant Professors

Karimi-Hakkak, Ahmad.* 1985, M.A., 1974, Missouri; M.A., 1977, Ph.D., 1979, Rutgers; Persian language and literature.

Sokoloff, Naomi B.* 1985, M.A., 1979, Ph.D., 1980, Princeton; modern Hebrew language and literature.

Course Descriptions

Courses for Undergraduates

Arabic

ARAB 311, 312, 313 Elementary Arabic (5,5,5) *A,W,Sp* Intensive study of grammar, with oral and written drill and reading of simple texts.

ARAB 315 Intensive Elementary Arabic (15) *S Siddiq* Intensive study of grammar, with oral and written drill and reading of simple texts.

ARAB 321, 322, 323 Intermediate Arabic (5,5,5) *A,W,Sp* Reading of selected texts in standard Arabic, with continuing emphasis on grammar and syntax. Prerequisites: 313 for 321; 321 for 322; 322 for 323.

ARAB 401 Adab Prose: Jahiz (3) *A Siddiq* Readings in early Arabic prose, especially the writings of Jahiz. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 402 Maqamat (Assemblies): Hamadhani, Hariri (3) *W MacKay* Reading of several *maqamat* (essays in rhymed prose) of al-Hamadhani and al-Hariri. Examination of the *maqamat* genre as a whole. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 403 *Historians: Tabari* (3) Sp Readings in Arab historians with particular reference to al-Tabari and his school of historical writing. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 404 *Qur'an and Tafsir* (3) A Reading of various sections from the Qur'an with the relevant exegetical writings on religious, philological, and grammatical points. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 405 *Hadith and Law* (3) W Selected readings from the traditions (*hadith*) of Muhammad, and from works on jurisprudence and law based on the holy texts. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 406 *Islamic Political Theorists* (3) Sp Readings from the main political theorists: al-Baghdadi, al-Mawardi, and Ibn Khaldun. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 411 *Desert Poetry: Pre-Islamic and Umayyad* (3) A *Siddiq* Reading and analysis of selected poems from pre-Islamic and Umayyad times. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 412 *Urban Poetry: The New 'Abbasid Poetry* (3) W *Siddiq* Reading of the new poetry of the 'Abbasid period and studying of the social and political factors that gave rise to it; al-Mutanabbi and al-Ma'arri. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 413 *Modern Poetry* (3) Sp *Siddiq* Neoclassical poetry of the nineteenth and twentieth centuries, and the development of modern verse. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 414 *Islamic Philosophical Literature* (3) A *Heer* Reading of selected texts by representative Islamic philosophers. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 415 *Islamic Theological and Mystical Literature* (3) W *Heer* Reading of selected texts representative of Islamic theological and mystical schools. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 416 *Modern Prose* (3) Sp *Siddiq* Modern essays, fiction, and ideological writings. Prerequisite: 323 or equivalent. (Offered alternate years.)

ARAB 431, 432, 433 *Advanced Arabic* (5,5,5) A,W,Sp Designed to impart to the student an active knowledge of Arabic structure and syntax and to increase his or her vocabulary power through supervised composition, translation into Arabic, and précis of expository writings. Particular emphasis is placed on journalistic articles and editorials. Prerequisite: 323 or equivalent.

ARAB 470 *Intensive Arabic Morphology and Syntax* (15) S *Siddiq* Allows students in the graduate programs of the Department of Near Eastern Languages and Civilization and other departments to complete the first year of Arabic during Summer Quarter. Primarily for graduate students.

ARAB 471, 472, 473 *Arabic Morphology and Syntax* (5,5,5) A,W,Sp Allows students with knowledge above the elementary level in one Near Eastern language other than Arabic to begin study of Arabic. Primarily for graduate students.

ARAB 474, 475, 476 *Arabic Texts* (5,5,5) A,W,Sp Readings in Arabic texts. Primarily for graduate students. Prerequisites: 473 for 474; 474 for 475; 475 for 476.

ARAB 490 *Supervised Study* (1-6, max. 18) AWSp Special work in literary texts for graduates and undergraduates. Prerequisite: 323 or equivalent.

ARAB 499 *Undergraduate Research* (1-6, max. 18) AWSp

Coptic

COPTC 411 *Introduction to Coptic* (3) A *Williams* Elements of grammar of the Sahidic dialect of the Coptic language.

COPTIC 412, 413 *Readings in Coptic* (3,3) W,Sp *Williams* Readings from ancient Coptic Christian literature, with emphasis on the Nag Hammadi Gnostic texts.

Hebrew

HEBR 311, 312, 313 *Elementary Modern Hebrew* (5,5,5) A,W,Sp *Sokoloff* Modern Israeli Hebrew. Core vocabulary, grammar, conversational text, and oral and written communication. Excerpts from modern Hebrew prose and poetry.

HEBR 321, 322, 323 *Intermediate Modern Hebrew* (5,5,5) A,W,Sp *Sokoloff* Readings of selected texts in modern Hebrew with continuing emphasis on grammar and syntax. Prerequisites: 313 for 321; 321 for 322; 322 for 323.

HEBR 401, 402, 403 *Introduction to Hebrew Literature* (3,3,3) A,W,Sp *Sokoloff* Literary texts and analysis. Grammar, composition, and dictionary skills. Primarily modern texts—short poetry, fiction, and essays—with some selections as well from biblical passages, the liturgy, midrash, and medieval poetry. Prerequisite: 323 or permission of instructor.

HEBR 471, 472, 473 *Hebrew Morphology and Syntax* (5,5,5) A,W,Sp Allows students with knowledge above the elementary level in one Near Eastern language other than Hebrew to begin study of Hebrew. Primarily for graduate students.

HEBR 474, 475, 476 *Hebrew Texts* (5,5,5) A,W,Sp Readings in Hebrew texts. Primarily for graduate students. Prerequisites: 473 for 474; 474 for 475; 475 for 476.

HEBR 490 *Supervised Study* (1-6, max. 18) AWSp Special work in literary texts for graduates and undergraduates. Prerequisite: 323 or equivalent.

HEBR 499 *Undergraduate Research* (1-6, max. 18) AWSp

Persian

PRSAN 311, 312, 313 *Elementary Persian* (5,5,5) A,W,Sp *Karimi-Hakkak* Conversation, pronunciation, and graded reading. Persian alphabet and basic sentence constructions. Offers rudimentary conversational and reading ability with a vocabulary of about two thousand words.

PRSAN 321, 322, 323 *Intermediate Persian* (5,5,5) A,W,Sp *Karimi-Hakkak* Reading of simple texts with emphasis on reading and writing, conversation skills, grammar, and syntax. Builds a vocabulary of standard Persian in preparation for advanced reading and comprehension of literary texts. Prerequisites: 313 for 321, 321 for 322, 322 for 323.

PRSAN 401 *Introduction to Persian Literature* (3) A *Karimi-Hakkak* Selected texts from modern and classical Persian poetry and prose. Provides insights into Iranian culture and its past and present achievements in literature. Prepares the student for a more comprehensive and critical study of Persian literature. Prerequisite: 323 or equivalent proficiency in Persian language.

PRSAN 402 *Modern Persian Literature: A Survey* (3) W *Karimi-Hakkak* Development of poetry and prose after Iran felt and absorbed the impact of Western cultures. Periods and genres. Works of such authors as Jamalzadeh, Hedayat, Dehkoda, Al-e Ahmad, Nima, Sepahri, and Forugh. Prerequisite: 323 or equivalent proficiency in Persian.

PRSAN 403 *Classical Persian Literature: A Survey* (3) Sp *Karimi-Hakkak* History of Persian literature from Rudaki to Hafiz. Studies epic, lyric, and mys-

tic traditions placed in historical settings. Covers the most important genres such as the Qasida, the Ghazal, the Ruba'i and the Masnavi. Prerequisites: 323 or equivalent proficiency in Persian.

PRSAN 411 *The Epic Tradition in Iran* (3) A *Karimi-Hakkak* Focuses on the *Shahnameh* of Firdawsi: explores the ancient legends that gave rise to it and follows the fortunes of epic poetry after Firdawsi, touching on the rise, development, and decline of romance in classical Persian literature. Prerequisite: 401 or equivalent.

PRSAN 412 *The Persian Ghazal* (3) W *Karimi-Hakkak* The Ghazal as the leading medium for lyrical expression in classical Persian tradition. Follows this genre from conception to culmination in the poetry of Hafiz. Conventions and devices of the Ghazal. Development placed in historical and social context. Prerequisite: 401 or equivalent.

PRSAN 413 *Sufism: Thought and Expression* (3) Sp *Karimi-Hakkak* Dynamics of mystical thought and expression as evolved in the writings of the great Sufi masters and reflected in the poetry of Sana'i, Attar, Rumi, and others. The fundamental unity of the mystical vision, with special attention to the peculiarities of individual style and expression. Prerequisite: 401 or equivalent.

PRSAN 471, 472, 473 *Persian Morphology and Syntax* (5,5,5) A,W,Sp Allows students with knowledge above the elementary level in one Near Eastern language other than Persian to begin study of Persian. Primarily for graduate students.

PRSAN 474, 475, 476 *Persian Texts* (5,5,5) A,W,Sp Readings in Persian texts. Primarily for graduate students. Prerequisites: 473 for 474; 474 for 475; 475 for 476.

PRSAN 490 *Supervised Study* (1-6, max. 18) AWSp Special work in literary texts for graduates and undergraduates. Prerequisite: 313 or equivalent.

PRSAN 499 *Undergraduate Research* (1-6, max. 18) AWSp

Turkish

TKISH 301, 302, 303 *Elementary Uzbek* (3,3,3) A,W,Sp *Cirtautas* The modern written and spoken language. Joint with TKIC 301, 302, 303. Prerequisite: permission of instructor.

TKISH 304, 305, 306 *Introduction to Kazakh* (3,3,3) A,W,Sp *Cirtautas* Position of Kazakh within the community of other Turkic languages; alphabets used for Kazakh; reading of texts from the Soviet Union and China (Sinkiang); exercises. Joint with TKIC 304, 305, 306. Prerequisite: permission of instructor.

TKISH 311, 312, 313 *Elementary Turkish* (5,5,5) A,W,Sp Introduction to modern Turkish. Pronunciation and conversation, grammar and composition, graded reading. Latin characters used throughout.

TKISH 321, 322, 323 *Intermediate Turkish* (5,5,5) A,W,Sp *Andrews* Introduction to modern Turkish literature. Prerequisites: 313 for 321; 321 for 322; 322 for 323.

TKISH 341, 342, 343 *Introduction to Uighur* (3,3,3) A,W,Sp *Cirtautas* Phonology, morphology, and syntax of Uighur. Joint with TKIC 341, 342, 343. Prerequisite: permission of instructor.

TKISH 401 *Readings in Turkish Literary History I: Modern* (3) A *Andrews* The development of modern Turkish literature and its ties to, and divergence from, the Ottoman tradition. Readings in modern and Tanzimat poetry, short story, drama, and novel. Prerequisite: 400 or permission of instructor. (Offered alternate years.)

TKISH 402 Readings in Turkish Literary History II: Literature of the Ottoman Empire (3) W Andrews The parallel development of the classical high-culture literature and the popular literatures of the Ottoman Empire. Readings in poetry, history, travel-literature, drama, and popular narrative forms. Prerequisite: 323 or equivalent. (Offered alternate years.)

TKISH 403 Ottoman Travelers and Geography (3) Sp MacKay Introduction to the geographic literature of Ottoman Turkish: readings from traditional cosmographies, travel journals, sailing instructions (portulans), ambassadorial and secret service reports, etc. Prerequisite: 413 or permission of instructor. (Offered alternate years.)

TKISH 404 Introduction to Turkic Studies (3) Cirtautas The bibliography, problems, and methods of research in the field of Turkic studies for advanced students of Turkish/Turkic languages. Readings in those languages on the languages, literatures, and ethnography of past and present Turkic peoples. Joint with TKIC 404. Prerequisite: permission of instructor.

TKISH 405, 406, 407 Intermediate Uzbek (3,3,3) A,W,Sp Cirtautas Continuation of elementary Uzbek. Oral work, grammar, and readings in Uzbek literature. Joint with TKIC 401, 402, 403. Prerequisite: permission of instructor.

TKISH 411 Turkish Literary Genres: Prose (3) A Andrews Major genres, styles, and themes of Turkish art-prose from Ottoman times to present; creation of stylistic and critical norms. Prerequisite: 323 or equivalent. (Offered alternate years.)

TKISH 412 Turkish Literary Genres: Poetry (3) W Andrews Poetic traditions of Turkey with a focus on the development of peculiarly Turkish aspects of style and structure. Social functions of poetry and the poetic milieu. Prerequisite: 323 or equivalent. (Offered alternate years.)

TKISH 413 Introduction to Ottoman Turkish (3) Sp Andrews Introduction to Turkish in Arabic characters to cover the peculiar grammatical and syntactical problems of Ottoman. Prerequisite: permission of instructor.

TKISH 414, 415, 416 Introduction to Uzbek Literature (3,3,3) A,W,Sp Cirtautas Readings from selected Uzbek writers. Joint with TKIC 411, 412, 413. Prerequisite: permission of instructor.

TKISH 471, 472, 473 Turkish Morphology and Syntax (5,5,5) A,W,Sp Allows students with knowledge above the elementary level in one Near Eastern language other than Turkish to begin study of Turkish. Primarily for graduate students.

TKISH 474, 475, 476 Turkish Texts (5,5,5) A,W,Sp Readings in Turkish texts. Primarily for graduate students.

TKISH 490 Supervised Study (1-6, max. 18) AWSp Special work in literary texts for graduates and undergraduates. Prerequisite: 323 or equivalent.

TKISH 499 Undergraduate Research (1-6, max. 18) AWSp

Near Eastern Courses in English

N E 210 Introduction to Islamic Civilization (5) A Siddiq Major developments in Islamic civilization from advent of Islam in seventh century to present. Islamic history, law, theology, and mysticism, as well as the politics, cultures, and literatures of the various Islamic societies. Joint with SJSM 210.

N E 220 Themes in Near Eastern Literature (5) Sp Significant and interesting aspects of Near Eastern culture and society as represented by literary themes. Aspects of Near Eastern life and art such as women, minority groups, mysticism, and modern literature. Content varies.

N E 260 The Middle East in Film (3) Sp Albright The cinema of Egypt, Iran, Israel, Turkey, and other Middle Eastern nations; compares and contrasts the films with Middle Eastern literature from the twentieth century. Both films and literature illustrate how Middle Easterners view the world: their concepts of self versus society, religion, art, and politics.

N E 325 Modern Hebrew Literature in English (3) W Sokoloff Major developments in Hebrew literature from the Enlightenment to the current Israeli literature. Examines the development of modern Hebrew thought and literary style.

N E 350 The City of Cairo (3) MacKay Development of Fustat and Cairo, 600-1800, with special emphasis on art and architecture. Consideration of the economic, social, and geographical influences on the creation of the distinctive Egyptian styles of Islamic art. Joint with ART H 350.

N E 420 Islamic Theological Literature in English (3) A Heer Readings from Muta'zillite and Ash'arite works and from traditionalist works opposed to theology.

N E 421 Islamic Mystical Literature in English (3) W Heer Readings from the works of principal Sūfī writers and poets.

N E 422 Islamic Philosophical and Scientific Literature in English (3) Heer Readings in philosophy, the physical sciences, and medicine.

N E 425 Current Trends in Modern Near Eastern Literature and Criticism (3) Siddiq Modern literary tradition of the Near East with emphasis on major literary movements and/or genres and literary criticism in the modern period. The literatures of the Arab world, Persia, Turkey, and Israel are considered in alternate quarters.

N E 430 Islam (5) Religious and cultural milieu of Arabia before Muhammad; Muhammad's call and struggle to establish the new faith; Qur'anic content and style; Western and Muslim scholarship and the Qur'an; place of traditions in the Islamic edifice; Muslim political and religious thought; sources of Muslim religious law; and modern Muslim movements. Joint with RELIG 430.

N E 432 Islamic Literature on Jurisprudence and Law in English (3) Sp The origins of the *shari'ah*, its development throughout the Islamic period, and the modern reform of this law. Joint with LAW B 543.

N E 434 Modern Near East Fiction in Translation (3) Andrews, Siddiq Literary genres; literary theory; principal literary authors of Arabic, of Persian, and of Turkish and their works. From the beginnings to the modern period.

N E 435 Major Trends in Modern Arabic Fiction (3) Sp Siddiq Development of the Arabic novel from the end of the nineteenth century to the present.

N E 440 Calligraphy in Islamic Culture (3) W Andrews Survey of the esthetics, uses, interpretations of artistic writing in Islamic culture with a "hands on" approach to recognizing, appreciating, and creating Arabic script calligraphy. Students need not know Arabic script nor have calligraphic talents, although some familiarity with Islamic civilization is helpful.

N E 490 Supervised Study (1-6, max. 18) AWSp Special work in Near Eastern studies for graduates and undergraduates.

N E 499 Undergraduate Research (1-6, max. 18) AWSp

Courses for Graduates Only

Arabic

ARAB 600 Independent Study or Research (*) AWSp

Hebrew

HEBR 600 Independent Study or Research (*) AWSp

Near East

N E 520 Seminar on Near Eastern Civilization and Thought (3, max. 27)

N E 521 Research Methods (3) A Heer Introduction to research in Islamic civilization. Research methods, primary sources, evidence and documentation, reference works, transliteration systems, scholarly writing style.

N E 522 Islamic Theology (3) W Heer Various schools of Islamic theology.

N E 523 Islamic Philosophy (3) Sp Heer Various topics and problems dealt with by the Islamic philosophers.

N E 524 Islamic Law (3) A Selected topics in Islamic law that highlight major aspects of Islamic civilization.

N E 525 Islamic Institutions (3) Sp Islamic institutions of the caliphate, the sultanate, the bureaucracy, taxation, mosques, and madrasahs, as well as theories of government.

N E 530 Seminar on Near Eastern Literature (3, max. 27) Prerequisite: reading knowledge of at least one Near Eastern language.

N E 531 Proseminar in Literary Analysis (3) A Andrews Introduction to the theory and techniques of the study of literature in general and Near Eastern literatures in particular. Prerequisite: reading knowledge of at least one Near Eastern language.

N E 532 Theory and Practice in Modern Near Eastern Literature (3) W Siddiq Application of literary theory to works of modern Near Eastern literature. Concentrates on one major theory each year.

N E 533 Islamic Poetry and Poetics (3) Sp Karimi-Hakkak Detailed introduction to prosody and rhyme in classical Arabic and Persian, followed by critical analysis of selected texts. Prerequisite: advanced level of Arabic or Persian; some knowledge of the other recommended.

N E 600 Independent Study or Research (*) AWSpS

Persian

PRSAN 600 Independent Study or Research (*) AWSp

Turkish

TKISH 600 Independent Study or Research (*) AWSp

Peace and Strategic Studies

B10 Padelford

The program in Peace and Strategic Studies enhances the student's understanding of the problem of global nuclear war and also contributes to society's capacity for coping with this problem. Students have access to the experience of those working both with peace and conflict studies and with strategic studies. Offered as an option under General Studies, the program is intended to serve primarily as part of a double major with, for example, political science, psychology, or physics. See General Studies adviser for requirements.

Philosophy

345 Savery

Philosophy is the study of the most fundamental issues concerning reality, knowledge, and value, and of the basic concepts, principles, and arguments of the major intellectual disciplines. Its fields include metaphysics, epistemology, logic, ethics, history of philosophy, political philosophy, esthetics, philosophy of science, philosophy of language, philosophy of law, and philosophy of religion.

Undergraduate Program

Bachelor of Arts Degree

Major Requirements: 50 credits in philosophy, which must include: (1) at least 25 credits at the University of Washington; (2) at least four courses at the 400 level or above, excluding transfer credits and reading courses (PHIL 484 and 584), which normally cannot be used to satisfy this requirement; (3) PHIL 120 or 370; and (4) PHIL 320 and 322 (or upper-division courses in the same areas; undergraduate adviser must approve substitutions).

Graduate Program

The Department of Philosophy offers programs of study leading to the Master of Arts and Doctor of Philosophy degrees, the regular M.A. program option serving as the initial stage of the Ph.D. program. (In addition to the regular M.A. program, described here, the department offers an alternate M.A. program option designed for, and restricted to, persons not interested in becoming professional philosophers. Details on the alternate M.A. program are available from the Graduate Program Coordinator.)

The regular Master of Arts program option is a two-year nonthesis program. The student must take twelve courses in philosophy, satisfy a logic requirement, and, at the end of the second year, submit three research papers for evaluation by the graduate faculty of the department. The courses and the papers must satisfy a distribution requirement. The departmental evaluation of the student's papers and course work determines whether an M.A. degree is awarded and also whether admission to the Ph.D. program is granted. The Ph.D. program, which normally requires at least two years of study beyond the M.A., has five general requirements: (1) presentation of a paper at a philosophy colloquium, (2) teaching experience as a teaching assistant, (3) General Examination, (4) dissertation, and (5) Final Examination.

Research Facilities

The department maintains its own research library. This library of more than fifteen thousand volumes contains nearly all of the material needed for any philosophical research.

Special Requirements

An undergraduate major in philosophy is not required for admission to the M.A. program. An applicant's philosophical potential is assessed primarily on the basis of a sample of his or her written work in philosophy and secondarily on the basis of his or her undergraduate record, Graduate Record Examination scores, and letters of recommendation. A reading knowledge of at least one foreign language is strongly recommended.

Financial Aid

A number of teaching assistantships are available each year to new graduate students. At present, eleven students of a total enrollment of thirty-three hold teaching assistantships.

Correspondence and Information

Graduate Program Coordinator
345 Savery, DK-50

Faculty

Chairperson

Karl H. Potter

Professors

Boler, John F.,* 1960, M.A., 1952, St. Louis; Ph.D., 1960, Harvard; medieval philosophy.

BonJour, Laurence A.,* 1977, Ph.D., 1969, Princeton; epistemology.

Coburn, Robert C.,* 1971, M.A., 1958, Ph.D., 1958, Harvard; metaphysics, social philosophy.

Cohen, S. Marc,* 1973, Ph.D., 1967, Cornell; ancient philosophy, metaphysics, philosophy of mind.

Dietrichson, Paul,* 1955, (Scandinavian Languages and Literature), Ph.D., 1955, Yale; philosophy of religion, ethics, metaphysics.

Keyt, David,* 1957, M.A., 1953, Ph.D., 1955, Cornell; ancient and contemporary philosophy.

Marks, Charles E.,* 1968, Ph.D., 1972, Cornell; contemporary philosophy, British empiricism and continental rationalism.

Potter, Karl H.,* 1971, (Asian Languages and Literature), (International Studies),† M.A., 1952, Ph.D., 1955, Harvard; Indian philosophy, epistemology.

Richman, Robert J.,* 1961, M.A., 1950, Ph.D., 1953, Harvard; ethics, epistemology.

Associate Professors

Clatterbaugh, Kenneth C.,* 1966, (Psychology, Women Studies), Ph.D., 1967, Indiana; philosophy of science, ancient philosophy, continental rationalism.

Mish'alani, James K.,* 1963, M.A., 1958, Ph.D., 1961, Brown; ethics, philosophical psychology.

Moore, Ronald M.,* 1979, Ph.D., 1971, Columbia; philosophy of law, esthetics.

Assistant Professor

Marti, Genoveva, 1987, M.A., 1983, Ph.D., 1988, Stanford; philosophy of language, metaphysics.

Course Descriptions

Courses for Undergraduates

PHIL 100 Introduction to Philosophy (5) AWSp Major philosophical questions relating to such matters as ethics, the existence of God, the foundations of knowledge, and the nature of reality. Problems studied and works read vary.

PHIL 101 Philosophical Classics (5) Selected works of some of the major philosophers, such as Plato, Aristotle, Descartes, Hume, Kant. The philosophers studied vary.

PHIL 102 Contemporary Moral Problems (5) BonJour, Richman Philosophical consideration of some of the main moral problems of modern society and civilization, such as abortion, euthanasia, war, sexual morality, governmental paternalism, reverse discrimination, and capital punishment. Topics vary.

PHIL 104 Ideas in the Western Tradition—Ancient (5) Keyt Philosophy of the ancient world, primarily the views of man and the universe in selected works of Greek and Roman thought.

PHIL 105 Ideas in the Medieval and Renaissance Periods (5) Boler Major ideas in Christian, Jewish, and Islamic thought from late antiquity to the beginnings of the modern period.

PHIL 108 Ideas in the Western Tradition—Modern (5) Coburn Basic ideas about man and the world since the Renaissance. Content and emphasis vary.

PHIL 110 Introduction to Social and Political Philosophy (5) Coburn Examination of such ideals as liberty, distributive justice, democracy, peace, and human survival. Problems involved in achieving social change also considered. Content varies.

PHIL 114 Philosophical Issues in the Law (5) Moore Analysis and critical assessment of various philosophical issues in law and legal reasoning. Material drawn from actual law cases, as well as writings by contemporary philosophers of law and lawyers. Topics include criminal responsibility, civil disobedience, abortion, reverse discrimination, enforcement of morals. Special legal or philosophical training not required.

PHIL 115 Practical Reasoning (5) Introduction to logic emphasizing concepts and methods useful for practical analysis of arguments in everyday contexts. Meaning, syllogisms, logical diagrams, inductive and statistical inference, informal fallacies, argument structure, perhaps some beginning symbolic logic. A wide variety of examples, including logical puzzles, considered.

PHIL 120 Introduction to Logic (5) AWSp Elementary symbolic logic. The development, application, and theoretical properties of an artificial symbolic language designed to provide a clear representation of the logical structure of deductive arguments.

PHIL 160 A Historical Introduction to the Philosophy of Science (5) Clatterbaugh Study of how scientific theories are justified and why they are accepted, using selected examples from the history of science.

PHIL 200 Types of Philosophy (3-5) Introductory philosophy. The content of the course is entirely at the discretion of the instructor.

PHIL 206 Philosophy of Feminism (5) Philosophical analysis of the concepts and assumptions central to feminism. Theoretical positions within the feminist movement; view of the ideal society, goals and strategies of the movement, its relation to racial liberation, and ethical issues. Joint with POL S 212 and WOMEN 206.

PHIL 230 Philosophic Issues in World Affairs (3) Coburn Moral problems that arise in connection with such topics as affluence, hunger, and overpopulation; global environmental degradation; war and weaponry; restructuring the international order.

PHIL 240 Introduction to Ethics (5) Richman Critical study of some typical views of the basis and presuppositions of morality and of moral knowledge. Custom, theology, human nature, and happiness as standards of moral judgments. Consideration of such topics as free will and responsibility, ethical relativism, and the problem of evil.

PHIL 241 Topics in Ethics (5) Mish'alani Introduction to ethics through in-depth study of one or more selected topics (e.g., limits of moral community, moral education, conscience, shame and guilt, virtue and vice, purity, saintliness and heroism, friendship, veracity, manners and morals, freedom, rights, collective responsibility). Topics vary.

PHIL 267 Introduction to Philosophy of Religion (5) Dietrichson, Mish'alani Study of religious thought. Examination of the problem of evil, of the nature of mysticism, atheism, and theism, and of the relationship between religion and morality.

PHIL 320 Ancient Philosophy (5) A. Cohen, Keyt Survey of the history of ancient Greek philosophy. The metaphysical and epistemological theories of Plato, Aristotle, and the Atomists, their origins in the thought of Socrates and the pre-Socratics, and their development by the Stoics, Skeptics, Epicureans, and Plotinus.

PHIL 321 Medieval Philosophy (5) *Boler* Development of main lines of philosophical thought in the Latin West from 400 to 1400, with emphasis on Augustine, Anselm, Abelard, Aquinas, and Occam. Recommended: 320.

PHIL 322 Modern Philosophy (5) *W Clatterbaugh* Examination of the development of philosophy in the seventeenth and eighteenth centuries, focusing especially on the problem of scepticism.

PHIL 325 Nineteenth-Century Philosophy (5) Post-Kantian Idealism, Schopenhauer and Hegel and the revival of materialism in Feuerbach, Marx, and Engels. Some consideration of Kierkegaard and Nietzsche.

PHIL 326 Twentieth-Century Philosophy (5) *Marks* Survey of the main problems in philosophical analysis from the English Realist reaction against Idealism at the beginning of this century to the present. Includes the logical atomism of Russell and Wittgenstein and the logical positivism of the Vienna Circle as well as more recent developments.

PHIL 327 American Philosophy (5) *Boler, Potter* Study of several of the major American philosophers: Peirce, Royce, Dewey, William James, C. I. Lewis, Goodman, Quine. Recommended: at least one course in philosophy.

PHIL 330 History of Ancient Political Philosophy (4) *Keyt* Political philosophy of fourth- and fifth-century Greece, especially the Sophists, Plato, and Aristotle, stressing the connection between the political philosophy and the underlying philosophical system of each philosopher. Recommended: at least one course in philosophy.

PHIL 331 History of Medieval Political Philosophy (4) *Boler* Political philosophy in the Middle Ages, especially the major figures (Augustine, Aquinas, Occam), with special emphasis on the setting of their political thought in the context of their general philosophical positions. Recommended: at least one course in philosophy.

PHIL 332 History of Modern Political Philosophy (5) Examination of major political philosophies from the sixteenth century to the nineteenth century, with attention to the underlying philosophical methods and foundations.

PHIL 334 Philosophy of Marxism (3) Philosophy of Marx and the Marxist tradition with attention to the philosophical method and foundation of Marxism.

PHIL 338 Philosophy of Human Rights (3) *Coburn* Theories of human rights and the bearing of these theories on such issues of public policy as the legitimacy of war and terrorism, whether people have rights to a clean environment or a welfare floor, and whether future generations have rights.

PHIL 340 History of Ancient Ethics (5) *Richman* Development of moral thought from Socrates through the Stoics. Particular emphasis on the ethical writings of Plato and Aristotle. Recommended: one course in philosophy.

PHIL 342 History of Modern Ethics (5) *Richman* Development of moral thought from Hobbes through Nietzsche, with particular emphasis on the ethical writings of Hume, Kant, and John Stuart Mill. Recommended: one course in philosophy.

PHIL 344 History of Recent Ethics (5) *Richman* Study of major ethical writings in the twentieth century, with principal emphasis on the Anglo-American tradition. Recommended: one course in philosophy.

PHIL 345 Moral Issues of Life and Death (4) *Coburn* Examination of such topics as war and murder, famine relief, capital punishment, high-risk technologies, abortion, suicide, and the rights of future generations. Prerequisite: one course in philosophy or junior standing.

PHIL 346 Personal Values and Human Good (3) *Coburn* Examination of the idea of a good human life. Emphases differ from year to year. Typical topics include happiness and prudence, rationality and life plans, personal values and the meaning of life, autonomy and false consciousness, self-respect and self-esteem, honesty and self-deception, faith and "vital lies." Prerequisites: two previous courses in philosophy.

PHIL 347 Philosophy in Literature (3) *Marks, Mish'alani* Study of philosophical ideas expressed in works of literature.

PHIL 350 Introduction to Epistemology (4) *BonJour* Theory of knowledge. Nature, definition, and possibility of knowledge. Problems about our knowledge of the external world, the past, other minds, mathematics, etc. Prerequisites: two previous courses in philosophy.

PHIL 353 Introduction to the Philosophy of Language (5) Philosophical theories about the nature of language. Topics include meaning, reference, truth, propositions, relations between language and thought and between language and logic, relation of philosophy of language to linguistics and psychology. Recommended: 120.

PHIL 363 Introduction to the Philosophy of Mind (5) *Cohen, Marks* Various theories of the nature of mind, the relationship between mind and body, the self, memory, the unconscious, introspection, and knowledge of other minds. Recommended: one course in philosophy.

PHIL 370 Intermediate Logic (5) A Study of first-order predicate calculus, plus philosophically significant applications and extensions. Elementary meta-theory, including soundness and completeness. Recommended: 120.

PHIL 372 Introduction to Set Theory (5) Historical development and basic concepts of set theory. Set-theoretical paradoxes and their proposed solutions.

PHIL 386 Introduction to the Philosophical Systems of India (5) *A Potter* The fundamental views of classical Indian philosophical schools on epistemology and metaphysics through readings in translation of basic works. Nyaya, Vaisheshika, Samkhya, Yoga, Jain philosophy, Vijnanavada and Madhyamika Buddhism, Advaita Vedanta and later developments. Joint with SISSA 386. Prerequisite: SISSA 210 or one course in philosophy.

PHIL 410 Social Philosophy (3) *Coburn* Examination of social ideals such as liberty and justice, and of social problems associated with current and prospective technological developments. Emphases vary each year.

PHIL 412 Indian Philosophy (5) *Potter* Historical survey of the major systems and the traditional problems of philosophy in India. Readings in Buddhism, Nyaya, Samkhya, and Vedanta. Recommended: 100 or 386.

PHIL 413 Studies in Indian Philosophy (3, max. 6) *Potter* One or more individual figures or problems in Indian philosophy selected by the instructor. Prerequisite: 412.

PHIL 414 Philosophy of Law (3) *Moore* Nature and function of law. Relation of law to morality. Legal rights, judicial reasoning. Recommended: 110 or 114 or 240.

PHIL 415 Chinese Philosophy (5) Development of Chinese philosophy from the sixth century B.C. to modern times. Emphasis on Confucianism, Mohism, Taoism, Legalism, the Dialecticians, Buddhism, and Neo-Confucianism; reevaluation of them in the light of new trends of thought after contact with the West.

PHIL 416 Neo-Confucianism (5) Systematic study of Neo-Confucianism, its background and development with emphasis on the Rationalist school of Ch'eng-Chu and the Idealist school of Lu-Wang. Prerequisite: 415 or permission of instructor.

PHIL 418 Indian and Tibetan Buddhist Philosophy (3) Topics from Buddhist thought, both Sravakayana and Mahayanist, touching on the following areas: epistemology, theory of liberation, metaphysics and the theory of the absolute, cosmology, and ethics. Readings in translation. At least one course in Indian philosophy or Hinduism or Buddhism recommended.

PHIL 421 Studies in Medieval Philosophy (3, max. 9) *Boler* Detailed study of an individual figure or problem in medieval philosophy (of the Latin West) selected by the instructor. Recommended: 321.

PHIL 422 Studies in Continental Rationalism (3, max. 9) *Clatterbaugh, Marks* Study of one or more of the major continental Rationalists: Descartes, Spinoza, Leibniz. Recommended: 322.

PHIL 431 Philosophy of Plato (3, max. 6) *Cohen, Keyt* Study of selected middle and late dialogues. Recommended: 320.

PHIL 433 Philosophy of Aristotle (3, max. 6) *Cohen, Keyt* Study of several major Aristotelian treatises. Recommended: 320.

PHIL 434 Philosophy of Thomas Aquinas (3) *Boler* Examination of the major philosophical positions of Thomas Aquinas in the theory of knowledge, metaphysics, and ethics. Recommended: 321.

PHIL 436 British Empiricism (3) *BonJour, Marks* Examination of the metaphysical and epistemological views of Locke and Berkeley, with perhaps some attention also to Hume. Recommended: 322.

PHIL 437 Philosophy of Hume (3) *Marks, Richman* Study of the principles and methods employed by Hume in his analyses of knowledge, the passions, and morals. Recommended: 322.

PHIL 438 Philosophy of Kant (5) *BonJour, Dietrichson* Systematic study of *The Critique of Pure Reason* or of one or more other major works of Kant. Recommended: one course in philosophy (other than logic) beyond the introductory level.

PHIL 439 The Later Philosophy of Wittgenstein (3) *Coburn, Marks* Detailed study of topics in the later philosophy of Wittgenstein, with particular attention to the *Philosophical Investigations*. Recommended: 322.

PHIL 440 Ethics (3) *Coburn, Richman* Critical examination of the concepts and judgments of value, including an analytical treatment of the notions of good and bad, right and wrong, and obligation. Recommended: 240.

PHIL 443 Philosophy and Linguistics (3) Study of philosophical problems that arise in the attempt to understand current linguistic theories and of the implications of linguistics for philosophy. Joint with LING 443.

PHIL 444 Philosophy of Language—Pragmatics (3) *Potter* Language as communicative activity. Speech act theory in Austin, Grice, and contemporary writings. Applications to problems of reference, presupposition, metaphor, relativism. Joint with LING 444.

PHIL 445 Philosophy of Art (5) *Moore* Critical examination of various accounts of the nature of art, artistic activity, the esthetic experience. The philosophy of criticism, the role of the critic, and problems in interpretation and evaluation of works of art.

PHIL 446 Development of Esthetic Theory (5) *Moore* Historical development of esthetics, emphasizing such major figures as Plato, Aristotle, Hume, Kant, Hegel, and Goodman. Recommended: 100 or 445.

PHIL 447 Philosophy of Literature (3) *Mish'alani* Investigation of philosophical questions about literature: What is literature? Why write? Must literature be interpreted? What is interpretation? Literature and ideology; criticism of literature and society.

PHIL 450 Epistemology (3) *BonJour* Systematic study of some of the main problems of the theory of knowledge, such as: the definition of "knowledge"; *a priori* knowledge; perception and knowledge of the external world; memory knowledge; theoretical knowledge; knowledge of other minds; and whether knowledge has or requires a foundation. Recommended: 350 or 322.

PHIL 453 Philosophy of Language (5) *Marti* Current theories of meaning, reference, predication, and related concepts. Joint with LING 476. Recommended: 120.

PHIL 456 Metaphysics (3) *Coburn* Examination of issues and problems that arise in connection with such topics as freedom of the will, the nature of persons and personal identity, the existence of God, time, necessary truth, and universals. The emphases vary from year to year.

PHIL 458 Phenomenology (5) *Mish'alani* The contribution of phenomenology to selected topics in the theory of meaning, philosophy of mind, ontology, and epistemology.

PHIL 460 Philosophy of Science (5) *Clatterbaugh* Critical study of different theories about the nature of scientific theory. Topics include the relation of theory to observation, the use of mathematics, how theories change, the requirements for the meaningfulness of a theory, and the relation between theory and methodology.

PHIL 461 Philosophical Anthropology (5) *Mish'alani* Investigation of the question, "What is human reality?" Philosophical significance of this question and its relation to the human sciences. Typical answers. Implications of those answers for culture, religion, morals, and politics. Recommended: 100, 206, 240, or 410.

PHIL 463 Philosophy of Mind (3) *Marks* Examination of current theories of the nature of the mind and mental processes. Recommended: 363 or permission of instructor.

PHIL 464 Philosophy of Psychology (3) *Marks* Philosophical problems connected with research in psychology or artificial intelligence. Topics vary. Readings from both philosophical and scientific literature. Accessible to nonphilosophers with suitable interests and backgrounds.

PHIL 465 Philosophy of History (3) *Mish'alani* Analyses of basic concepts employed in historical interpretation, and study of some of the principal philosophers of history, such as Plato, Saint Augustine, Hegel, Marx, Spengler, Toynbee.

PHIL 466 Philosophy of the Social Sciences (3) *Coburn* Examination of fundamental issues in the methodology and the interpretation of the social sciences. Particular emphasis on value orientation and objectivity, functionalism, reductionism, and the status of idealized models. Recommended: 120 or 160 or 460, or course beyond introductory level in a social science.

PHIL 467 Philosophy of Religion (5) *BonJour, Dietrichson* Study of selected topics and problems in the philosophy of religion, such as: arguments for the existence of God; the problem of evil; atheism; faith; religious experience and revelation; the attributes of God; miracles; immortality; and the relation between religion and morality. Readings from historical and contemporary authors. Recommended: one course in philosophy, other than logic, beyond the introductory level.

PHIL 469 Existentialist Philosophy (3) *Dietrichson* Critical examination of major ideas in Kierkegaard's philosophy and in Sartre's or Heidegger's philosophy. Recommended: one course in philosophy, other than logic, beyond the introductory level.

PHIL 470 Advanced Logic (5) Advanced treatment of predicate calculus and associated first-order theories. Decision problem, soundness, completeness, compactness, Skolem-Löwenheim theorem, Tarski's undefinability theorem, Gödel's first incompleteness result. Recommended: 370 or equivalent.

PHIL 472 Axiomatic Set Theory (5) Development of axiomatic set theory up to and including the consistency of the Axiom of Choice and Continuum Hypothesis with the Zermelo-Fraenkel Axioms. Recommended: 370 or permission of instructor.

PHIL 473 Philosophy of Mathematics (5) Traditional accounts of the nature of mathematical entities and mathematical truth given by logicism, intuitionism, and formalism, and the impact of Gödel's incompleteness theorems on these accounts. Recommended: some background in mathematics and formal logic.

PHIL 474 Modal Logic (5) Notions of necessity and possibility, using the classical systems T, S4, and S5, and the syntax and the semantics (Kripke models) of these systems. Recommended: 370.

PHIL 479 Formal Semantics and Natural Language (3) Introduction to formal characterization of linguistic meaning. Emphasis on nature and purpose of formal semantics and its relation to formal syntax. Typical topics: Tarskian definitions of truth; "truth theory" and theory of meaning; possible world semantics; Montague semantics; generative semantics; Chomsky on syntax and semantics. Joint with LING 479. Recommended: 120 or 370.

PHIL 484 Reading in Philosophy (1-5, max. 15) *AWSp* Reading of approved philosophical works. Prerequisite: permission of instructor.

Courses for Graduates Only

PHIL 500 Proseminar in Philosophy (5) Development of oral skills in the presentation, criticism, and discussion of philosophical problems and arguments. Student presentations and responses to criticism on a variety of basic philosophical issues. Recommended for all first-year graduate students.

PHIL 514 Seminar in Legal Philosophy (5, max. 20) *Moore*

PHIL 520 Seminar in Ancient Philosophy (5, max. 20) *Cohen, Keyt*

PHIL 521 Seminar in Medieval Philosophy (5, max. 20) *Boler*

PHIL 522 Seminar in Modern Philosophy (5, max. 20) *Clatterbaugh*

PHIL 525 Seminar in Nineteenth-Century Philosophy (5, max. 20)

PHIL 526 Seminar in Recent Philosophy (5, max. 20) *Keyt, Marks*

PHIL 540 Seminar in Ethics (5, max. 20) *Coburn, Keyt, Richman*

PHIL 545 Seminar in the Philosophy of Art (5, max. 20) *Moore*

PHIL 550 Seminar in Epistemology (5, max. 20) *BonJour, Cohen*

PHIL 553 Seminar in Philosophy of Language (5, max. 20) *Marti* Topics may vary, but emphasis on contemporary research in field. Sample topics: truth; intensionality and actuality; treatments of quantification; semantics for psychological verbs.

PHIL 556 Seminar in Metaphysics (5, max. 20) *Coburn, Cohen*

PHIL 560 Seminar in the Philosophy of Science (5, max. 20) *Clatterbaugh*

PHIL 563 Seminar in the Philosophy of Mind (5, max. 20) *Marks*

PHIL 565 Seminar in the Philosophy of History (5, max. 20) *Mish'alani*

PHIL 566 Seminar in Philosophy of the Social Sciences (5)

PHIL 567 Seminar in the Philosophy of Religion (5, max. 20) *Dietrichson*

PHIL 570 Seminar in Logic (5, max. 20)

PHIL 584 Reading in Philosophy (1-4, max. 12) *AWSp* Intensive reading in philosophical literature. The name of the staff member with whom research will be done *must* be indicated in registration. Prerequisite: permission of graduate program coordinator.

PHIL 586 Seminar in Indian Philosophy (5, max. 20) *Potter* Prerequisite: 412.

PHIL 587 Contemporary Analytic Philosophy (5, max. 20) *Marks, Richman*

PHIL 600 Independent Study or Research (*) *AWSp* Prerequisite: permission of graduate program coordinator.

PHIL 700 Master's Thesis (*) *AWSp*

PHIL 800 Doctoral Dissertation (*) *AWSp*

Physics

215 Physics

Physics is the study of the fundamental structure of matter and the interaction of its constituents, as well as the basic natural laws governing the behavior of matter.

Undergraduate Program

Bachelor of Science Degree

Admission: Recommended preparation includes four years of college preparatory mathematics, one year of physics, and one year of chemistry.

Major Requirements: (1) Core courses—PHYS 121, 122, 123, 131, 132, 133, 224, 225, 227, 228, 321, 322, 334, 335; (2) 3 credits selected from upper-division lecture courses in modern physics; (3) 3 credits selected from upper-division physics laboratory courses; (4) 8 credits selected from approved upper-division physics courses or approved courses in cognate subjects; (5) MATH 124, 125, 126, 238, 327, 328 or MATH 134, 135, 136, 334, 335, 336; (6) 9 credits selected from physical or biological sciences other than physics or mathematics, or from the history or philosophy of science, in addition to any courses in these fields taken to satisfy requirement (4); (7) at least 12 credits of the physics courses presented to satisfy requirements (1) through (4) shall be in physics courses numbered 300 or above taken at the University of Washington. Grades of 2.0 or better are required in all courses presented in fulfillment of requirements (1) through (4). Students who plan graduate study in physics are strongly advised to complete, in addition to courses listed in requirement (1), the following: PHYS 323, 324, 325, 326, 331, 421, 422, 423, 424, 425, 426, 431, 432, 433, and AMATH 401, 402, 403.

Progress Requirement: In each academic year, every undergraduate physics major who either has completed the required 200-level courses in physics or has begun physics courses beyond the 200 level must (1) complete at least 15 credits of course work acceptable in fulfillment of the departmental degree requirements exclusive of credits earned by repeating courses in which acceptable credit has been earned previously, or (2) complete satisfactorily an approved part-time program of study. Students who do not satisfy the above requirement will be dropped as physics majors unless exempted explicitly by the Physics Undergraduate Affairs Committee. Students dropped for this reason may petition the committee for readmission to the major.

Graduate Program

The Department of Physics offers studies leading to the degrees of Master of Science and Doctor of Philosophy. The department has a permanent faculty of fifty-six members and a research, visiting, and cooperating faculty that normally numbers about thirty-five. About ten Ph.D. degrees in physics have been awarded annually in recent years.

Research Facilities

The department is well equipped, both in staff and facilities, for instruction and research in a discipline that emphasizes fundamental problems in understanding the physical universe. Areas of research available to the Ph.D. student include astrophysics, nuclear physics, elementary-particle physics, low-temperature and condensed-matter physics, general relativity, atomic physics, and physics education. Members of the nuclear physics group are involved in studies using the facilities of the Nuclear Physics Laboratory on campus, as well as facilities at Los Alamos, while the high-energy experimental groups are heavily engaged in experiments with the large accelerators at SLAC, BNL, and Fermilab. Experimental work on atomic physics using radiofrequency spectroscopy, laser techniques, and trapping of single ions, and condensed matter-low temperature work on thin films, matter under high pressure, and various properties of materials are under way within the physics building itself. Synchrotron radiation from facilities at SLAC and Brookhaven are being used to study molecules and solids. On the theoretical side, members of the department are concerned with problems in the theories of elementary particles and quantum fields, nuclear and high-energy reactions, phase transitions and statistical mechanics; and condensed-matter physics, atomic physics, general relativity, and astrophysics. Students in physics are encouraged to pursue appropriate interdisciplinary interests and research in applied physics with faculty members in other departments.

Departmental facilities are housed in Physics Hall and the Nuclear Physics and High-Energy Physics Laboratories. Contained therein are offices, classrooms, research and instructional laboratories; machine, glass, and electronics shops; computers; and an extensive physics branch library. The main facility at the Nuclear Physics Laboratory is a three-stage FN tandem electrostatic accelerator and a superconducting booster, equipped with computers for on- and off-line data analysis and with a variety of special ion sources and detection apparatus.

Master of Science, Doctor of Philosophy Degrees

Admission Requirements: Undergraduate preparation to include upper-division courses in mechanics; electricity and magnetism; statistical physics and thermodynamics; modern physics, including an introduction to quantum mechanics; and advanced laboratory work. Preparation in mathematics to include vector analysis, complex variables, ordinary differential equations, Fourier analysis, boundary-value problems, and special functions. Admissibility is determined by the applicant's undergraduate program, undergraduate grades,

Graduate Record Examination aptitude and advanced physics scores, letters of recommendation, and a statement of educational and professional objectives.

Master of Science Degree

Graduation Requirements: Department requirements include standard Graduate School requirements. In addition, 3 credits must be in PHYS 600 and at least 12 other credits in physics graduate courses. A final examination is required. A thesis or foreign-language study is not required.

Master of Science Degree (Applications of Physics)

Admission Requirements: This option is designed for students who are currently employed and whose backgrounds are in physical science, engineering, or mathematics. Admission is based on course grades in physics and related fields, adequacy of preparation in physics, and interest in areas of specialization offered in the physics department.

Graduation Requirements: In addition to the standard Graduate School requirements, students are expected to complete the sequence of core courses PHYS 441, 541, and 543 and to select appropriate specialized courses. Students are expected to undertake an independent study project in consultation with a faculty member. This project may be carried out at the University or at the student's place of employment. Students must take at least 3 credits of PHYS 600 and at least 12 in other physics graduate courses. A final examination is required. A thesis or foreign-language study is not required.

Doctor of Philosophy Degree

Graduation Requirements: The student is expected to obtain, here or elsewhere, a background in physics equivalent to that contained in the following sequences of basic graduate courses: PHYS 505, 506; 513, 514, 515; 517, 518, 519, 520; and 524, 525; and in specialized courses appropriate to each student's interests. The student is required to pass, successively, a written qualifying examination (in the autumn of the second year), an oral General Examination for admission to candidacy, and an oral Final Examination. In order to take the General Examination, the student must have been accepted by a graduate faculty member as a research student and have completed the graduate studies outlined above. This examination covers the area in which the dissertation research is planned. Teaching experience is required of all candidates. Foreign-language study is not required.

Financial Aid

Most graduate students are supported by fellowships and assistantships. Application for these should be made along with the application for admission.

Faculty

Chairperson

Mark N. McDermott

Professors

Adelberger, Eric G.,* 1970, Ph.D., 1967, California Institute of Technology; experimental nuclear physics.

Arons, Arnold B., 1968, (Emeritus), M.S., 1940, Stevens Institute of Technology; Ph.D., 1943, Harvard; physical oceanography, physics education.

Baker, Marshall,* 1962, (Applied Mathematics), Ph.D., 1958, Harvard; field theory, theoretical elementary-particle physics.

Bardeen, James M.,* 1976, (Astronomy), Ph.D., 1965, California Institute of Technology; general relativity, theoretical astrophysics.

Bodansky, David,* 1954, M.A., 1948, Ph.D., 1950, Harvard; experimental nuclear physics.

Boulware, David G.,* 1965, M.A., 1960, Ph.D., 1962, Harvard; field theory, theoretical elementary-particle physics, general relativity.

Boynnton, Paul E.,* 1970, (Astronomy),† Ph.D., 1967, Princeton; high-energy astrophysics, astronomy.

Brown, Frederick C.,* 1987, M.S., 1947, Ph.D., 1950, Harvard; use of synchrotron radiation in experimental solid-state physics.

Brown, Lowell S.,* 1968, A.M., 1958, Ph.D., 1961, Harvard; field theory, theoretical elementary-particle physics.

Burnett, Thompson H.,* 1975, Ph.D., 1968, California (San Diego); experimental elementary-particle physics.

Clark, Kenneth C.,* 1948, (Geophysics),† A.M., 1941, Ph.D., 1947, Harvard; optical spectroscopy, upper atmosphere.

Cook, Victor,* 1963, Ph.D., 1962, California (Berkeley); experimental high-energy physics.

Cramer, John G., Jr.,* 1964, M.A., 1959, Ph.D., 1961, Rice; experimental nuclear physics.

Dash, J. Gregory,* 1960, M.A., 1951, Ph.D., 1951, Columbia; low-temperature condensed-matter physics.

Dehmelt, Hans G.,* 1955, M.S., 1949, Ph.D., 1950, Goettingen; radio-frequency spectroscopy.

Ellis, Stephen D.,* 1975, Ph.D., 1971, California Institute of Technology; theoretical elementary-particle physics.

Engel, Thomas,* 1980, ‡(Chemistry), M.A., 1964, Johns Hopkins; Ph.D., 1969, Chicago; surface chemistry and catalysis.

Fain, Samuel C.,* 1969, M.S., 1966, Ph.D., 1969, Illinois; experimental condensed-matter physics, surface physics.

Farwell, George W.,* 1948, (Emeritus), Ph.D., 1948, Chicago; experimental nuclear physics.

Fortson, E. Norval,* 1963, Ph.D., 1964, Harvard; radio-frequency spectroscopy, experimental atomic physics.

Geballe, Ronald,* 1946, (Emeritus), M.S., 1940, Ph.D., 1943, California (Berkeley); atomic and molecular collisions.

Gerhart, James B.,* 1956, M.A., 1952, Ph.D., 1954, Princeton; experimental nuclear physics, physics education.

Halpern, Isaac,* 1953, Ph.D., 1948, Massachusetts Institute of Technology; experimental nuclear physics.

Haxton, Wick,* 1984, M.S., 1973, Ph.D., 1976, Stanford; theoretical nuclear physics.

Heller, Eric J.,* 1984, (Chemistry),† Ph.D., 1973, Harvard; molecular spectra and dynamics.

Henderson, Joseph E., 1929, (Emeritus), Ph.D., 1928, Yale; physics.

Henley, Ernest M.,* 1954, Ph.D., 1952, California (Berkeley); theoretical nuclear physics, theoretical elementary-particle physics.

Ingalls, Robert L.,* 1966, M.S., 1960, Ph.D., 1962, Carnegie Institute of Technology; experimental condensed-matter physics.

Lord, Jere J.,* 1952, M.S., 1948, Ph.D., 1950, Chicago; cosmic rays, experimental elementary-particle physics.

Lubatti, Henry J.,* 1969, M.S., 1963, Illinois; Ph.D., 1966, California (Berkeley); experimental elementary-particle physics.

Margon, Bruce,* 1980, ‡(Astronomy), M.A., 1971, Ph.D., 1973, California (Berkeley); x-ray astronomy, counterparts of x-ray sources.

McDermott, Lillian C.,* 1967, M.A., 1956, Ph.D., 1959, Columbia; physics education.

McDermott, Mark N.,* 1962, M.A., 1956, Ph.D., 1959, Columbia; radio-frequency spectroscopy.

Miller, Gerald A.,* 1975, S.M., 1968, Ph.D., 1972, Massachusetts Institute of Technology; theoretical nuclear physics.

Mockett, Paul M.,* 1972, (Research), Ph.D., 1965, Massachusetts Institute of Technology; experimental elementary-particle physics.

Parks, George K.,* 1971, ‡(Atmospheric Sciences, Geophysics), Ph.D., 1966, California (Berkeley); particles and waves in auroral, magnetospheric, and interplanetary space plasma phenomena.

Peierls, Sir Rudolf E., 1974, (Emeritus), Ph.D., 1929, Leipzig; physics.

Peters, Philip C.,* 1964, (Astronomy), Ph.D., 1964, California Institute of Technology; general relativity, theoretical astrophysics.

Puff, Robert D.,* 1962, Ph.D., 1960, Harvard; many-body theory, statistical physics.

Rehr, John J.,* 1974, Ph.D., 1972, Cornell; theoretical condensed-matter physics.

Riedel, Eberhard K.,* 1975, Ph.D., 1966, Munich Technical (Germany); theoretical condensed-matter physics.

Rothberg, Joseph E.,* 1969, (Environmental Studies), M.A., 1958, Ph.D., 1963, Columbia; experimental high-energy physics.

Rutherford, John P.,* 1976, Ph.D., 1968, Cornell; experimental high-energy physics.

Schick, Michael,* 1969, M.S., 1964, Ph.D., 1967, Stanford; theoretical condensed-matter physics.

Schmidt, Fred H.,* 1946, (Emeritus), M.A., 1940, Buffalo; Ph.D., 1945, California (Berkeley); experimental nuclear physics.

Snober, Kurt A.,* 1972, (Research), M.S., 1968, Ph.D., 1969, Stanford; experimental nuclear physics.

Stern, Edward A.,* 1966, Ph.D., 1955, California Institute of Technology; experimental condensed-matter physics.

Streib, John F.,* 1947, (Emeritus), Ph.D., 1941, California Institute of Technology; physics.

Thouless, David J.,* 1980, Ph.D., 1958, Cornell; theoretical condensed-matter physics.

Van Dyck, Robert S., Jr.,* 1971, Ph.D., 1971, California (Berkeley); experimental atomic physics.

Vandenbosch, Robert,* 1963, ‡(Chemistry), Ph.D., 1957, California (Berkeley); nuclear studies and spectroscopy.

Vilches, Oscar E.,* 1968, Doctor en Fisica, 1966, Univ. Nac. de Cuyo (Argentina); low-temperature condensed-matter physics.

Vlases, George C.,* 1973, ‡(Nuclear Engineering), M.S., 1959, Ph.D., 1963, California Institute of Technology; nuclear engineering.

Weitkamp, William G.,* 1964, (Research), M.S., 1961, Ph.D., 1965, Wisconsin; experimental nuclear physics.

Wilets, Lawrence,* 1958, M.A., 1950, Ph.D., 1952, Princeton; theoretical nuclear and atomic physics.

Williams, Robert W.,* 1959, M.A., 1943, Princeton; Ph.D., 1948, Massachusetts Institute of Technology; experimental high-energy physics, cosmic rays.

Young, Kenneth K.,* 1967, Ph.D., 1965, Pennsylvania; experimental high-energy physics.

Associate Professors

Chaloupka, Vladimir,* 1980, Ph.D., 1975, Geneva (Switzerland); experimental elementary-particle physics.

den Nijs, Marcel,* 1983, Ph.D., 1979, Katholieke University (Netherlands); theoretical condensed-matter physics.

Heckel, Blayne,* 1983, M.A., 1978, Ph.D., 1981, Harvard; experimental atomic physics.

Tralnor, Thomas A.,* 1973, (Research), Ph.D., 1973, North Carolina; experimental nuclear physics.

Assistant Professors

Gossett, Cynthia,* 1983, (Research), M.S., 1979, Ph.D., 1983, Wisconsin (Madison); experimental nuclear physics.

Holzworth, Robert,* 1982, ‡(Geophysics), M.A., 1974, Ph.D., 1977, California (Berkeley); space physics and electrical fields.

Hyde-Wright, Charles,* 1986, Ph.D., 1984, Massachusetts Institute of Technology; experimental nuclear physics.

Nagourney, Warren,* 1977, (Research), Ph.D., 1972, Columbia; experimental atomic physics.

Raab, Frederick,* 1980, (Research), Ph.D., 1980, State University of New York (Stony Brook); experimental atomic physics.

Sorensen, Larry B.,* 1983, M.S., 1974, Ph.D., 1980, Illinois; experimental condensed-matter physics.

Course Descriptions

Courses for Undergraduates

PHYS 101-102, 103 Introductory Physics (5-5,5) A,W,Sp Basic concepts of physics presented in a laboratory setting. Useful for students whose high school preparation in science is weak and who plan to take standard college science courses. Also provides background needed by teachers for effective use of science curriculum materials in the schools. Prerequisites: 101 for -102; -102 for 103.

PHYS 104 Introduction to Mechanics (3) Problem-solving techniques applicable to elementary Newtonian mechanics. Prerequisite: concurrent registration in 103.

PHYS 110, 111, 112 Liberal Arts Physics (5,5,5) AS,W,Sp Basic concepts of physics presented with emphasis on their origin and their impact on society and the Western intellectual tradition. Primarily for students in the arts, humanities, and social sciences. Prerequisites: 110 for 111; 111 for 112.

PHYS 114, 115, 116 General Physics (4,4,4) AWSpS,AWSpS,AWSpS Basic principles of physics presented without use of college-level mathematics. Suitable for students majoring in technically oriented fields other than engineering or the physical sciences. Concurrent registration in 117, 118, 119 strongly recommended. 114: mechanics and sound. 115: heat and electromagnetism. 116: light and modern physics. Prerequisites: working knowledge of algebra and trigonometry, one year of high school physics or one quarter of college-level physical science; 114 for 115; 115 for 116.

Credit is not given for both 114 and 121, 115 and 122, 116 and 123, 117 and 131, 118 and 132, 119 and 133.

PHYS 117, 118, 119 General Physics Laboratory (1,1,1) AWSpS,AWSpS,AWSpS 117: mechanics laboratory, to be taken concurrently with 114. 118: heat and electromagnetism laboratory, to be taken concurrently with 115. 119: sound, light, and modern physics laboratory, to be taken concurrently with 116.

The courses 121, 122, 123, 224, 225 plus appropriate laboratory together make up the general physics sequence for science and engineering students.

PHYS 121 Mechanics (4) AWSpS Basic principles of mechanics. Concurrent registration in 131 strongly recommended. Prerequisites: one year of high school physics or permission of academic adviser, concurrent or previous MATH 124 or 134.

PHYS 122 Electromagnetism and Oscillatory Motion (4) AWSpS Basic principles of electromagnetism, the mechanics of oscillatory motion. Concurrent registration in 132 strongly recommended. Prerequisites: 121; concurrent or previous MATH 125 or 135.

PHYS 123 Waves (4) AWSpS Electromagnetic waves, optics, and waves in matter. Concurrent registration in 133 strongly recommended. Prerequisites: 122, concurrent or previous MATH 126 or 136.

PHYS 131, 132, 133 Experimental Physics (1,1,1) Experimental topics in physics for science and engineering majors. Prerequisites: concurrent or previous enrollment in 121 for 131; 122 for 132; 123 for 133.

PHYS 205 Concepts of Physical Science (3) The nature, origin, and use of selected concepts of the physical sciences.

PHYS 207 The Physics of Music (3) The nature of sound; vibrations; traveling and standing waves; response of the ear to sound; production of musical sounds.

PHYS 210, 211, 212 Intermediate Physics for Teachers and Students in Liberal Arts (5,5,5) A,W,Sp Individualized study of selected topics emphasizing depth of understanding and development of skills essential to the scientific process. Useful as background for teaching physical sciences. Prerequisites: at least two quarters of physics at the 100 level; 210 strongly recommended prior to 211.

PHYS 214 Light and Color (5) A Compares past explanation of certain familiar natural phenomena with present understandings. Lamps and lighting, outdoor light, optical devices, color vision, perspective, paints, and pigments. Quantitative comparison critical to the course, but college-level mathematics background not required. Intended for nonscience students.

PHYS 215 Order and Disorder (5) W Includes symmetry in biological systems and in inanimate nature, relation of structure to size, and micro- and macrostructure of universe, systems in chaos. Quantitative comparison critical to course, but college-level mathematics background not required. 214, 215, 216 may be taken independently or in any order. Intended for nonscience students.

PHYS 216 Time and Change (5) Sp Includes miracles and magic, how and why things move, basic forces in nature, quantum mechanics, relativity, past and future of the universe. Quantitative comparison critical to course, but college-level mathematics background not required. 214, 215, 216 may be taken independently or in any order. Intended for nonscience students.

PHYS 224 Thermal Physics (3) Introduction to heat, thermodynamics, elementary kinetic theory, and the physics of continuous media. Prerequisites: 122, which may be taken concurrently, and MATH 126.

PHYS 225 Modern Physics (3) AWSpS Special theory of relativity; phenomena of modern physics with emphasis on photons, electrons, and atoms; introduction to quantum physics. Prerequisites: 123, concurrent or previous MATH 126 or 136.

PHYS 227, 228 Elementary Mathematical Physics (3,3) Applications of mathematics in physics with emphasis on the mechanics of particles and continuous systems. Prerequisites: 123, MATH 238.

PHYS 311 Relativity and Gravitation (3) Special theory of relativity, Newtonian gravity, and relativistic effects of gravitation, including black holes, gravitational waves, and applications to cosmology. Prerequisite: 123, MATH 126.

PHYS 321, 322, 323 Electromagnetism (3,3,3) A,W,Sp Charges at rest and in motion; dielectric and magnetic media; electromagnetic waves; relativity and electromagnetism; physical optics. Prerequisites: 123, MATH 328, which may be taken concurrently, for 321; 321 for 322; 322 for 323.

PHYS 324, 325 Quantum Mechanics (3,3) A,W Introduction to nonrelativistic quantum mechanics. Prerequisites: 225, MATH 328 for 324; 324 for 325.

PHYS 327 Introduction to Nuclear Physics (3) Nuclear structure, including nuclear reactions, fission, particle accelerators, and nuclear instrumentation; applications of nuclear phenomena in atomic energy and astrophysics. Prerequisite: 225 or permission of instructor.

PHYS 328 Statistical Physics (3) Sp Elements of statistical mechanics and their applications. Prerequisites: 224, 225, 226, 324 or a similar introduction to quantum mechanics; MATH 327.

PHYS 331 Optics Laboratory (3) Sp Optical and spectroscopic measurements. Prerequisite: 323 (preferably concurrent).

PHYS 334, 335 Electric Circuits Laboratory (3,3) W,Sp Basic elements of DC, AC, and transient circuits; electronic devices; electrical measurements. Prerequisites: 123, MATH 126 or 136 for 334; 334 for 335.

PHYS 401, 402, 403 Special Problems (*,*,*) Supervised individual study.

PHYS 405-408 Physical Science for Teachers (2-5, max. 8)-(2-5, max. 6) Individualized study of selected topics emphasizing depth of understanding and development of skills essential to scientific process. Useful as background for teaching physical science.

PHYS 407, 408, 409 Physics for Teachers (5,5,5) Individualized study of selected topics in basic physics with emphasis on depth of understanding and development of skills essential to the scientific process. Background for teaching physics at secondary school and introductory college levels. Prerequisite: permission of instructor. Strongly recommended: 407 taken prior to 408.

PHYS 410 Physical Science for In-service Teachers (1-2, max. 10) A "hands-on" inquiry-oriented course designed to train in-service teachers in the use of the physical science content of any of several science programs that might be selected by a school or school district. Prerequisite: in-service teacher in co-operating school district.

PHYS 411, 412, 413 Physical Science for Lead Teachers (1-4, max. 4; 1-4, max. 4; 1-4, max. 4) For preservice and in-service teachers. Extends the physical science content covered in previous courses and helps prepare lead teachers to train their colleagues in the use of the physical science content of any of several science programs that might be selected by a school or school district. Prerequisites: 101-102 or 400 or 405-408.

PHYS 421 Atomic and Molecular Physics (3) A Survey of the principal phenomena of atomic and molecular physics. Prerequisites: 323 and 325, or permission of instructor.

PHYS 422 Nuclear and Elementary-Particle Physics (3) W Survey of the principal phenomena of nuclear and elementary-particle physics. Prerequisites: 323 and 325, or permission of instructor.

PHYS 423 Solid-State Physics (3) Sp Survey of the principal phenomena of solid-state physics. Prerequisites: 323 and 325, or permission of instructor.

PHYS 424, 425, 426 Mathematical Physics (3,3,3) A,W,Sp 424: advanced classical mechanics. 425, 426: mathematical techniques of particular use in physics, including partial differential equations. Prerequisites: 323 and 325, or permission of instructor for 424 or 425; 425 for 426.

PHYS 427 Applications of Physics (1-3, max. 12) Current applications of physics to problems in the sciences and technology.

PHYS 428 Selected Topics in Physics (1-3, max. 12)

PHYS 431, 432, 433 Modern Physics Laboratory (3,3,3) A,W,Sp 431, 432: measurement in modern atomic, molecular, and solid-state physics. 433: techniques in nuclear and elementary-particle research. Prerequisites: 30 credits in physics or permission of instructor for 431, 432; 327 or 422 or permission of instructor for 433.

PHYS 434 Application of Computers to Physical Measurement (3) Laboratory giving specific instruction and experience in interfacing a minicomputer to laboratory equipment. Prerequisite: junior standing or permission of instructor.

PHYS 441 Quantum Physics (4) A Methods of quantum mechanics and applications to physical systems. Examples from such fields as atomic and molecular systems, atomic collisions, nuclear physics, solid-state physics. Students are helped to make up deficiencies in physics background and mathematics proficiency. Typical preparation: 30 credits in physical science or engineering.

PHYS 485, 486, 487 Senior Honors Seminar (1,1,1) A,W,Sp

Courses for Graduates Only

PHYS 505, 506 Mathematical Methods of Physics (3,3) A,W Mathematical techniques discussed in the context of the physics problems where they arise. Differential and integral equations with boundary conditions applied to conduction and diffusion, hydrodynamics, acoustics, classical and quantum mechanics.

PHYS 507 Physical Applications of Group Theory (3) Applications of finite and continuous groups, representation theory, symmetry, and conservation laws to physical systems.

PHYS 513, 514, 515 Electromagnetism and Relativity (4,4,4) A,W,Sp Properties of electric and magnetic fields in free space and material media; boundary-value problems; radiation from accelerated charges and electromagnetic waves; the theory of special relativity leading to a relativistic formulation of electromagnetism and particle dynamics.

PHYS 517, 518, 519 Quantum Mechanics (4,4,4) A,W,Sp The uncertainty principle and the interpretation of quantum mechanics; solutions of the Schrödinger equation in three dimensions; Dirac notation and matrix formulation; angular momentum; Wigner-Eckart theorem; elementary collision theory; density matrix; approximation methods; atomic structure; semiclassical radiation theory; introduction to group theory and symmetry.

PHYS 520 Advanced Quantum Mechanics (4) A Second quantization; applications to the many-body problem; Dirac equation; Klein-Gordon equation; radiation theory; elementary meson theory. Prerequisite: 519.

PHYS 524, 525 Thermodynamics and Statistical Mechanics (3,3) A,W Statistical mechanical basis for the fundamental thermodynamical laws and concepts; applications of thermodynamic reasoning to selected physical problems; classical statistical distribution functions; quantum statistical mechanics; introduction to equilibrium many-body problems. Prerequisite: 517, which may be taken concurrently.

PHYS 527, 528 Current Problems in Physics (1,1) Introduction to current research topics for beginning graduate students.

PHYS 530 Physics Colloquium (*)

PHYS 531 Seminar in High-Energy Physics (*)

PHYS 532 Seminar in Atomic Collisions and Spectroscopy (*)

PHYS 533 Seminar in Relativistic Astrophysics (*)

PHYS 534 Seminar in Coherent Spectroscopy (*)

PHYS 535 Seminar in Nuclear Physics (*)

PHYS 536 Seminar in Low-Temperature and Solid-State Physics (*)

PHYS 537 Seminar in Theoretical Physics (*)

PHYS 538 Seminar in Cosmic Ray Physics (*)

PHYS 539 Seminar in Problems of Physics Education (*)

PHYS 541 Applications of Quantum Physics (4) Sp Techniques of quantum mechanics applied to lasers, quantum electronics, solids, and surfaces. Emphasis on approximation methods and interaction of electromagnetic radiation with matter. Prerequisite: 421 or 441 or equivalent.

PHYS 542 Numerical Methods in Physics (4) Numerical methods for analysis and computation in physics. Topics include: interpolation, approximation, integration, differential and difference equations, transcendental equations, optimization. Emphasis on physical applications, eigenvalue and scattering problems, modeling.

PHYS 543 Electromagnetic Waves (4) Principal concepts of electromagnetism and classical mechanics. Boundary-value problems. Electromagnetic waves with applications in materials, optics, wave guides. Special relativity and electromagnetism. Prerequisite: 30 credits in physical sciences or engineering.

PHYS 544 Electromagnetic Theory and Plasma Physics (4) Review of electromagnetic theory in terms of Maxwell's equations. Basic fluid mechanics and kinetic theory. Magnetohydrodynamics and plasma physics with the aim of providing an understanding of the principles underlying fusion reactors and other applications.

PHYS 545 Contemporary Optics (4) Coordinated lecture and laboratory treatment of topics in contemporary optics. Subjects include Fourier optics, lens systems, interferometry, laser optics, holography, polarization, crystal optics, birefringence, laser and conventional light sources, optical detectors. Prerequisite: 543 or equivalent.

PHYS 546 Condensed-Matter Physics (4) Experimental techniques for investigating surface geometrical and electronic structure, surface composition, and surface thermodynamics. Auger electron spectroscopy, photo-electron spectroscopy, low-energy electron diffraction, ion sputtering. Prerequisite: 441 or equivalent.

PHYS 547 Electronics for Physics Research (4) Electronic techniques as applied in physics research. Topics include noise, control-system analysis, operational amplifiers, lock-in amplifiers, precision power supplies and metering, data transmission, microprocessors. Several integrated measurement systems are examined in the context of specific research problems. Prerequisite: elementary electronics.

PHYS 548 Nuclear Instrumentation (4) Techniques of nuclear particle detection and radiation detection; position detection; signal preparation and amplification; signal transmission and termination; noise suppression; pulse height discrimination; analog signal processing; fast logic; fast and slow timing; time-to-amplitude conversion; pile-up rejection; singles pulse height analysis; multiparameter pulse height analysis; computer-based data collection; interfacing. Prerequisites: 334 and 335 or equivalents.

PHYS 549 Low-Temperature Physics and Cryogenics (4) Condensed-matter physics at low and ultralow temperatures. Production of low temperatures; liquefaction of gases, dilution refrigeration, magnetic and compressional cooling. Macroscopic quantum effects: superconductivity, superfluidity. Applications of superconductors. The ultralow temperature frontier.

PHYS 550, 551 Atomic Physics (3,3) Theory of atomic structure and spectra; atomic and molecular beams; resonance techniques; atomic collisions; topics of current interest. Prerequisite: 519.

PHYS 552 Introduction to Cosmic Ray Physics (3) The nature and cosmological significance of cosmic ray photons and particles. The motion and confinement

of particles in the geophysical, interplanetary, and interstellar medium. Theories of the processes involved in the high-energy interaction of cosmic rays, including shower theory. Methods of measurement and current problems. Prerequisite: introductory quantum mechanics.

PHYS 557, 558, 559 High Energy Physics (3,3,3) High-energy kinematics; phenomenology of high-energy collisions. Second quarter is devoted to strong interactions, and the third quarter discusses weak interactions. Experimental results are emphasized. Prerequisite: 519.

PHYS 560, 561, 562 Theoretical Nuclear Physics (3,3,3) Nuclear structure, scattering, reactions, and decays in terms of elementary properties of nucleons and current theoretical models. Prerequisite: 519.

PHYS 564, 565 General Relativity (3,3) General covariance and tensor analysis, the relativistic theory of gravitation as given by Einstein's field equations, experimental tests and their significance, and applications of general relativity, particularly in the areas of astrophysics and cosmology. Prerequisite: 515.

PHYS 567, 568, 569 Theory of Solids (3,3,3) A,W,Sp A three-quarter course covering the fundamentals of solid-state physics. Various topics in solid-state physics are covered in considerable detail, bringing knowledge up to the current literature. Prerequisite: 519.

PHYS 570, 571 Quantum Field Theory (3,3) Emphasis varies in different years between relativistic quantum field theory and the many-body problem. Prerequisite: 520.

PHYS 572 Modern Quantum Field Theory (3) Advanced topics in quantum field theory. Prerequisites: 570, 571.

PHYS 576 Selected Topics in Experimental Physics (*)

PHYS 578 Selected Topics in Theoretical Physics (*)

PHYS 580 Laser Physics (4) Physics underlying laser design and operation in the context of common laboratory systems. Topics may include continuous and pulsed lasers; solid, liquid, and gas gain media; Q-switching, mode-locking, resonator theory, nonlinear optics, and others. Prerequisites: basic quantum mechanics, electromagnetism, and optics; recommended: 541.

PHYS 581 Fluid Mechanics (4) Mechanics of ideal and viscous fluids. Topics may include turbulence, thermal conduction and diffusion, shock waves, and others.

PHYS 582 Liquid Crystal Devices (4) Physics of liquid crystals and applications to practical display devices. Phases, phase transitions, optical and dielectric properties, molecular and device "engineering," future prospects.

PHYS 600 Independent Study or Research (*) Study or research under the supervision of individual faculty members. Prerequisite: permission of supervisor.

PHYS 600 Doctoral Dissertation (*) Prerequisite: permission of Supervisory Committee chairperson.

consequences. They learn how to evaluate individual, group, and mass behavior in political settings. Because of their understanding and interest in political systems, students who major in political science enter such career fields as government service, law, journalism, politics, public policy analysis, and education.

The department is organized into four major fields of study: political theory, American government and politics, international relations, and comparative politics. Several subfields—such as law and public policy, political culture, and political economy—cut across these main areas and provide focused specializations for both undergraduate and graduate students. The department has long been renowned in comparative and international politics, especially in the study of Asian political phenomena and in American government and politics. Recently, the department has augmented its faculty strength in political and feminist theory as well as in political economy.

Undergraduate Program

Students begin their concentration by choosing three basic courses that define the discipline and its major fields of interest, then advance to more specialized study in the field areas. The undergraduate program is designed to provide broad knowledge of the discipline, to emphasize the acquisition of research skills to students who will seek advanced degrees, and to offer practical experience through internships and fieldwork courses to students who will seek employment after completing the baccalaureate degree.

Bachelor of Arts Degree

Admission Requirements: Successful completion of two of the required introductory courses (POL S 101, 201, 202, 203, 204, 205, or equivalents). Cumulative University of Washington grade-point average of 2.00 or higher.

Major Requirements: 50 credits in political science, including (1) 15 credits from POL S 101, 201, 202, 203, 204, or 205 and (2) 35 credits from the following fields: political theory, comparative politics, international relations, American politics, and research methods with at least one course from each of three different fields. Majors must maintain a 2.25 cumulative grade-point average in political science. Transfer and fifth-year students must meet all major requirements and complete a minimum of 10 upper-division credits in political science at this university.

Political Economy: The department also offers a political economy focus, a specialized program of study that combines political science and economics, emphasizing rational choice theory. Students who wish to pursue this interdisciplinary concentration should consult with a political science adviser. A list of recommended course work is available.

Internships: In order to prepare students for career opportunities, the department offers three internship programs that range from part-time, 5-credit assignments to full-time, 15-credit programs. Students can elect to work in local agencies (POL S 496), in the state legislature during Winter Quarter (POL S 497), and in Washington, D.C. (POL S 498). Students in all majors may apply for the Washington Center Program, which places students in Washington, D.C., during every academic quarter. Additional information is available from Sharon Redeker, Director of Instructional Programs, 107 Gowen.

Graduate Program

Master of Arts Degree

The M.A. program is made flexible in order to serve the needs both of students who are intending to go on to

the Ph.D. and of students with more immediate goals. Approximately two-thirds of the program is made discretionary. M.A. aspirants must submit an essay of distinction and pass comprehensive oral examinations in three fields. Two of these fields must be chosen from four general fields: political theory, international relations, comparative politics, and American politics. The third field may be chosen from outside the discipline of political science or may be tailored to the specialized needs of the student. The M.A. degree requires the completion of 46 credits, of which 23 must be at the 500 level or above. One course in foundations of political analysis is required.

Doctor of Philosophy Degree

The doctoral program is built around the four general fields, with each student required to select at least two of these fields. Two additional fields may be selected from more specialized offerings within the department or from outside the discipline. Comprehensive written examinations must be completed in each of the four fields, an essay of distinction must be presented at the time of those examinations, and a dissertation must be defended in the Final Examination. One course in quantitative political analysis and an elective methodology course are required. Competence in a foreign language is required only if deemed appropriate by the student's Supervisory Committee. The doctoral degree requires the completion of a total of 124 graduate credits, of which at least 58 must be at the 500 level or above. 36 credits are allowed for the dissertation.

The department has long been outstanding in comparative and international politics, especially in the study of Asian political phenomena. Recently, the department has augmented its faculty strength in American politics, political economy, public policy, and methodology. Graduate students can pursue studies in other campus units, such as the Institute for Marine Studies, the Graduate School of Public Affairs, the Henry M. Jackson School of International Studies, the Institute for Environmental Studies, and the School of Law.

Research Facilities

The University library system, the largest research library in the Pacific Northwest, has a collection of four million volumes, with specialized collections for the Pacific Northwest, Near East, South Asia, and Slavic and East European areas. A separate Political Science Library serves the specialized needs of the department. Interactive and batch-processing computing is available through several large computers. Specialized access to these facilities and access to extensive data holdings are available through the Center for Social Science Computation and Research. The department's own Political Science Psychology Laboratory and Treaty Research Center offer unique computing research and training opportunities. The University is a member of the Inter-University Consortium for Political and Social Research.

Admission and Financial Aid

Admission and financial aid decisions are based on the applicant's academic transcript, Graduate Record Examination scores, three letters of reference, and a statement of purpose. Foreign students are required to submit TOEFL scores. Students are admitted Autumn, Winter, and Spring quarters. Application deadlines are: April 1, Autumn Quarter; October 15, Winter Quarter; and January 15, Spring Quarter.

Two types of financial assistance are available. Several J. Allen Smith fellowships in political science are awarded annually to outstanding first-year students. Teaching and research assistantships, which may include residency status, are also available to qualified students. Applications for financial aid are due by February 15.

Correspondence and Information

Graduate Program Coordinator
101 Gowen, DO-30

Political Science

101 Gowen

Students of political science examine the theory and practice of government and politics. They acquire knowledge of political institutions and processes and learn to think critically about public policies and their

Faculty

Chairperson

David J. Olson

Professors

Bennett, W. Lance,* 1974, M.Phil., 1973, Ph.D., 1974, Yale; American politics, political psychology.

Blalock, Hubert M.,* 1971, ‡(Sociology), M.A., 1953, Brown; Ph.D., 1954, North Carolina; methodology.

Bone, Hugh A., 1948, (Emeritus), M.A., 1936, Wisconsin; Ph.D., 1937, Northwestern; American government and politics.

Brass, Paul R.,* 1965, (International Studies), † M.A., 1959, Ph.D., 1964, Chicago; comparative government, international relations.

Cassinelli, C. W.,* 1960, (Emeritus), A.M., 1950, California (Berkeley); Ph.D., 1953, Harvard; comparative government (Latin America).

Cole, Kenneth C., 1924, (Emeritus), Ph.D., 1930, Harvard; political science.

Gerberding, William P.,* 1979, M.A., 1956, Ph.D., 1959, Chicago; political science.

Gore, William J.,* 1966, M.P.A., 1950, Ph.D., 1952, Southern California; public policy, public administration.

Heilmann, Donald C.,* 1967, (International Studies), † M.A., 1960, Ph.D., 1964, California (Berkeley); comparative government, international relations.

Hitchner, Dell G., 1947, (Emeritus), M.A., 1937, Missouri; Ph.D., 1940, Wisconsin; political science.

Kroll, Morton,* 1958, (Public Affairs), † Ph.D., 1952, California (Los Angeles); comparative administration, public policy.

Lang, Gladys Engel,* 1984, (Communications, Sociology), † M.A., 1942, Washington; Ph.D., 1954, Chicago; press and politics, public opinion, mass communication.

Lev, Daniel S.,* 1970, Ph.D., 1964, Cornell; comparative politics (Southeast Asia).

Levi, Margaret A.,* 1974, (Women Studies), Ph.D., 1974, Harvard; American government and politics, political economy.

Lujan, Herman D.,* 1978, M.A., 1960, California (Berkeley); Ph.D., 1964, Idaho; American government and politics, public administration.

Lyden, Fremont J.,* 1962, ‡(Public Affairs), M.P.A., 1952, Ph.D., 1960, Washington; public policy and administration.

Matthews, Donald R.,* 1976, (Scandinavian Languages and Literature), M.A., 1951, Ph.D., 1953, Princeton; American government and politics.

McCrone, Donald J.,* 1979, Ph.D., 1966, North Carolina; American politics, political economy.

Migdal, Joel S.,* 1980, ‡(International Studies), M.A., 1968, Ph.D., 1972, Harvard; international political economy.

Modelski, George,* 1967, Ph.D., 1954, London; international relations, international political economy.

Olson, David J.,* 1974, M.A., 1966, Ph.D., 1971, Wisconsin; American government and politics.

Ottenberg, Simon,* 1955, ‡(Anthropology), Ph.D., 1957, Northwestern; comparative politics (Africa), political theory and methodology.

Perry, Elizabeth J.,* 1979, ‡(International Studies), M.A., 1971, Washington; Ph.D., 1978, Michigan; comparative politics (China, Japan), political theory.

Reshetar, John S.,* 1957, M.A., 1946, Ph.D., 1950, Harvard; comparative government (Soviet Union), international relations.

Scheingold, Stuart A.,* 1969, M.A., 1959, Ph.D., 1963, California (Berkeley); American politics (public law).

Taylor, Michael,* 1985, M.Sc., 1985, Ph.D., 1975, Essex; political economy, political theory, empirical theory.

Townsend, James R.,* 1968, (International Studies), † M.A., 1957, Ph.D., 1965, California (Berkeley); comparative government (China), politics of development.

Associate Professors

Gottfried, Alex, 1950, (Emeritus), A.M., 1948, Ph.D., 1952, Chicago; American government and politics.

Hartsock, Nancy C. M.,* 1984, (Women Studies), † M.A., 1967, Ph.D., 1972, Chicago; political and feminist theory.

Horowitz, Ruth L.,* 1971, M.A., 1969, Ph.D., 1972, Washington (St. Louis); political theory and methodology.

Keele, John T. S.,* 1980, M.A., 1975, Ph.D., 1978, Harvard; comparative government (Western Europe), international relations.

Lee, Kai N.,* 1973, (Marine Studies), (Environmental Studies), † Ph.D., 1971, Princeton; American government and politics, political economy.

May, Peter J.,* 1979, (Public Affairs), † M.P.P., 1976, Ph.D., 1979, California (Berkeley); public policy, political economy, methodology.

Pool, Jonathan R.,* 1977, M.A., 1968, Ph.D., 1971, Chicago; comparative government, methodology, political economy, political psychology.

Riley, Walter L., 1946, (Emeritus), M.A., 1935, Stanford; Ph.D., 1957, Washington; political science.

Rohn, Peter H.,* 1958, M.A., 1953, Ph.D., 1958, Washington; international relations, international law.

Assistant Professors

DiStefano, Christine, 1985, Ph.D., 1984, Massachusetts (Amherst); political and feminist theory.

Goldberg, Ellis, 1985, M.A., 1970, Ph.D., 1983, California (Berkeley); comparative politics, Mideast politics.

Majeski, Stephen J.,* 1984, M.A., 1975, New Hampshire; Ph.D., 1981, Indiana; international relations, foreign policy, peace and conflict resolution.

McCann, Michael,* 1982, M.A., 1976, Ph.D., 1983, California (Berkeley); American government and politics, public law, political theory.

Lecturer

Chandler, Trevor L., 1970, M.A., 1968, Ph.D., 1970, Oregon; American government and politics, minority politics.

Course Descriptions

Most upper-division courses (300- and 400-level) do not require prerequisites. However, because these courses generally offer more advanced subject matter, they are recommended for juniors and seniors. Freshmen or sophomores who wish to enroll in upper-division courses may do so, but they should consult with the instructor or the departmental adviser first.

Courses for Undergraduates

POL S 101 Introduction to Politics (5) AWSpS Political problems that affect our lives and shape the world around us. Recommended for nonmajors, for students who are thinking about political science as a major, and for political science majors who haven't decided on an area of specialization.

POL S 201 Introduction to Political Theory (5) Philosophical bases of politics and political activity. Provides an introduction to the study of politics by the reading of a few books in political philosophy. Organized around several key political concepts, such as liberty, equality, justice, authority, rights, and citizenship.

POL S 202 Introduction to American Politics (5) AWSpS Institutions and politics in the American political system. Ways of thinking about how significant problems, crises, and conflicts of American society are resolved politically.

POL S 203 Introduction to International Relations (5) AWSp The world community, its politics, and government.

POL S 204 Introduction to Comparative Politics (5) Political systems in a comparative framework. Traditional and contemporary approaches to the study of governments and societies in different countries.

POL S 205 Political Science as a Social Science (5) Methodological perspectives of the various social science disciplines: commonalities and differences in assumptions, values, and paradigms. Current issues from the multiple perspective of social sciences; limits of the social sciences in resolving key social issues. Recommended: introductory course in one or more social science.

POL S 210 Ethnic Minorities and American Politics (5) Ethnic groups in American politics, minorities in urban society, sources of tension and frustration, historical relationship of minorities to the political process, protest as political activity, urban services and urban politics, the effect of national politics and policies on urban minorities. Each quarter focuses on one minority group.

POL S 211 The Future of American Minorities (5) Alternatives open to different minority groups in the United States; their development and place in American politics, the possibilities of community formation, integration, separatism, competitive economic structures, coalitions, etc. Prerequisite: 210 or permission of instructor.

POL S 212 Philosophy of Feminism (5) Philosophical analysis of the concepts and assumptions central to feminism. Theoretical positions within the feminist movement; view of the ideal society, goals and strategies of the movement, its relation to racial liberation, and ethical issues. Joint with PHIL 206 and WOMEN 206.

POL S 270 Introduction to Political Economy (5) Political economy as a tool for understanding and evaluating the political world. Combines theory, methods, and insights derived from economics and political science and applies them to a range of substantive issues.

POL S 273 The Concept of Political Power (5) How to understand and explain relationships of power. Readings from Marxism, Weberian sociology, anarchism, classical political philosophy, and contemporary political science. May also include works of fiction.

POL S 290 Introduction to Quantitative Political Science (5) Skills of analytical reasoning and scientific methods applied to social problems. Reading graphs and tables, discovering fallacies in arguments, evaluating the evidence for an assertion, and determining which of several decisions would be optimal. Students learn to do elementary operations on a computer.

POL S 300 Practical Political Research (5) Techniques for research and report writing in practical politics (e.g., election campaigns, public interest groups, government agencies, political analyses for business). Supervised group research in the computer analysis of current political data. For a sequence in political statistics, students may also take 290 and/or 491.

POL S 301 Special Topics in Political Theory (5, max. 10) Selected contemporary political issues. Political principles as reflected in concrete political problems. Topics might include: women's rights, civil disobedience, national health care, affirmative action, environmental protection, privacy, human rights, and redistribution of property. Recommended: introductory course in political science at the 100 or 200 level.

POL S 302 Field Experience in Politics (5, max. 10) Analysis of political theory and of methods of political research, combined with extensive field research in contemporary problems of government and politics experienced by people of the Seattle community.

POL S 303 Public Policy Formation in the United States (5) Policy decision making with emphasis on: how issues arise, the way they become part of the policy agenda of the executive and the legislature, how these institutions organize to handle policy issues, and the roles of the legislature, the executive, and the bureaucracy. Public policy literature and familiarization with key aspects of policy decision making at the national, state, and local levels.

POL S 304 The Press and Politics in the United States (5) Journalists' role in elections and public policy. Relationship between news coverage and political campaigns. Study and analysis of local political news writing, reporting and response by local and state political figures. Extensive off-campus experience included. Joint with CMU 304.

POL S 305 The Politics of Mass Communication in America (5) Role of mass audiences in politics from the standpoint of the communication strategies used to shape their political involvement. Topics include: social structure and political participation, political propaganda and persuasion, the political uses of public opinion, and the mass media and politics.

POL S 308 The Western Tradition of Political Thought, Ancient and Medieval (5) Origin and evolution of major political concepts from ancient Greece to the medieval period, from Thales through Aquinas. Recommended: 201.

POL S 309 The Western Tradition of Political Thought, Pre-Modern (5) Continuation of 308, treating materials from the fifteenth through eighteenth centuries, Machiavelli through Rousseau. Recommended: 201.

POL S 310 The Western Tradition of Political Thought, Modern (5) Continuation of 308 and 309, focusing on material from the eighteenth through twentieth centuries, from Rousseau through Lenin. Recommended: 201.

POL S 313 Women in Politics (5) Political theory, historical and contemporary, including writings of the women's liberation movement on the political role of women in society. Empirical studies of the "apolitical" woman, and on the process of political socialization in various cultural contexts. Joint with WOMEN 313. Prerequisite: WOMEN 200 or political science course.

POL S 318 American Political Thought I (5) Major thinkers and themes in American political and cultural development from Puritan origins to the Civil War.

POL S 319 American Political Thought II (5) Major thinkers and themes in American political and cultural development from the Civil War to the present.

POL S 321 American Foreign Policy (5) Constitutional framework; major factors in formulation and execution of policy; policies as modified by recent developments; the principal policymakers—President, Congress, political parties, pressure groups, and public opinion. Recommended: 101 or 202.

POL S 324 Europe in World Politics (5) Independent and coordinated efforts of Britain, France, and West Germany to adapt to the post-World War II global system. Creation and development of the Atlantic alliance. Relations with the Soviet bloc. Decolonization and the evolution of relations with the Third World. The movement for European integration. Prerequisite: 203 or equivalent.

POL S 325 The Arab-Israeli Conflict (5) The politics of conflicting ideologies: Zionism and Arab nationalism; formation of the state of Israel; development of Palestinian nationalism; Arab-Israeli wars. Reemergence of Palestinian activism; domestic sources of foreign policy; the role of the superpowers.

POL S 326 Scandinavia in World Affairs (5) Introduction to the foreign relations of Scandinavia with a focus on Nordic security, international economic pressures, and global conflict resolution. Survey of the national settings for international involvements and highlights the dilemmas for industrial societies exposed to the pressure of interdependence. Joint with SCAND 326.

POL S 328 The United Nations and Specialized Agencies (5) The structure and functions of the United Nations and specialized agencies, accomplishments, proposals for strengthening, relations of regional bodies and member states.

POL S 331 Government and Politics in the Middle East and North Africa (5) Breakdown of traditional society and the problems of building modern political systems.

POL S 340 Government and Politics of South Asia (5) Comparison of problems of national integration and political development in India, Pakistan, and Ceylon.

POL S 341 Government and Politics of Canada (5) Critical analysis of parliamentary institutions, political parties, and the federal system in Canada.

POL S 342 Government and Politics of Latin America (5) Analysis of the political dynamics of change in Latin America comparing various national approaches to the political problems of modernization, economic development, and social change.

POL S 343 Government and Politics of Southeast Asia (5) Government and politics in the countries of Southeast Asia, with attention given to the nature of the social and economic environments that condition them.

POL S 346 Governments of Western Europe (5) Modern government and politics of Great Britain, France, Germany, and Italy.

POL S 347 Governments of Eastern Europe (5) Survey of the communist regimes of Poland, Hungary, Czechoslovakia, East Germany, and the Balkans. Joint with SISRE 347.

POL S 349 Communism, Literature, and the Movies (5) Film and literature as media of social and political commentary in communist societies. The role of the cultural intellectual under conditions of political constraint. Emphasis is on materials from eastern Europe, although in some years attention will be given to selected Soviet works. Joint with SISRE 360.

POL S 350 Government and Interest Groups in the United States (5) Agrarian, labor, professional, business, and ethnic interest in politics; impact on representative institutions and governmental processes. Recommended: 101.

POL S 351 The American Democracy (5) Democratic theory; constitutional theory; the Presidency; Congress; the Supreme Court; civil rights and civil liberties. Designed for nonmajors. Recommended: 202 or equivalent.

POL S 352 American Political Parties (5) Theories of American parties, campaigns and voting behavior; party leadership; political socialization and participation. Recommended: 101 or 202.

POL S 353 U.S. Congress (5) Organization and procedure of Congress, state legislative politics, lobbying, legislative roles, theory and practice of representative government. Prerequisite: 101 or 202.

POL S 354 Elections and Voting in the United States (5) Electoral institutions and processes of the United States: the idea and practice of elections, the electoral system, individual voting behavior, collective voting behavior, and the impact of elections on policy. Recommended: 101 or 202.

POL S 355 The American Presidency (5) The American presidency; its evolution, its occupants, and its place within the American system. Topics include presidential character, war, elections, Watergate, the economy, and the Constitution.

POL S 356 Society and Politics (5) Focus on the causes of political change in democratic countries, including public opinion, social movements, interest group activity, and party organization. Joint with SOC 356.

POL S 360 Introduction to United States Constitutional Law (5) Growth and development of the United States Constitution as reflected in decisions of the Supreme Court; political, social, and economic effects.

POL S 361 United States Courts and Civil Liberty (5) Cases and literature bearing on protection of constitutionally guaranteed private rights, with particular reference to the period since 1937.

POL S 365 Lawyers in American Politics (5) Influence of lawyers on American politics. Official and unofficial political roles, lawyers as lobbyists, as legislators, in the bureaucracy, politics of the American Bar Association. Includes study of legal education, professional values, and avenues of political access.

POL S 370 Government and the American Economy (5) Economic and political aspects of the regulation of business, budgetary policy, and tax policy. Processes of policy formulation, policy conflicts, role of private interests and their effects, and strategies for policy change.

POL S 381 Introduction to Large City Government and Politics in the United States (5) Contemporary large-city politics. Social, economic, and political trends that have shaped characteristics of large American cities. Distribution and use of economic and political power at national and local levels. Future of large cities and politics of change. Recommended: 101 or 202.

POL S 382 State Government (5) Focus on the structures, processes, and policy outputs of state governments in the United States.

POL S 383 Environmental Politics and Policy in the United States (5) Interrelation between technological and environmental change and policy formation. Consideration of political behavior related to these phenomena and the capacity of urban public organizations to predict change and to formulate policies that can take future states into account.

POL S 388 Honors Seminar (5, max. 15) AWSp Intensive and advanced studies in various aspects of political science. Open only to participants in the departmental honors program.

POL S 401 Advanced Special Topics in Political Theory (5, max. 10) Topics can include, but are not limited to, analytical theory pertaining to justice, exploitation, and freedom; revolution and social changes; collective choice and action; sexuality and politics; critical theory; Marxist theory; post-structuralism. Content varies. Prerequisite: 201.

POL S 405 American Politics Seminar (5, max. 10) Intensive reading and research in selected problems or fields of political analysis. Recommended: 202.

POL S 406 Marxian Political Economy (5) Explores the relationship between social classes, the state, and political power in advanced capitalist societies. Investigates this relationship primarily by means of the tools of Marxian political economy and, in the process, evaluates these tools. Emphasis on theoretical perspectives, although the reading list has a few empirical applications as well. Prerequisite: 201.

POL S 407 International Conflict (5) Many forms of international conflict, including global wars, local

wars, antiregime wars, military interventions, and international crises. Several political, social, and anthropological explanations for conflicts and examination of alternative world futures.

POL S 408 Problems of Peace and Conflict Resolution (5) Factors involved in conflict and conflict resolution; application to international and other problems. Lectures, discussions, and readings in social psychology, political science, and economics. Suitable for non-majors. Recommended: 290 or 300.

POL S 409 Undergraduate Seminar in Political Economy (5) Seminar in political economy with focus on Marxian and public choice approaches to political economy. Explores the questions raised by each approach, the assumption(s) and testability of hypotheses, and applies these approaches to a number of problems in political economy. Joint with ECON 409. Prerequisites: 270, ECON 300, and permission of instructor.

POL S 410 Technology, Politics, and the State (5) Relationships between politics, technological change, and development of multinational corporations. Considers whether the relations between political and economic systems of industrial societies have been fundamentally altered by the increased importance and interdependence of government, experts, and new technological possibilities for intervention in social life.

POL S 411 Theories of the State (5) Topics may include origins and development of the state; arguments about the necessity, desirability, and proper role of the state; the nature and operation of modern states and the international state system; the legitimacy of modern state power.

POL S 413 Contemporary Political Theory (5) Analysis of political theorists, exploring contemporary theories of humanity and society that form the basis for differing political ideas.

POL S 414 Chinese Political Thought (5) Theories of the Oriental state as exhibited in the writings of diplomats and philosophers.

POL S 416 Economic Theory as Applied to the Political System (5) Explanation and evaluation of the political system, using elementary economics theory. Topics include alternative voting rules, the political effectiveness of various types of groups, causes and consequences of logrolling, and bureaucratic organizations. Joint with ECON 452. Prerequisite: ECON 200 or 400 or equivalent.

POL S 417 Political Economy of India (5) Relationships among processes of economic change, political institutions, and structures of political power in contemporary India. Contrasting approaches of Indian economic development, land reform, radical and agrarian political movements, and role of foreign aid. Joint with SISSA 417.

POL S 418 Multinationals and World Order (5) Multinational corporations as a problem for world order. MNCs and the global political economy; theories of multinational activity; governance and regulation; international organizations, world politics, and MNCs. Prerequisites: Introductory courses in international relations and international studies.

POL S 420 Foreign Relations of the Soviet Union (5) Ideological, historical, and strategic components of Soviet foreign policy; Comintern, Cominform, and international communist movement; Soviet policy in foreign trade, in international law and organization, and in specific geographic areas.

POL S 421 Relations Among Communist States (5) Major disputes and types of relationships among different communist states and ruling parties, attempts at integration and methods of alliance maintenance, tensions and contradictions in relations. Nature of the socialist commonwealth and the communist state system.

POL S 423 International Law (5) Origin and present status of efforts to make rules of conduct for sovereign states; simulation of a treaty-drafting conference, with students playing roles of legal advisers to foreign governments. Recommended mainly for seniors with prior courses in international relations.

POL S 424 International Courts (5) Earlier models, establishment, and operation to date of the World Court in the context of international law and politics; simulation of a court case, with students playing roles of judges and attorneys. Recommended mainly as a sequel to 423.

POL S 425 International Law Seminar (5) Team research on a student-selected topic in international law; quantitative methods, computer applications, and writing skills. Prerequisite: 423 or 424 or permission of instructor.

POL S 426 World Politics (5) A The nation-state system and its alternatives, world distributions of preferences and power, structure of international authority, historical world societies and their politics. Joint with SIS 426.

POL S 428 Military Intervention (5) Historical and theoretical analysis of military intervention in the post-World War II era. Considers how and why interventions occur and evaluates intervention as a foreign-policy response.

POL S 431 International Relations in the Middle East (5) Study of domestic sources of foreign policy in the Middle East; politics of oil; the East-West rivalry in the arena and conflict and collaboration among the local powers.

POL S 433 International Relations in Southeast Asia (5) Analysis of the problems affecting relations among the countries of Southeast Asia. Prerequisites: 101, 343, or permission of instructor.

POL S 434 International Relations of South Asia (5) Interrelationships of domestic, interstate, and extraregional forces and their effects upon the resolution or expansion of interstate conflicts in South Asia. Joint with SISSA 434.

POL S 435 Japanese Government and Politics (5) Government and politics of Japan with emphasis on the period since 1945.

POL S 436 Ethnic Politics and Nationalism in Multi-Ethnic Societies (5) Provides a broad theoretical base, both descriptive and analytical, for the comparative study of ethnicity and nationalism. Examples drawn from ethnic movements in different societies. Some previous exposure either to introductory courses in political science or to courses in ethnicity in other departments is desirable. Prerequisite: junior standing.

POL S 437 Politics in Scandinavia (5) Twentieth-century politics in Scandinavia. How Scandinavian countries have been governed. Costs and consequences of their governmental style and its uncertain future. Optimal size of polities, problems of mature welfare states, process of leadership and representation in multiparty systems, decline of political parties. Joint with SCAND 437.

POL S 438 Politics in France (5) Study of contemporary France. Structures of government in the Fifth Republic; nature of French voting behavior and evolution of the bipolarized political party system; behavior of political interest groups; training of France's administrative elite and functioning of the state bureaucracy; dynamics of policy-making.

POL S 439 Politics of Korea (5) Korean politics in the twentieth century, treating political legacy of ancient regime, colonial period, Korean War, and the politics of North and South Korea. Comparative treatment of both Koreas, in light of the Chinese and Japanese experience. Includes the American-Korean relationship. Joint with SISEA 439. Recommended: SISEA 210 or equivalent.

POL S 440 European Fascism (5) Analysis of fascism as revolutionary movement and type of political system in post-World War I Europe: Hitler's Third Reich, Mussolini's Italy, and Vichy France. Consideration of dynamics of resistance, policies that produced Holocaust, and questions raised at trials of fascist leaders in Nuremberg and elsewhere. Prerequisite: permission of instructor.

POL S 441 Government and Politics of the Soviet Union (5) A Ideological and historical bases of Soviet politics, Leninism-Stalinism, Communist Party structure and functions, administrative agencies, the police and military, law and the judiciary, Soviet federalism and nationality policy.

POL S 442 Government and Politics of China (5) Post-1949 government and politics, with emphasis on problems of political change in modern China. Prerequisite: junior standing.

POL S 443 Comparative Political Societies (5) W Analyses of modern and premodern types of stable political society; special attention to contemporary representative democracy.

POL S 444 Revolutionary Regimes (5) Analysis of the several types of political regimes concerned with effecting fundamental social change; emphasis on the twentieth century.

POL S 446 Peasants in Politics (5) Interdisciplinary study of peasants, with special attention to questions of rural transformation. Peasant involvement in an increasingly interdependent world. Rebellion and revolution, impact of the international market, agricultural development. Joint with SIS 444.

POL S 447 Comparative Politics Seminar (5, max. 10) Selected comparative political problems, political institutions, processes, and issues in comparative perspective. Strongly recommended: 204.

POL S 448 Comparative Political Organizations (5) Dynamics of political organizations (political parties and interest groups) and the roles they play in the political processes of democratic polities. Theories of organizational behavior are tested through consideration of selected cases drawn primarily from the United States and western Europe.

POL S 449 Politics of Developing Areas (5) Comparative study of problems of national integration and political development in the new states of Asia and Africa. Prerequisite: junior standing.

POL S 450 State-Society Relations in Third World Countries (5) Relationships among political, social, and economic changes in Asia, Africa, and Latin America. Problems of economic and political development, revolution and reform, state-society relations, imperialism and dependency. Joint with SIS 456.

POL S 452 Political Processes and Public Opinion in the United States (5) The foundations and environment of opinion; organization and implementation of opinion in controlling government and public opinion as a force in the development of public policy; public relations activities of government agencies.

POL S 453 The State Legislature (5) Study of American state legislatures, with special reference to Washington State Legislature. Student must spend several Fridays in Olympia when the legislature is in session. Those desiring a more extensive involvement with the legislature should enroll in the political internship. Prerequisites: upper-division standing and permission of instructor.

POL S 455 Analytical Models of American Politics (5) Presents several analytic models of American politics and uses computer simulations to demonstrate their differences. Resolution of conflict, leadership, legislative processes, mass politics. Prerequisites: introductory courses in American government; 202 and at least two 300- or 400-level courses in the area of American government.

POL S 462 The Supreme Court in American Politics (5) Introductory public law course that examines the interplay of constitutional law and American politics with particular attention to the role of the Supreme Court in the formulation and implementation of public policy in such matters as criminal-law enforcement, civil rights political expression, and economic regulation.

POL S 463 Political Analysis of United States Social Programs (5) Social problems in the United States and policy responses. National policies concerning poverty, health, welfare, manpower, and the Social Security system. Examination of subgovernmental clusters around each policy area.

POL S 464 The Politics of American Criminal Justice (5) Political forces and value choices associated with the enforcement of criminal law. Distribution of resources among participants in the criminal justice system (e.g., police, attorneys, defendants, and judges). Understanding and evaluation of the interaction of criminal justice processes with the political system. Prerequisite: junior or senior standing.

POL S 465 Law and Public Policy in the United States (5) Relationship between law and public policy, with particular attention to problems of social, economic, and political change. Considers legal and constitutional processes as they relate to such problems of public policy as race relations, the environment, and the economy. Prerequisite: junior or senior standing.

POL S 467 Comparative Law in Society (5) Legal systems around the world as they actually work in their respective political, social, and economic contexts. Emergence and development of European legal systems, legal customs at variance with those of Europe, problems of legal processes in the modern state.

POL S 470 Public Bureaucracies in the American Political Order (5) Growth, power, and roles of governmental bureaucracies in America; conflict and conformity with American political thought, other political institutions, and the public.

POL S 471 Administrative Processes (5)

POL S 475 Public Choice (5) Problems and prospects for collective action in a political democracy. Designing rules and institutions for effective central authority and effective constraints on governmental power. Social choice theory and game theory. Prerequisite: 270 or 370.

POL S 480 Introduction to Urban, Suburban, and Metropolitan Political Systems (5) Causes and consequences of variations in urban form and political structure. Social, economic, and cultural characteristics of different urban forms, and processes by which they have developed; emphasis on suburbanization and metropolitanism. Joint with URBPD 480. Recommended: 101 or 202.

POL S 485 Problems in Urban Political Analysis (5, max. 10) Advanced undergraduate course in urban politics. Opportunity for more independent and intensive analysis of particular problems or lines of inquiry. Prerequisites: 101 or 202 and 480 or 381.

POL S 487 Intergovernmental Relations (5) Analysis of the content and dynamics of the relations between federal, state, and local governments, with emphasis upon patterns in these relationships that reflect program structures.

POL S 488-489 Honors Senior Thesis (5-5) A,W Students individually arrange for independent study of selected topics under the direction of a faculty member. Research paper is student's senior thesis. Students meet periodically as a group to discuss research in progress. Prerequisites: 15 credits in 398, senior honors standing, and permission of instructor.

POL S 490 Foundations of Political Analysis (5) Fundamental issues pertaining to research in political science: "logics of inquiry," problems of concept for-

mation, and development of research methods. Postivist, postempiricist, and other arguments about the nature of scientific knowledge.

POL S 491 Political Research Design and Analysis (5) Major quantitative methods of empirical research in political science. Primary emphasis on research design, data collection, data analysis, and use of computers. Prerequisite: 290 or equivalent or graduate standing or permission of instructor.

POL S 492 Politics and Culture (5) How people interpret and shape the political world around them through the use of such cultural resources as language, symbolism, myth, and ritual. The various uses of these cultural elements establish the place of the individual in society, influence the perception of political events, and create opportunities for individual and mass political responses. Prerequisite: junior or senior standing.

POL S 493 Language and Politics (5) Language as a political phenomenon, a tool of political power, and a source of political problems. Includes the effects of "public doublespeak," the role of language in racism and sexism, and the search for ways to overcome national and international language barriers in several parts of the world. Primarily for students in political science, languages, and area studies. Prerequisite: permission of instructor.

POL S 495 Psychology in American Politics (5) Contributions of cognitive psychology, social psychology, and psychoanalysis to the understanding of politics. Topics include psychological analysis of leadership, mass political behavior, voting and public opinion, group conflict, and decision making in executive, judicial, legislative, and bargaining institutions.

POL S 496 Undergraduate Internship (5, max. 15) Students serving in approved internships. Prerequisites: sophomore standing or above and permission of undergraduate adviser.

POL S 497 Political Internship in State Government (5, max. 20) Students serving in approved internship program with state government agencies. Prerequisites: junior standing or above and permission of undergraduate adviser.

POL S 498 Washington Center for Learning Alternatives Internship (15) AWSps Full-time academic internship with the Washington Center in Washington, D.C. Includes internship activities, academic seminar, assemblies, and related activities. Prerequisites: 202, junior standing or above; one year at this university; application and acceptance into program, permission of undergraduate adviser.

POL S 499 Individual Conference and Research (2-5, max. 20) Intensive study with faculty supervision. No more than one registration in 499 under same instructor. Prerequisites: junior or higher standing and permission of undergraduate adviser.

Courses for Graduates Only

POL S 501 Survey of American Government (3) Conceptual perspectives toward American government. Alternative ways of considering policy issues. Focuses on such models as legal-constitutional, pluralistic competition, political economy, public interest, and conflict resolution. For graduate students outside political science.

POL S 505 Comparative Politics (5) Core course. Modern theories, approaches, and methods in the study of comparative politics.

POL S 506 Contemporary Problems, Domestic and Foreign (3, max. 6)

POL S 509 Political Theory: Core (5) Introduction to the works of major political theorists, past and present. Enduring controversies in political thought and on contemporary political theory literature.

POL S 511 Seminar in Ethical and Political Theory (5) Ethical writings of major political philosophers. Coherent themes arising from these works and assessment of their impact on concepts of politics. Recommended: background in political philosophy.

POL S 512 Seminar in Epistemology and Political Theory (5) Study of the theories of perception and knowledge of major political philosophers. Recommended: background in political philosophy.

POL S 513 Issues in Feminist Theory (5) Contemporary issues in feminist theory as they affect studies of women, politics, and society.

POL S 514 Selected Topics in Political Theory (3-5) Selected topics, historical and conceptual, national, regional, and universal. Prerequisite: permission of instructor.

POL S 515 Scope and Methods in Political Science (3) Inquiry into the philosophic foundations of various approaches in political science and their possible contributions to an understanding of politics. Recommended: substantial background in philosophy, as well as in political science.

POL S 516 Special Topics in American Political Thought (3 or 5) Special topics or themes in the development of American political culture.

POL S 517 Marxism and Critical Theory (5) Works of Marx and Engels as well as selected works of twentieth-century Marxist and critical theorists. Themes such as Marx's method, twentieth-century interpretations of Marx, and relationship of twentieth-century theorists to their eighteenth- and nineteenth-century forebears.

POL S 519 Theories of Decision Making (3) Survey of the several theories of collective decision making, including analysis of alternative strategies and the spectrum of decisional functions associated with each strategy.

POL S 520 Seminar on the Foreign Policy of the Soviet Union (3) Selected topics in the development, methods, and objectives of the foreign policy of the Soviet Union. Prerequisite: permission of instructor.

POL S 521 International Relations I: Theory and Method (5) Part one of the core course in the field of international relations. Reviews contemporary theory, research, and methodology in the study of world politics.

POL S 522 International Relations II: Organization and Politics (5) Part two of the core course in the field of international relations. Reviews basic literature on diplomacy and world organization, history of world politics, and selected special fields, including foreign policies of major powers, international political economy, and global problems.

POL S 523 Long Cycles in World Politics (4) Approaches to world system analysis. Long-run processes in world politics. Relationship to other types of fluctuation. Prerequisites: 426, 521 or 522.

POL S 525 International Law I: Policy (3) Inputs of international law into the decisional process in foreign policy. Effect of policy on law. Relevant roles of individuals and institutions in routine and crisis situations. Prerequisite: 423 or permission of instructor.

POL S 529 Problems of American Foreign Policy (3) Critical analysis of the historical foundations and contemporary problems of foreign-policy making, with attention given to selected foreign-policy decisions. Prerequisite: 321 or permission of instructor.

POL S 532 The Chinese Political System (3) Examination of key approaches, interpretations, and secondary literature in the study of contemporary Chinese politics. Prerequisite: permission of instructor.

POL S 533 Seminar on Contemporary Chinese Politics (3) Research on selected problems in contemporary Chinese politics. Prerequisite: 532 or permission of instructor.

POL S 534 American Foreign Policy (3) American foreign policy viewed whole, including defense policy, the relationships of foreign policy to domestic policies and priorities, and the full range of historical, constitutional, institutional, political, and theoretical questions related to the formation and execution of foreign policy in this broad sense. Joint with PB AF 534.

POL S 535 International Relations of Modern China (3-5) Foreign policy of the People's Republic of China: historical antecedents; domestic and international systemic determinants; and Chinese policies toward major states, regions, and issues. Prerequisite: a course on contemporary Chinese politics or history, or permission of instructor.

POL S 536 Ethnic Politics and Nationality Formation (3) Seminar on analysis and theoretical understanding of two interrelated processes: ethnic group persistence and change over time; and the transformation of ethnic groups into politically self-conscious and influential nationalities. The readings and discussions deal with these two processes in the contexts of both developing societies and advanced industrial societies.

POL S 537 Approaches to East European Politics (3-5) Selected concepts and methodologies useful for the analysis of politics and social structure in the socialist countries of east-central and southeastern Europe. Joint with SISRE 504. Prerequisite: permission of instructor. (Offered alternate years.)

POL S 538 Government and Politics in the Middle East and North Africa (3) Political change in the area within the context of comparative politics; breakdown of traditional political systems; new range of choice expressed in competing ideologies; governmental and nongovernmental instrumentation of change; and problems of international relations and regional conflict and integration.

POL S 540 Problems in South Asian Politics (3) Research problems in contemporary Indian politics.

POL S 541 The Soviet Political System (4) Critical appraisal of the principal research methods, theories, and types of literature dealing with the government and politics of the Soviet Union. Prerequisite: permission of instructor.

POL S 543 Seminar on British Government (3) Advanced studies in British parliamentary government.

POL S 544 Problems in Comparative Government (3, max. 9) Selected problems in the comparative analysis of political institutions, organizations, and systems.

POL S 545 Seminar on Japanese Government and Diplomacy (3, max. 6)

POL S 546 Seminar on Problems of Soviet Politics (3) Selected problems of Soviet domestic politics. Prerequisite: 541 or permission of instructor.

POL S 548 Comparative Political Parties (3) Role of political parties in the modern state. Similarities and differences in origins and development of political parties and functions they perform, both in established democracies and in developing countries.

POL S 549 Problems of Political Development (5) Concepts of development and modernization, with particular attention to their political dimensions and their application to various historical and contemporary cases.

POL S 550, 551 American Politics I, II (5,5) Core course in American government and politics. Systematic survey of the literature. 550 focuses on national politics, 551 on subnational politics. Prerequisites: undergraduate courses in American government and politics.

POL S 553 Public Opinion (3) Selected problems in opinion formation, characteristics, and role of public opinion in policy-making process. Prerequisite: 452.

POL S 554 Legislative Politics (3, max. 6) Selected problems in legislative processes and leadership, state and national.

POL S 561 Law and Politics (5) Points and levels at which law and politics intersect. What is distinctive about legal forms; how these legal forms influence, and are influenced by, politics. Conceptions of law, courts and public policy, law and bureaucracy, civil and criminal justice, and the legal profession.

POL S 562, 563, 564 Public Law (3,3,3) Constitutional and legal concepts governing governmental authority and institutions and the conduct of governmental activities.

POL S 566 Problems in Comparative Legal Institutions (3) Social science inquiry in comparative legal institutions. Worldwide scope, with attention to both theory of law in society and development and practice of legal institutions.

POL S 567 Public Policy, Administration, and Political Theory (3) Meaning of democracy in the context of American public policies and administration. Perspective of individual and group participation in the policy process, individual's role in organizations, functions of the public servant in the making of policy decisions, and realities of policy formulation in relation to political values. Joint with PB AF 556.

POL S 570 Public Policy and Administration (3) Interaction between the bureaucracy and those institutions, organizations, and groups involved in the policy process. Analyses of current policy problems. Joint with PB AF 501.

POL S 571 The Administrator and the Policy Process (3) Context of public administration from the perspective of the administrator. Case and research materials; field inquiries and interviews. Roles and functions of the administrator, particularly in relation to the process of implementing, making, and changing public policy. Joint with PB AF 502.

POL S 575 Public Policy Processes (5) Political science frameworks, approaches, and theories concerning development and implementation of public policies within American political systems. Governmental behaviors and processes, including rational, political, and bureaucratic models of governmental decision making; agenda-building processes; and normative perspectives concerning role of governmental entities.

POL S 576 Political Culture (5) Values, beliefs, and rituals that guide political action in society. Some approaches emphasize symbolic sphere of value and belief over material conditions of power and economic production. Other approaches emphasize material relations. Reconciliation of symbolic and materialist approaches that explain intervention of the modern state in cultural processes.

POL S 579 Comparative Administrative Systems (3) Methodological problems of research in comparative administration. Theoretical and substantive aspects of administrative systems in urban-industrial and developing nations. Joint with PB AF 551.

POL S 581 Politics of Economic Policy Making (4) Determinants of American economic policy with particular attention paid to competing theories of government growth, to political business cycle theory, to incrementalist and other budgetary theories, to effects of party control, and to theories of class control. Interrelationships of monetary, tax, and expenditure policies.

POL S 582 The Political Economy of Social Change (3 or 5) Social change and property rights theory. Exploration of long-term secular change through works whose approaches derive from neoclassical economics and analytical Marxism. Evolution and

transformation of property rights over land, labor, and capital and the consequences of the property rights structure for political and economic institutions.

POL S 583 Economic Theories of Politics (3-5) Problems of public goods provision and collective action. Collective action theories and applications as well as critical review of the concept of rationality.

POL S 584 Approaches to Subnational Government (3) Analysis of current approaches and concepts in the study of subnational government—urban, state, and regional public organization.

POL S 585, 586 Local, State, and Regional Politics and Administration (3,3) Exploration and analysis of political and organizational behavior at the local, state, and regional levels of government, with emphasis upon methodology and field research.

POL S 587 Politics of Urban Reform (3) Interpretations of urban reformers at turn of this century and during 1960s and 1970s. Historical and political science literature on the subject. Prerequisites: graduate student standing and permission.

POL S 589 Special Topics in Political Economy (3, max. 9) Evaluating research in political economy as well as developing research problems. Topics vary with instructor and with current problems in the literature. Prerequisites: 406, 416, ECON 400, and permission of instructor.

POL S 590 Seminar in Political Behavior (3, max. 6) Analysis of behavioral research in selected fields of political science.

POL S 595 Seminar in Political Psychology (3) Fields of psychology and their applications to political analysis. Established and emerging theoretical orientations in political psychology, drawing upon cognitive, sociopsychological, and psychoanalytic perspectives to account for a variety of political phenomena, such as individual and mass political action, small-group behavior, and performance of organizations. Prerequisite: some undergraduate background in psychology.

POL S 598 Independent Writing I (3-5) Supervised research and writing for graduate students completing the M.A. essay of distinction.

POL S 599 Independent Writing II (3-5) Supervised research and writing for graduate students completing the Ph.D. essay of distinction.

POL S 600 Independent Study or Research (*)

POL S 700 Master's Thesis (*)

POL S 800 Doctoral Dissertation (*)

Psychology

119 Guthrie

Psychology involves the scientific study of behavior and its causes and the understanding of human behavior in a variety of settings. Psychology is studied either as a natural science, which stresses physical and biological causes of behavior, or as a social science, which stresses the effects of the social setting on human behavior. Major areas of emphasis are human cognition, animal behavior, physiological and sensory bases of behavior, quantitative techniques, personality and clinical psychology, developmental psychology, and social psychology. The department does not have formal programs in educational, school, or counseling psychology (see the College of Education section of this catalog), engineering psychology, or industrial psychology.

Undergraduate Program

Advisers
114 Guthrie

Admission Requirements: PSYCH 101 or 102, plus a minimum of 4 additional credits in psychology. Admission is competitive, based on: (1) personal statement representing the student's interest in, and commitment to, psychology; (2) grade-point average, with emphasis on grades received in psychology courses (especially courses in experimental design and/or statistics); (3) psychology courses beyond those required for admission; (4) other evidence of commitment to becoming a psychology major.

Application deadline is the first Friday of each quarter, including Summer Quarter. Admission date is the sixth week of the same quarter. Only students with a 2.00 or higher cumulative grade-point average are considered. Applicants denied admission may submit written petitions requesting reconsideration. Applications and additional information are available at 114B Guthrie.

Bachelor of Science Degree

Intended to prepare students for doctoral programs in experimental psychology (e.g., clinical, human experimental, social, animal behavior). Emphasizes a strong natural science and mathematics background, research experience, and high grade-point average.

Major Requirements: 55 credits in psychology courses—PSYCH 101 or 102, 209, 217, 218, 231 or 361, 232 or 233, or 419, 3 credits of 499, plus 10 credits each in social science psychology and in natural science psychology (listed below), and electives to total 55 credits; 28-30 additional credits in other disciplines, to include MATH 105 and 124, 5 credits in physics or chemistry, 10 credits in biology or zoology, and either PHY A 201 or GENET 351. 3.00 overall grade-point average in all courses completed at the University and 3.30 grade-point average in all psychology courses. Transfer students must meet all above requirements, but need complete only 15 credits in psychology at this university. *Social science psychology*—205, 206, 210, 240, 250, 257, 260, 304, 305, 306, 345, 355, 402, 405, 410, 414, 415, 437, 438, 439, 440, 442, 443, 444, 445, 446, 447, 448, 457, 464, 489, 490, and 495. *Natural science psychology*—200, 222, 310, 318, 322, 333, 357, 400, 403, 406, 407, 409, 411, 412, 413, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 434, 435, 441, 455, 461, 462, 463, 465, 468, and 475. (Note: The foregoing "social science" and "natural science" psychology courses should not be confused with the College of Arts and Sciences "distribution" requirements, which are listed separately.)

Bachelor of Arts Degree

The B.A. degree program is intended to prepare students for employment at the baccalaureate level and for graduate study in applied areas (e.g., counseling psychology, social work, business administration, public affairs). The program emphasizes supplementary course work in other departments and fieldwork.

Major Requirements: 50 credits in psychology courses—PSYCH 101 or 102, 209, 213 (or 217, 218), 231 or 232 or 233 or 361 or 419, and electives to total 50 credits (497 recommended); 1½ years of high school algebra or equivalent is a prerequisite to PSYCH 213, but is not a required course; 2.00 grade-point average in all psychology courses. Transfer students must meet all above requirements, but they need complete only 15 credits in psychology at this university.

A student may earn either a Bachelor of Science or a Bachelor of Arts degree in psychology, but not both.

Graduate Program

Graduate work in psychology is organized primarily as preparation for the Doctor of Philosophy degree. The

optional Master of Science degree is taken by some doctoral students in the course of their work toward the doctorate.

For graduate instruction, the department is organized into several content areas: clinical, developmental, social, cognitive, metacognition, psychology and society, animal behavior, physiological, quantitative, and personality, conditioning and motivation.

The program in clinical psychology is accredited by the American Psychological Association and provides scientific and professional training. Specialized training is provided in child-clinical and community-minority psychology and behavioral medicine.

The Physiology-Psychology Group of the Graduate School, composed of faculty from the departments of Psychology and of Physiology and Biophysics, offers an interdisciplinary program leading to the Doctor of Philosophy degree in physiology-psychology.

Master of Science Degree (Optional)

Graduation Requirements: Completion of first-year graduate program (same as for Doctor of Philosophy degree) and an appropriate research program, including a research thesis. Foreign-language study is not required.

Doctor of Philosophy Degree

Graduation Requirements: Completion of course work in major and minor areas and breadth requirements in two other areas; completion of required course work in statistics and general methodology; independent research; General Examination; dissertation; Final Examination. Minimum 3.00 grade-point average overall must be maintained; 3.0 grade required for all courses used to satisfy breadth and minor requirements. *First-year requirements:* Demonstrate competence in statistics and experimental design; complete two of the area breadth requirements; complete at least 3 credits of independent predoctoral research and report that research at the department's annual Research Festival.

Special Research Facilities

Facilities for research and graduate instruction include: teaching laboratories; machine, electronic, and carpentry shops; microprocessor room; animal vivarium; darkroom; remote-access console to computer center; and approximately sixty small, specialized laboratory research rooms.

Admission Qualifications

Undergraduate degree in psychology is not required; some preparation in biological or social sciences is strongly advised. Applicants are judged on a number of criteria, often including their academic and research backgrounds, Graduate Record Examination aptitude scores, and written evaluations submitted by former professors or supervisors. Students with little training in psychology may be required to complete preliminary work in undergraduate courses. Admission of new students usually occurs in Autumn Quarter only.

Assistantships, Fellowships, or Traineeship Opportunities

Research and teaching assistantships are available to qualified graduate students. Additional traineeships and fellowships are also available.

Correspondence and Information

Graduate Program Coordinator
122 Guthrie, NI-25

Faculty

Chairperson

Stephen C. Woods

Professors

Attneave, Carolyn L., (Emeritus), 1975, M.A., 1947, Ph.D., 1952, Stanford; family counseling, therapy and research, American Indian population.

Barash, David P., 1973, M.A., 1968, Ph.D., 1970, Wisconsin; sociobiology, psychological aspects of the arms race and nuclear war, peace studies.

Barnard, Kathryn, 1963, ‡(Parent and Child Nursing), M.S., 1962, Boston; Ph.D., 1972, Washington; parent and child interaction, child rearing, prevention of developmental dysfunction.

Beach, Lee Roy, 1966, (Management and Organization), M.A., 1959, Ph.D., 1961, Colorado; decision processes, cognition, organizational.

Becker, Joseph, 1965, (Psychiatry and Behavioral Sciences), † M.A., 1952, George Washington; Ph.D., 1958, Duke; clinical personality psychopathology.

Bernstein, Ilene L., 1972, M.A., 1967, Columbia; Ph.D., 1972, California (Los Angeles); physiological development, physiological and learning mechanisms involved in food intake and taste preference, influence of age and early experience on taste function.

Bolles, Robert C., 1966, M.S., 1949, Stanford; Ph.D., 1956, California (Berkeley); animal learning and motivation, behavior theory, history.

Butterfield, Earl C., 1981, ‡(Education, Engineering), Ph.D., 1963, Peabody (Vanderbilt); cognitive development, metacognition.

Carlson, James C., 1967, ‡(Music), M.A., 1958, Washington; Ph.D., 1962, Northwestern; systematic musicology, music education, psychology of music, musical perception.

Carr, John E., 1963, (Psychiatry and Behavioral Sciences), † M.A., 1958, Ph.D., 1963, Syracuse; phobic disorders, therapy outcome, cross-cultural psychopathology.

Chapman, C. Richard, 1971, ‡(Psychiatry and Behavioral Sciences, Anesthesiology), M.A., 1968, Ph.D., 1969, Denver; human pain measurement, psychophysiology, sensation and perception, chronic pain.

Doerr, Hans O., 1967, (Psychiatry and Behavioral Sciences), † M.S., 1962, Ph.D., 1965, Florida State; psychophysiology of central and autonomic nervous systems, neuropsychology.

Edwards, Allen L., 1944, (Emeritus), M.A., 1938, Ohio State; Ph.D., 1940, Northwestern; personality assessment and measurement, attitudes, statistics, and experimental design.

Fiedler, Fred E., 1969, (Management and Organization), A.M., 1947, Ph.D., 1949, Chicago; leadership and group effectiveness; social, industrial, and organizational psychology.

Fields, Paul E., 1953, (Emeritus), A.M., 1927, Ohio Wesleyan; Ph.D., 1930, Ohio State; teaching of psychology, psychology examinations.

Gottman, John M., 1986, M.S., 1964, Massachusetts Institute of Technology; M.A., 1967, Ph.D., 1971, Wisconsin; development of children's friendships, marriage and family, observational research techniques.

Greenwald, Anthony G., 1986, M.A., 1961, Ph.D., 1963, Harvard; social cognition, attitudes, self and self-relevant memory, methodology.

Guralnick, Michael J., 1986, Ph.D., 1967, Lehigh; developmental disabilities, peer relations, social and language development, early intervention programs, evaluation systems.

- Horst, A. Paul, 1947, (Emeritus), Ph.D., 1931, Chicago; prediction of personal adjustment factor analysis measurement techniques.
- Hunt, Earl B., * 1966, Ph.D., 1960, Yale; cognition, individual differences in cognition, human information processing, artificial intelligence.
- Hutton, Robert S., * 1971, M.S., 1964, California (Los Angeles); Ph.D., 1969, Southern California; neural basis of motor control, acute and chronic neuromuscular adaptations to use/disuse.
- Jacobson, Neil S., * 1979, Ph.D., 1977, North Carolina; behavior marital therapy, depression, family therapy.
- Kuhl, Patricia K., * 1978, ‡(Speech and Hearing Sciences), M.A., 1971, Ph.D., 1973, Minnesota; infant speech perception, auditory development, theories of perception.
- Latham, Gary P., * 1975, ‡(Management and Organization), M.S., 1969, Georgia Institute of Technology; Ph.D., 1974, Akron; industrial-organizational psychology, human motivation, selection staffing, performance appraisal, training and motivation.
- Lockard, Joan S., * 1964, (Neurological Surgery), † M.S., 1961, San Diego State; Ph.D., 1963, Wisconsin; primate social behavior, animal behavior, sociobiology, human ethology, neurobehavior.
- Loftus, Elizabeth F., * 1973, (Law), M.A., 1967, Ph.D., 1970, Stanford; cognition, long-term memory, eye-witness testimony, psychology and law.
- Loftus, Geoffrey R., * 1972, Ph.D., 1971, Stanford; perception, memory, cognitive processes, information processing, computer control of experimentation.
- Loh, Wallace D., * 1974, ‡(Law), M.A., 1968, Cornell; Ph.D., 1971, Michigan; J.D., 1974, Yale; contracts, constitutional criminal procedure, criminal justice reform.
- Lumsdaine, Arthur A., * 1965, (Emeritus), (Education), † Ph.D., 1949, Stanford; opinion and attitude change, poverty and affluence, political behavior and conflict resolution.
- Lunneborg, Clifford E., * 1962, (Statistics), † M.S., 1957, Ph.D., 1959, Washington; psychometrics, multivariate models, individual differences in cognition.
- Lunneborg, Patricia W., * 1967, (Women Studies), M.S., 1959, Washington; Ph.D., 1962, Texas; growth of abilities in college students, adult vocational development, test construction in occupational choice.
- Marlatt, G. Alan, * 1972, Ph.D., 1968, Indiana; cognitive-behavior therapy and assessment, addictive behaviors, relapse prevention, transpersonal psychology.
- Martin, Joan C., * 1972, ‡(Psychiatry and Behavioral Sciences), M.S., 1962, Ph.D., 1965, Florida State; behavioral teratology, effects of drugs *in utero* on behavior, behavioral factors in laboratory safety.
- Mitchell, Terence R., * 1969, (Management and Organization), † M.A., 1967, Ph.D., 1969, Illinois; organizational behavior, leadership, group processes, motivation.
- Nelson, Thomas O., * 1971, M.A., 1966, Ph.D., 1970, Illinois; human memory, metacognition, research methodology, philosophy of science.
- Robinson, Nancy M., * 1974, ‡(Pediatrics, Psychiatry and Behavioral Sciences), M.A., 1953, Ph.D., 1958, Stanford; mental retardation, accelerated development.
- Sackett, Gene P., * 1970, M.A., 1961, Ph.D., 1963, Claremont; primate behavior, early experience and development.
- Sarason, Irwin G., * 1956, M.A., 1953, Iowa State; Ph.D., 1955, Indiana; personality, social support, stress and anxiety.
- Sax, Gilbert, * 1966, (Education), † M.A., 1956, California (Los Angeles); Ph.D., 1958, Southern California; measurement, evaluation, research design, statistics.
- Simpson, John B., * 1975, M.A., 1972, Ph.D., 1973, Northwestern; neural and endocrine controls of body fluid homeostasis, behavioral endocrinology.
- Smith, Moncrieff H., * 1949, M.A., 1941, Missouri; Ph.D., 1947, Stanford; psychophysics, pathology of human memory, biological motivation.
- Smith, Ronald E., * 1969, M.A., 1964, Ph.D., 1968, Southern Illinois; clinical, personality, sport psychology.
- Steele, Claude M., * 1973, M.A., 1969, Ph.D., 1971, Ohio State; social causes and effects of alcoholism, name-calling, attribution, self-esteem therapy.
- Stotland, Ezra, * 1957, (Emeritus), M.A., 1949, Ph.D., 1953, Michigan; empathy, criminal justice, stress.
- Strother, Charles R., 1947, (Emeritus), (Psychiatry and Behavioral Sciences), † M.A., 1932, Washington; Ph.D., 1935, Iowa; mental retardation, psychopathology, speech pathology.
- Teller, Davida Y., * 1965, (Physiology and Biophysics), † Ph.D., 1965, California (Berkeley); vision, visual development in infants.
- Townes, Brenda D., * 1961, ‡(Anesthesiology, Psychiatry and Behavioral Sciences), M.A., 1958, Mills; Ph.D., 1970, Washington; clinical neuropsychology, birth-planning decisions.
- Woodburne, Lloyd S., 1950, (Emeritus), M.A., 1930, Ph.D., 1932, Michigan; neural basis of behavior, neurophysiology of learning.
- Woods, Stephen C., * 1972, (Medicine), Ph.D., 1970, Washington; physiological and conditioned drug effects, neural control of endocrine system.

Associate Professors

- Armstrong, Hubert E., 1966, ‡(Education, Psychiatry and Behavioral Sciences), Ph.D., 1963, Syracuse; clinical psychology.
- Beecher, Michael D., * 1978, M.A., 1965, Ph.D., 1970, Boston; animal communication, animal behavior.
- Beil, Cecil H., Jr., * 1968, ‡(Management and Organization), Ph.D., 1970, Boston; organization development, organizational psychology, management theory and practice.
- Broedel, John W., * 1967, (Education), † M.S., 1956, Indiana State; Ed.D., 1958, Illinois; counseling, early adulthood, object relationship theory.
- Buck, Steven L., * 1979, (Research), M.A., 1974, Ph.D., 1976, California (San Diego); human visual psychophysics, perception, human and animal learning.
- Clatterbaugh, Kenneth C., * 1966, ‡(Philosophy), (Women Studies), Ph.D., 1967, Indiana; philosophy of science, causality, continental rationalism, metacognition.
- Culbert, Sidney S., * 1947, (Emeritus), Ph.D., 1950, Washington; perception, psycholinguistics, intercultural communication.
- Dale, Philip S., * 1968, (Linguistics, Speech and Hearing Sciences), M.A., 1964, M.S., 1966, Ph.D., 1968, Michigan; language and cognitive development in normal and exceptional children.
- Dawson, Geraldine, * 1985, Ph.D., 1979, Washington; developmental disabilities, autism, and neuropsychology.
- Diaz, Jaime, * 1978, M.A., 1972, Ph.D., 1975, California (Los Angeles); brain development, developmental psychopharmacology.
- Dong, Willie K., * 1976, (Research), ‡(Anesthesiology), Ph.D., 1974, California (Berkeley); somatosensory and trigeminal neurophysiology, pain.
- Douglas, Robert J., * 1968, M.A., 1961, Ph.D., 1964, Michigan; neuropsychology of learning and memory, aging and inhibition.
- Fry, Louis W., 1983, ‡(Management and Organization), Ph.D., 1956, Ohio State; creativity and innovation, strategic team development, management of high technology and organizations, organization design.
- Gillmore, Gerald M., * 1982, (Affiliate), M.A., 1969, Ph.D., 1970, Michigan State; educational measurement theory, instructional evaluation, evolution of educational programs.

- Greenberg, Mark T., * 1977, M.A., 1976, Ph.D., 1978, Virginia; infant and preschool social and personality development, development of deaf children, developmental psychopathology.
- Jackson, Nancy E., * 1980, (Research), ‡(Parent and Child Nursing), M.S., 1971, Ph.D., 1975, Washington; intellectual development and individual differences in intellectual functioning.
- Katon, Wayne J., 1985, ‡(Psychiatry and Behavioral Sciences), M.D., 1976, Oregon Health Sciences.
- Keating, John P., * 1972, (Environmental Studies), M.A., 1962, Gonzaga; M.S.T., 1969, Santa Clara; M.A., 1971, Ph.D., 1972, Ohio State; communication media and attitude change, environmental psychology, emergency behavior.
- Kenney, Nancy J., * 1976, (Women Studies), † M.A., 1972, Ph.D., 1975, Virginia; neural and endocrine controls of food and fluid intake, physiological basis of motivation.
- Kerr, F. Beth, * 1974, M.S., 1968, M.S.P.E., 1969, North Carolina; M.A., 1973, Ph.D., 1974, Oregon; cognition, human motor control, and learning, attention.
- Kiyak, Asuman H., * 1977, ‡(Architecture, Oral and Maxillofacial Surgery), M.A., 1974, Ph.D., 1977, Wayne State; social and environmental psychology, gerontology, health psychology.
- Kohlenberg, Robert J., * 1968, M.S., 1963, Wisconsin; Ph.D., 1968, California (Los Angeles); clinical behavior modification, learning, clinical psychophysiology, behavioral medicine.
- Linehan, Marsha M., * 1977, (Psychiatry and Behavioral Sciences), M.A., 1970, Ph.D., 1971, Loyola (Chicago); behavior assessment and therapy, suicide and parasuicide, assertion training, behavior therapy with women.
- McMahon, Robert J., * 1987, M.S., 1977, Ph.D., 1979, Georgia; social learning-based treatment of conduct-disordered children and their families; developmental psychopathology; behavioral assessment, family interaction, pediatric psychology.
- Meltzoff, Andrew N., * 1977, (Psychiatry and Behavioral Sciences), Ph.D., 1976, Oxford (England); perceptual, cognitive, and social development in infants, concept formulation and memory in infants.
- Mitchell, Sandra K., * 1977, ‡(Parent and Child Nursing), M.A., 1971, Illinois (Urbana); Ph.D., 1976, Washington; human development (life span), longitudinal research methods, behavior assessment of infants.
- Pagano, Robert R., * 1965, M.S., 1963, Ph.D., 1965, Yale; stress management, health psychology, clinical psychophysiology, physiological psychology.
- Passer, Michael W., * 1977, (Affiliate), M.A., 1972, Ph.D., 1977, California (Los Angeles); social psychology of sport and motor behavior.
- Perry, Martha A., * 1972, (Affiliate), M.A., 1969, Ph.D., 1970, Syracuse; child-clinical, child abuse, child assessment, mental retardation, development of attitudes toward the handicapped.
- Rose, Richard M., * 1966, M.A., 1961, Ph.D., 1964, Pennsylvania; stochastic models, psychophysics, sleep.
- Rubel, Edwin W., 1986, ‡(Neurosurgery, Otolaryngology, Physiology and Biophysics), Ph.D., 1969, Michigan State; auditory systems development, developmental neurobiology, influence of experience on brain and behavior development.
- Samson, Herman H., * 1977, (Research), ‡(Psychiatry and Behavioral Sciences), M.A., 1965, McMaster; Ph.D., 1968, Waterloo; behavioral pharmacology, addictive processes.
- Smoll, Frank L., * 1970, M.S., 1966, Ph.D., 1970, Wisconsin; psychological correlates of motor development, sport psychology, behavioral assessment of coaches.
- Verhulst, Johan, 1978, ‡(Psychiatry and Behavioral Sciences), M.D., 1964, Louvain (Belgium); clinical psychology, marital therapy.

Vitaliano, Peter P., * 1977, ‡(Psychiatry and Behavioral Sciences), M.S., 1973, Ph.D., 1975, Syracuse; psychiatric epidemiology and psychometrics, aging, stress.

Vitiello, Michael V., * 1977, ‡(Psychiatry and Behavioral Sciences), Ph.D., 1980, Washington; sleep, aging, psychopharmacology, depression.

Weinstein, Philip, * 1972, ‡(Community Dentistry, Pediatric Dentistry), M.S., 1968, Ph.D., 1971, Kentucky; behavioral medicine, management of anxiety and fear, preventive medicine and dentistry, clinical assessment.

Wise, James A., * 1975, ‡(Architecture, Environmental Studies), Ph.D., 1970, Washington; decision theory, environmental psychology, design methodologies.

Assistant Professors

Brenowitz, Elliot A., * 1987, (Zoology), Ph.D., 1982, Cornell; animal behavior, neuroethology, neuroendocrinology, animal communication.

Cauce, Ana Mari, 1986, M.S., 1979, Ph.D., 1984, Yale; social support and networks, at-risk adolescents, community psychology, minority populations.

Chen, Andrew C. N., 1980, (Research), ‡(Psychiatry and Behavioral Sciences, Oral Medicine), M.S., 1971, Ph.D., 1980, Washington; brain and behavior, cognitive neuroscience, neuropsychophysiology, brain evoked potentials and cortical power spectrum analyses, Chinese and international psychology.

Fenner, Robert H., 1968, ‡(Education), M.A., 1962, Ph.D., 1965, Colorado; individual and group psychotherapy, personality theory, counseling.

Kivlahan, Daniel, 1984, ‡(Psychiatry and Behavioral Sciences), Ph.D., 1983, Missouri; secondary prevention with high-risk drinkers, assessment of substance-abuse disorders, alcoholism treatment outcome evaluation.

Lee, Thomas W., 1983, (Management and Organization), Ph.D., 1984, Oregon; organizational behavior and human resources management.

Miyamoto, John M., 1984, M.A., 1978, Ph.D., 1985, Michigan; mathematics psychology, psychophysiology measurement, theories of subjective value, inductive inference.

Palmer, John C., * 1984, Ph.D., 1984, Michigan; visual perception and psychophysics, memory and attention, mathematical models.

Speltz, Matthew L., 1984, (Psychiatry and Behavioral Sciences), Ph.D., 1980, Missouri (Columbus); developmental psychotherapy, family therapy, pediatric behavioral medicine.

Lecturer

Vance, Ellen B., 1980, Ph.D., 1975, Washington; clinical diagnosis and therapy, women in transition, forensic evaluation.

Senior Research Associate

Sarason, Barbara R., * 1976, M.A., 1954, Iowa State; Ph.D., 1956, Indiana; social support, stress anxiety, cognitive coping skills, personality variables.

Course Descriptions

Courses for Undergraduates

PSYCH 101 Psychology as a Social Science (5) AWSps Beach, Keating, R. Smith Research theories and observations of human behavior: individual differences, personality, development, motivations, social behavior, deviant behavior, genetics and physiology of behavior, learning and cognitive processes, and sensory and perceptual processes. Social problems and research psychologists' efforts to help characterize and solve them.

PSYCH 102 Psychology as a Natural Science (5) AWSps Bernstein, Sackett, Simpson, Woods Behavior from a natural science viewpoint: components and mechanisms of behavior; evolution, genetics, and physiology of behavior, learning processes, motivation, individual differences, development, social behavior, and sensory, perceptual, and cognitive processes.

PSYCH 200 Comparative Animal Behavior (5) AWSps Barash, Beecher Research methods and findings of comparative animal behavior and their importance to an understanding of human behavior; rationale for study of behavioral differences and similarities between animal species, behavior viewed as part of the adaptation of each species to its natural habitat. Prerequisite: 102 or BIOL 210.

PSYCH 205 Introduction to Personality and Individual Differences (4) AWSps Cauce, Linehan, Marlatt Basic concepts, methods, and background for more intensive study. Prerequisite: 101 or 102, or equivalent.

PSYCH 206 Psychosocial Aspects of Nuclear War (3) A Barash Introduction to basic issues of nuclear war, including its effects, weaponry, and history of the arms race. Primary focus on the psychological underpinnings of deterrence, relations between nations, and the personal and social forces operative in the arms race and peace movements.

PSYCH 209 Fundamentals of Psychological Research (4) AWSps Kerr, Miyamoto Psychological research methodology and techniques. Topics include hypothesis testing, influence of paradigms, experimental design, techniques of scientific writing, research techniques, ethical issues in psychological research, bias and expectation problems. Required for all psychology majors. Prerequisite: 101 or 102 or equivalent.

PSYCH 210 Introduction to Human Sexuality (4) Broad survey of biological, psychological, and social determinants of human sexuality and sexual behavior: empirical data (e.g., survey data, experimental findings) and major theoretical approaches.

PSYCH 213 Elementary Psychological Statistics (6) Lunneborg, Pagano Applied statistics in psychology. Data, probability theory, stating and testing hypotheses in psychology. More commonly used inference tests. Required for majors registered in the psychology Bachelor of Arts degree program. Prerequisites: 209 and 1½ years of high school algebra or permission of instructor.

PSYCH 217 Introduction to Probability and Statistics for Psychology (4) AWSps G. Loftus, Rose Probability theory as a model for scientific inference. Probabilistic variables and experimental outcomes, conditional probability, binomial and related distributions, experiments as samples, statistics and sampling distributions, the normal distribution, problems of estimation from experiments. Prerequisites: 209 and MATH 157 or 124, or permission of instructor.

PSYCH 218 Statistical Inference in Psychological Research (4) AWSps G. Loftus, Rose Hypothesis testing and its probabilistic and statistical basis. Development and application of statistical inference techniques employed in psychological research: t-test, analysis of variance, correlation and regression, and nonparametric statistics. Nature and control of experimental and inferential error in research. Required for majors in the psychology Bachelor of Science degree program or in the psychology honors or distinction programs. Prerequisite: 217.

PSYCH 222 Survey of Physiological Psychology (3) AWSps Diaz, Douglas, Simpson The brain and how it works. Learning, memory, sleep, the senses, and the emotions. For students who do not intend to specialize in physiological psychology. Prerequisite: major standing in a biological science or either 101 or 102.

PSYCH 231 Laboratory in Human Performance (3) AWSps Hunt Selected aspects of human learning, perception, and performance. Prerequisites: 209 and 213 or 217.

PSYCH 232 Laboratory in Animal Learning (3) AWSps Bolles Selected aspects of animal learning emphasizing operant techniques with the rat. Prerequisite: 209.

PSYCH 233 Laboratory in Animal Behavior (5) AWSps Barash Experience with a variety of animal species and experimental procedures and instrumentation. Prerequisites: 101 or 102, 209, and 200 or BIOL 212, or equivalents.

PSYCH 240 Behavior Modification (3) A Jacobson, Kohlenberg, Linehan, Marlatt, Pagano, R. Smith Survey of behavior modification application for students who plan careers in human services. Behavioral approach and associated research on such topics as sexual dysfunction, stress, athletic performance, phobias and anxieties, depression, marital discord, weight control, energy conservation, pollution, health, addictions, interpersonal relationships, creativity, industrial safety. Prerequisite: introductory psychology.

PSYCH 250 Racism and Minority Groups (4) Problems of racism and their effects upon minority groups, with emphasis on the conditions related to the development of mental health. Emphasis on the situation of the Black, Chicano, American Indian, and Asian groups.

PSYCH 257 Psychology of Sex Differences (5) A Kenney Major psychological theories of sex-role development; biological and environmental influences that determine and maintain sex differences in behavior; roles in children, sex differences in aggression, cognitive abilities, achievement motivation, affiliation, and sexuality. Joint with WOMEN 257. Recommended: 101 or 102. Not open for credit to students who have taken GIS 244.

PSYCH 260 Psychological Aspects of Poverty and Affluence (4) Experience of poverty in various United States and world situations; psychological and socioeconomic causes of poverty; attitudes and motives of both the poor and the more affluent; psychological and socioeconomic factors in world hunger and poverty in developing nations. Recommended: 101 or 345.

PSYCH 304 Issues and Concepts in Community Psychology (4) Community mental health, epidemiology, program evaluation, and social ecology; research, theory, and practice in community settings; the influence of community-environmental factors in individual functioning and their utilization to promote mental health. Prerequisite: 10 credits in psychology.

PSYCH 305 Deviant Personality (5) AWSps Jacobson, Kohlenberg, I. Sarason Psychopathology; analysis of forms, nature, and causes of disorders of behavior and personality. Prerequisite: 10 credits in psychology, including 101 or 102, or equivalent.

PSYCH 306 Developmental Psychology (5) AWSps Dale, Greenberg Analysis of psychological development of the child in relation to biological, physical, and sociological antecedent conditions from infancy to adolescence. Prerequisite: 101 or 102, or equivalent.

PSYCH 310 Motor Development (4) W Smoll Analysis of motor development from infancy through adolescence with emphasis on relationships between biophysical and psychosocial development of children and youth. Prerequisite: 101 or 102 or equivalent.

PSYCH 318 Psychobiological Responses to Exercise/Disease (5) Hutton Adaptive responses to prolonged increased or decreased use of organ systems. Induction mechanisms, exercise, and human behavior. Prerequisite: 222 or ZOO 118.

PSYCH 322 Introduction to Drugs and Behavior (3) A Diaz Basic concepts of drug action emphasizing the behavioral consequences of the intake of a variety of drugs. Prerequisite: 222.

PSYCH 333 Sensory and Perceptual Processes (4) Beecher, Buck, Palmer Perception and processing by each of the senses with emphasis on behavioral studies and their relationship to underlying structure. Prerequisite: 101 or 102 or equivalent, or permission of instructor.

PSYCH 345 Social Psychology (5) AWSpS Steele Effects of the social environment upon the formation of individual attitudes, values, and beliefs, and upon individual and group behavior; major theoretical approaches; field and experimental research findings. Prerequisite: 101 or 102, or equivalent.

PSYCH 350- Honors Research Seminar in Psychology (2-, max. 6) AWSp Teller Presentations by professors and advanced honors or distinction students concerning the rationale, methodology, and progress of their research projects. Required quarterly for all junior honors and distinction candidates in conjunction with 498 and 499. Prerequisites: 231 and 232 or 233, or equivalents, and permission of departmental honors adviser.

PSYCH 355 Survey of Cognitive Psychology (5) AW Hunt, E. Loftus Current theory and research in perception, attention, memory and learning, attitudes, thinking and decision making, and language. For the student who wishes a survey or who intends additional work in any of the above content areas. Prerequisite: 8 credits in psychology, including an introductory course.

PSYCH 357 Psychobiology of Women (5) W Kenney Physiological and psychological aspects of women's lives; determinants of biological sex; physiological and psychological events of puberty; menopause; sexuality; contraception, pregnancy, childbirth, and lactation; role of culture in determining psychological response to physiological events. Not open for credit to students who have taken GIS 357. Joint with WOMEN 357. Prerequisite: 101 or 102 or 257 or WOMEN 257 or WOMEN 200.

PSYCH 361 Laboratory in Social Psychology (5) Keating Practice and discussion of methods of systematic observation, content analysis, laboratory and field experimental manipulation in social psychology; individual research projects. Prerequisites: 209, 213 or 217, 345, and major standing.

PSYCH 400 Learning (5) Sp Bolles Experimental research and basic theories primarily in animal learning. Prerequisite: 101 or 102.

PSYCH 402 Infant Behavior and Development (3 or 5) Sp Meltzoff Psychological development in the first two years of life. Basic and advanced techniques for assessing psychological development in infancy. Classic theories of human infancy and examination of a wide range of new experiments about infant behavior and development. Prerequisite: upper-division or graduate standing.

PSYCH 403 Motivation (5) WSp Bolles Theory and research on reinforcement, punishment, frustration, preference, instinctual mechanisms, and other factors controlling animal behavior. Prerequisite: 101 or 102.

PSYCH 405 Advanced Personality: Theory and Research (5) I. Sarason Intensive survey of theoretical concepts and detailed review of experimental methods and experiments in the field of personality. Prerequisite: 205 or equivalent.

PSYCH 407 History of Psychology (5) W Bolles Historical and theoretical background of the basic assumptions of modern psychology, including such doctrines as behaviorism, determinism, and associationism and the scientists who developed them. Prerequisite: 400 or equivalent.

PSYCH 409 Sociobiology (4) WSp Barash, Beecher Biological bases of social behavior, emphasizing evolution as a paradigm: individual versus group selection, kin selection, altruism, group versus individual living, mating systems, parental care of offspring, and competitive strategies. Joint with ZOO 409. Prerequisites: 200 or BIOL 211 and 212, or equivalent.

PSYCH 410 Deviant Development (5) Introduction to psychopathology in children, adolescents, and families. Family systems perspective. Particularly for students interested in advanced work in clinical psychology or special education. Prerequisites: 305, 306, or equivalents.

PSYCH 411 Perceptual Development (5) Origins, development of perception in human infancy; nature-nurture controversy applied to perceptual development. Topics from visual, auditory domains. Development of object and face perception; auditory pattern perception; speech perception; categorization; perception of three-dimensional space; auditory localization; cross-modal relations between touch, vision, audition. Joint with SPHSC 411.

PSYCH 412 Behavior Genetics (5) Empirical research with animals and humans. Basic transmission genetics, evolutionary theory, population genetics, and quantitative models; human behavior genetics, normal and abnormal social behavior, intellectual performance, sex differences, prenatal diagnosis and genetic counseling, and ethical considerations in behavior genetic research. Prerequisite: GENET 351 or equivalent.

PSYCH 413 Developmental Psychobiology (3) W Bernstein Neural basis of behavioral development in normal and abnormal manifestations; relationship between structure and function in the nervous system; brain development and effects of prenatal and postnatal experiences on the brain and behavior. Prerequisite: 222 or 421 or 422 or equivalent.

PSYCH 414 Cognitive Development (5) Asp Dale Key theoretical approaches to cognitive development from infancy through adolescence. Object permanence, language development, imitation, logical reasoning, moral development, intelligence and educational implications. Prerequisite: 306.

PSYCH 415 Personality Development of the Child (5) Greenberg Socialization theory and research, infant attachment and social relationships, development of aggressive and altruistic behaviors, sex-role development, moral development, parent and adult influences. Applied issues in social development and policy. Prerequisite: 306.

PSYCH 416 Animal Communication (5) Beecher Evolution and mechanisms of animal communication and related processes of perception, thinking, and social behavior. Prerequisite: 200 or 233 or 10 credits in biology or zoology.

PSYCH 417 Human Behavior as a Natural Science (5) W Lockard Evolution of human social behavior and the adaptive significance of communication systems from a sociobiological and anthropological perspective. Prerequisite: 102 or an introductory zoology or anthropology course.

PSYCH 418 Primate Social Behavior (5) W Lockard Social behavior, ecology, and group structure of monkeys and apes from sociobiological and anthropological perspectives. Prerequisite: 102 or an introductory zoology or anthropology course.

PSYCH 419 Behavioral Studies of Zoo Animals (4, max. 8) AWSpS Lockard Observational studies of behavior of zoo animals to expand basic knowledge of animal behavior and research methodology with discussions and tours focusing on zoo philosophy and operations. Offered in cooperation with Woodland Park Zoo. Prerequisites: 200 and permission of instructor.

PSYCH 420 Drugs and Behavior (3) W Diaz Animal and clinical research on the behavioral consequences of drug intake. Prerequisite: 322 or permission of instructor.

PSYCH 421 Neural Basis of Behavior (5) ASP Diaz, Simpson Anatomical and physiological principles and resultant behavior involved in the integrative action of the nervous system. Prerequisites: 101 or 102, and 10 credits in biology or zoology.

PSYCH 422 Physiological Psychology (5) WSp Douglas Physiological mechanisms in behavior, including those basic to emotion, fatigue and sleep, learning, and memory. Prerequisite: 101 or 102, or equivalent.

PSYCH 423 Sensory Basis of Behavior (5) Sp Sensory and perceptual phenomena; sensory equipment; theories of sense-organ function. Prerequisite: 333 or permission of instructor.

PSYCH 424 Vision and Its Physiological Basis (5) A Teller Phenomena of human vision: spectral sensitivity, color vision, acuity and spatial vision, light and dark adaptation, and binocular vision. Correlation of human visual functioning with known optical, biochemical, physiological, and anatomical substrates. Joint with P BIO 424. Recommended: some background in physical or biological science.

PSYCH 425 Surgical and Histological Techniques (5) Sp Woods Practicum in basic and advanced surgical and histological techniques used in psychophysiological experimentation. Prerequisites: 421 and permission of instructor.

PSYCH 426 Neural Basis of Motor Behavior (5) Hutton Motor systems with emphasis on human motor behavior. Neuromuscular subsystems in motor control; spinal sensorimotor circuitry; propriospinal interlimb connections and regulation; supraspinal regulation of lower motor neurons to include motor and sensory cortex, cerebellum, and basal ganglia. Prerequisites: 101 or 102, and 10 credits in biology or zoology.

PSYCH 427 Behavioral Endocrinology (5) W Woods The endocrine system and how its secretions influence and are influenced by behavior; relationships between the nervous and endocrine systems. Prerequisites: 421 and two quarters of zoology, or permission of instructor.

PSYCH 428 Human Motor Control and Learning (5) Kerr Current theory and research in human motor performance and skill acquisition. Prerequisite: 101 or 102 or equivalent.

PSYCH 429 Brain Anatomy for the Behavioral Scientist (1) ASP Diaz Detailed review of the neuro-anatomical features of the sheep brain with laboratory demonstrations. Prerequisites: 421 or equivalent, or concurrent registration in 421, and permission of instructor.

PSYCH 430 Problems of Measurement in Psychology (5) C. Lunneborg Selection or development of instruments for the appraisal of individual or group differences in ability, achievement, interest, or opinion. Prerequisite: 213 or 217.

PSYCH 431 Neural Basis of Behavior (5) Diaz, Simpson Anatomical and physiological mechanisms in behavior, including those basic to emotion, fatigue and sleep, learning, and memory. Prerequisite: 421.

PSYCH 434, 435 Laboratory in Vision (2,3) Techniques of research in visual psychophysics: alignment and calibration of basic optical systems; replication of some classical vision experiments and/or design and completion of original vision experiments. Prerequisites: 424 and permission of instructor for 434; 434 and permission of instructor for 435.

PSYCH 436 Developmental Aspects of Sport Competition (4) SpS *Small* Biophysical and psychosocial influences of sport participation on growth and development of children and youth. Competition readiness, injuries, stress, roles and responsibilities of parents and coaches. Prerequisite: 101 or 102 or equivalent.

PSYCH 437 Applied Sport Psychology (3) R. *Smith* Application of psychological theories, research, and intervention strategies to sport settings. Stress and emotional control; attention control and concentration skills; mental rehearsal techniques; goal-setting strategies; leadership skills; psychological factors in injuries and rehabilitation; cognitive pain-control procedures. Participation in various psychological training procedures. Prerequisite: 101 or 102.

PSYCH 438 Social Psychology of Motor Behavior and Sport I (4) A *Small* Reciprocal effects of interpersonal and group influence processes. Social facilitation, behavior modification, observational learning, individual versus group performance, group cohesion, leadership, aggression. Prerequisite: 101.

PSYCH 439 Social Psychology of Motor Behavior and Sport II (4) Sp *Small* Current issues and research. Anxiety and arousal, competition, achievement, motivation, personality, attitudes, individual differences in motor performance.

PSYCH 440 Environmental Psychology (3) W *Keating* Research and methods of environmental psychology; development of research strategies to study psychological implications of environmental issues. Prerequisites: 101 or 102, and 345, or equivalent.

PSYCH 441 Perceptual Processes (5) Sp *Palmer* Theory and findings in perception with a focus on visual perception in humans. Discrimination and constancy for simple judgments, segregation and identification of visual objects, and specific areas of investigation such as reading and computer vision. Prerequisite: 333 or equivalent.

PSYCH 442 Measurement and Design in Attitude Research (5) A or W Major problems of research design and measurement in studies of attitude formation and change; design of procedures for laboratory and field experiments employing both traditional and more recent approaches to measurement of attitudes, beliefs, etc. An attitude-measurement or -change project required. Prerequisites: 213 or 218, and 345, or equivalents.

PSYCH 443 Evaluation of Social Programs: Psychological Perspectives (3) W Major issues involved in the evaluation of social programs from the areas of mental health, education, law and justice, and family planning: formulation of program goals, selection of research designs, measurement of outcomes, and interpretation and utilization of research findings. Prerequisites: 213 or 217; upper-division and graduate students only.

PSYCH 444 Attitude Change and Persuasive Communication (3) Factors that influence attitude change; message variables in persuasive communications and experiments to measure their effects on opinions, attitudes, and associated behavior. Development of skills to interpret, criticize, and apply experimental results. Prerequisites: 345 and 209 or 213, or equivalents.

PSYCH 445 Theories of Social Psychology (5) W *Steele* Evaluation of the major theories of human social behavior supported by the empirical literature; theories of social cognition and thought; major theories of social interaction, group processes, and social learning. Prerequisites: 345 or equivalent.

PSYCH 446 Objective Assessment of Personality (3) A *R. Smith* Measurement of personality variables in clinical psychology, personality research, and social

psychology. Theoretical conceptions underlying various clinical and experimental scales and an assessment of their construct validity and behavioral correlates. Planning of research involving the use of objective measures of personality.

PSYCH 447 Psychology of Language (5) Psychological principles applied to linguistic development and organization; language in both its stimulus and response aspects. Prerequisite: 101 or 102, or equivalent.

PSYCH 448 Seminar in Psychology (1-15) AWSpS Selected research topics of contemporary interest. May be repeated for credit. Quarterly listings of specific offerings are available at departmental advisory office. Prerequisites: major standing and permission of instructor.

PSYCH 449 Organizational and Industrial Psychology (3) W *Fiedler* Research and methods in industrial-social psychology; application of social psychology to the behavior of individuals in large organizations and their subunits. Prerequisite: one course in elementary statistics or equivalent.

PSYCH 450- Honors Research Seminar in Psychology (2-, max. 6) AWSp *Teller* Design, execution, and writing of honors thesis, supervised by faculty sponsor and departmental honors adviser. Required quarterly for all senior honors and distinction candidates in conjunction with 498 and 499. Prerequisites: 231 or 361 and 232 or 233, or equivalents, three quarters of 350, and permission of departmental honors adviser.

PSYCH 455 Developmental Social Psychophysiology (2-5) Gottman Fundamentals of psychophysiology, emotion, and social interaction in developmental research. Laboratory and lectures emphasize skills in the study of basic biological process in the social context of the developing person. Prerequisites: 101 or 102, 213, 306, 422, upper-division standing, or permission of instructor.

PSYCH 457 Language Development (4) A or Sp *Dale* First-language acquisition and use by children. Emphasis on theoretical issues and research techniques. Joint with LING 447. Prerequisite: 306 or LING 400.

PSYCH 461 Human Learning (5) Current theoretical and experimental literature.

PSYCH 462 Human Memory (5) Nelson Current theoretical and experimental literature.

PSYCH 463 The Pathology of Human Memory (5) Sp Effects of brain damage on human memory; comparison of observed kinds of losses with current theories of memory: amnesia and other impairment of intellectual functions (aphasia, agnosia, apraxia) as they relate to memory. Prerequisite: 421; recommended: 461 or 462.

PSYCH 464 Metacognition (5) W *Nelson* Self-monitoring and self-control of an individual's own cognitive processes. Metacognitive aspects of memory and judgment under uncertainty. Methodology and findings of empirical research on metacognition. Prerequisite: 355 or equivalent; recommended: 462.

PSYCH 465 Intelligence in Psychology (3) Hunt, C. Lunnaborg Historical and contemporary treatments of the concept of intelligence by psychology, evolution and validity of techniques for assessment, biological and environmental issues in assessment, intelligence and personality, experimental and psychometric indicators of the future role of intelligence in psychology. Prerequisite: 15 credits in psychology, including one statistics course.

PSYCH 466 Psychological Aspects of Judgment and Decision (5) Beach Cognitive underpinnings of human judgment and decision making. Processes that shape judgment and decision, and their relationship to

prescriptive models from other disciplines. Prerequisites: 464, PHIL 460, and permission of instructor; recommended: introductory statistics.

PSYCH 468 Information Processing (4) Hunt Human thought as a phenomenon to be described by formal models. Current theories and experimental studies of rational information processing; emphasis on how man notices, recognizes, remembers, and recalls information used in rational problem solving; theoretical models of attention, memory, and recall; cognitive models of rational problem solving. Prerequisite: 231 or 355, or equivalent.

PSYCH 469 Psychology of Inductive Reasoning (3) A *Miyamoto* Heuristics and biases in intuitive statistical reasoning; representativeness, availability, overconfidence, and framing effects. Psychological models of causal and correlational reasoning. Relationships between normative and descriptive theory. Prerequisites: 355 and one statistics course, or graduate standing.

PSYCH 475 Computing in Behavioral Sciences (5) Hunt, G. Loftus Application of computers to research problems in the behavioral and social sciences; functional and performance characteristics of batch processing, interactive and control systems; computing languages; methods of data processing, control of experiments, and automated instruction. Prerequisites: upper-division or graduate standing in behavioral or social sciences, some knowledge of statistics and computer programming, or permission of instructor.

PSYCH 489 Clinical Psychology (3) Basic issues, methods, and research: professional issues, psychological assessment, and approaches to psychotherapy and behavioral change. Prerequisites: 205 and 305, and upper-division major standing.

PSYCH 490 Stress Management (3) Pagano Nature of stress. Physiological responses to stress and relaxation. Techniques of stress management with training in relaxation, biofeedback, meditation, cognitive restructuring, exercise, nutrition, interpersonal communication skills, and time management. Prerequisite: 101 or 102 or equivalent.

PSYCH 495 Introduction to Law: A Social Science Perspective (4) Sp *Loh* Uses and limits of social science in the law-making process on appeal and the fact-finding process at trial. Critical perspectives on the role of social science, especially social psychology, in adjudication. Instruction by use of case method, Socratic questioning, and discussion. Readings in judicial opinions, jurisprudential essays, and empirical research reports. Joint with LAW 495. Prerequisite: upper-division or graduate standing.

PSYCH 497 Undergraduate Fieldwork (1-3, max. 18) AWSpS Individual consultation with faculty member and supervised practicum experience in a broad range of community settings and agencies dealing with psychological problems. An overall maximum of 18 credits in 497, 498, and 499 may apply toward a baccalaureate degree. Prerequisites: junior or senior major standing and permission of instructor.

PSYCH 498 Readings in Psychology (1-3, max. 18) AWSpS Readings in special interest areas under supervision of departmental faculty. Discussion of reading in conference with the instructor. An overall maximum of 18 credits in 497, 498, and 499 may apply toward a baccalaureate degree. Prerequisite: permission of a supervising psychology faculty member.

PSYCH 499 Undergraduate Research (1-3, max. 18) AWSpS Design and completion of individual research projects. An overall maximum of 18 credits in 497, 498, and 499 may apply toward a baccalaureate degree. Prerequisites: 213 or 217, and permission of a supervising psychology faculty member.

Courses for Graduates Only

PSYCH 503 Advanced Social Psychology (4) *A Fiedler* Evaluation of current theories and research in social psychology, including attitude and opinion research; interpersonal perception and social relations; small-group and leadership processes; attribution theory. Prerequisites: 213, 345, or equivalents; open to advanced undergraduates with permission of instructor.

PSYCH 504 Biological Basis of Development (4) *A Bernstein* Embryological, genetic, physiological, and evolutionary perspectives of human development; biological development in infancy; sensory development and its influence on the development of perception; primate models for human development. First quarter of a three-quarter proseminar required for graduate majors in developmental psychology. Prerequisite: graduate standing or permission of instructor.

PSYCH 505 Cognitive and Linguistic Development (4) *W Meltzoff* Biological, Piagetian, and information-processing perspectives on cognitive and language development through the lifespan. Second quarter of a three-quarter proseminar, required for graduate majors in developmental psychology. Prerequisite: graduate standing or permission of instructor.

PSYCH 506 Personality and Social Development (4) *Sp Greenberg* Theories and empirical literature in personality and social development throughout infancy, childhood, and adulthood. Third quarter of a three-quarter proseminar required for graduate majors in developmental psychology. Prerequisite: graduate standing or permission of instructor.

PSYCH 508 Research Methods in Social Psychology (3) *Sp Steele* Examination and evaluation of research problems most typically encountered by social psychologists, and various types of research settings, factors relevant to the validity of experiments. Prerequisite: 514 or equivalent.

PSYCH 509 Leadership and Organizational Effectiveness (3) *Sp Fiedler* Current leadership and management theory: leadership selection, training, and implications for the effective management of groups and organizations. Prerequisites: one undergraduate course in statistics; advanced undergraduates with permission of instructor.

PSYCH 510 Advanced Attitude Change Theory (3) Theoretical and experimental work dealing with major concepts and hypotheses about factors influencing attitude and associated behavioral change. Critical evaluation of theories in the light of current research. Prerequisites: 503 or 444, and 508 or 442, or equivalents.

PSYCH 511 Personality: Motivation and Psychodynamics (3) *Sarason* Review of personality research. Roles of cognitive, motivational, and psychodynamic processes. Critical evaluation of current personality research as it relates to concepts of personality, its antecedents, and influences over behavior. Attention to role of personality variables in social relationships. Prerequisite: graduate or professional standing or permission of instructor.

PSYCH 513 Probability Theory and Nonparametric Statistics (4) *A Nelson, Rose* Basic concepts of measurement and probability as applied to design of psychological experiments. Statistical tests appropriate for simple experimental designs using ordinal, nominal, or interval data. Required for all first-year graduate students in psychology; may be challenged by examination at beginning of each academic year. Prerequisite: graduate standing or permission of instructor.

PSYCH 514, 515 Experimental Design (4,4) Design of experiments and analysis of experimental data in the behavioral sciences. Required of all first-year graduate majors. Prerequisites: elementary statistics and 513 or permission of instructor for 514; 514 for 515.

PSYCH 516 Educational and Psychological Measurement (3) Theory of measurement; examination of assumptions involved in test theory; errors of measurement, factors affecting reliability and validity, and norms and their use and development. Offered jointly with EDPSY 592. Prerequisites: 213 or 217, and permission of instructor.

PSYCH 517 Psychophysics and Fundamental Measurement (3) *Sp Rose* Application of mathematics (drawn from set theory, finite mathematics, and probability theory) in the areas of measurement and psychophysics. Open to undergraduates with permission of instructor. Prerequisite: 514 or equivalent.

PSYCH 518 Single Subject Design and Research (3) *Sp Kohlenberg* Single subject designs (reversal, multiple baseline, changing criterion) and their application to clinical cases. Prerequisite: graduate major standing in clinical psychology or permission of instructor.

PSYCH 519 Statistical Methods in Longitudinal Research (3) *Sp Greenberg, Sackett* Those aspects of statistics and experimental design unique to, or heavily used in, developmental research; behavioral observation methods, analysis of variance and nonparametric techniques, and time series analysis methods. Prerequisites: 514 or equivalent, and graduate standing.

PSYCH 522 Cognitive Perception (3) *G. Loftus* Current topics in perception, psychophysics, sensory memory, pattern recognition, letter and word perception, and visual masking. Prerequisites: 441 and 517, or permission of instructor.

PSYCH 523 Cognition (4) *Hunt* Problem solving, concept learning, individual differences in cognition, attention, and pattern recognition; computer simulation and mathematical models of cognitive phenomena. Prerequisites: graduate standing and completion of departmental mathematical and statistical requirement through 514.

PSYCH 524 Cognitive Approaches to Human Memory (4) *Nelson* Theories and behavioral data base of perceptual memory; short-term memory; acquisition, organization, and retention of information in long-term memory; relation between reinforcement and memory. Prerequisites: 462 and 522, or equivalents.

PSYCH 525 Assessment of Intelligence (5) *A Vance* Nature of intelligence issues in assessment of intelligence, test construction and evaluation of the adequacy of tests, training in administration, scoring, and interpretation of individual intelligence tests. Prerequisite: graduate major standing in clinical or child-clinical psychology, or minor standing in child-clinical psychology.

PSYCH 526 Psychological Assessment of Children (5) *W Dawson* Assessment techniques appropriate to children, including those for infants, special problems of preschool and school-age children; projective tests, family interviews, and target observational assessment; training in administration of selected techniques. Prerequisites: 525 and permission of instructor.

PSYCH 527 Psychological Assessment of Adults (3) *W Broedel* Training in adult assessment and development of skills in administration, scoring, and interpretation of the Rorschach with some attention to other projective techniques. Prerequisites: 525 and permission of instructor.

PSYCH 528 Judgment and Decisions (5) *Beach* Examination of research on human judgment under uncertainty, expected value of decision making, and psychological models of decision making. Psychological aspects of judgment and decision, applied problems. Prerequisite: 218 or equivalent.

PSYCH 534 Foundations of Psychological Research (3) *Nelson* Interpretation of psychological research results, related issues from the philosophy of science, and nonstatistical pitfalls in psychological research. Prerequisite: 513.

PSYCH 535 Approaches to Psychological Assessment (4) *Sp* Problem-solving approach to psychological assessment; review of psychological tests and procedures and presentation of approaches to their clinical interpretation and use. Required for all graduate students majoring in clinical and child-clinical psychology. Prerequisite: graduate major standing in clinical psychology.

PSYCH 536 Behavioral Assessment (4) *Linehan* Research, theory, and technique in behavioral assessment. Emphasis on assessing for change and relationship between assessment and therapy. Interviewing, observational techniques, self-monitoring, simulated environments, and physiological, self-report, and imaginal procedures. Prerequisites: clinical psychology graduate standing and permission of instructor.

PSYCH 538 Systems of Psychotherapy (3) *A Marlatt* Theory and research of major systems of psychotherapy, including the psychodynamic, behavioral, cognitive, and humanistic/transpersonal schools as an introduction to subsequent practice in clinical psychology. Required for all graduate students majoring in clinical psychology. Prerequisites: graduate major standing in clinical psychology and permission of instructor.

PSYCH 539 Interviewing and Case Formulation (2, max. 6) *W Carlin, Thorpe* Emphasis on learning interviewing skills and content to administer such recent psychodiagnostic procedures as DSM III and the research diagnostic criteria. Case formulation and presentation and treatment planning. For graduate students in psychology, nursing, social work, and anthropology, and for advanced medical students. Joint with PBSCI 539. Prerequisite: permission of instructor.

The content of each graduate seminar (numbered 540 through 560) offered by the department changes from quarter to quarter. A list of offerings is published each quarter and can be obtained from the Department of Psychology.

PSYCH 540 Seminar in Clinical Psychology (2) *Atneave, Broedel, Jacobson, Kohlenberg, Linehan, Marlatt, E. Robinson, Sarason, R. Smith* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 541 Seminar in Cognitive Processes (2) *Hunt, E. Loftus, G. Loftus, Nelson* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 542 Seminar in Animal Behavior (2) *Barash, Beecher, Lockard* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 543 Seminar in Developmental Psychology (2) *Greenberg* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 544 Seminar in Experimental Psychology (2) May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 545 Seminar in Motor Control (2) *Hutton, Kerr, Smoll* Variable topics address neural, developmental, and behavioral processes underlying motor behavior. May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 546 Seminar in Learning (2) *Bolles* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 547 Seminar in Motivation (2) *Bolles* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 548 Seminar In Perceptual Processes (2) May be repeated for credit. Prerequisites: 441 and permission of instructor.

PSYCH 549 Seminar In Physiological Psychology (2) *Diaz, Douglas, Kenney, Simpson, Teller, Woods* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 550 Seminar In Psycholinguistics (2) *Dale* May be repeated for credit. Prerequisites: 447 and permission of instructor.

PSYCH 551 Seminar In Psychophysics (2) *Teller* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 552 Seminar In Quantitative Techniques (2) *Hunt, C. Lunneborg, Nelson, Rose* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 553 Seminar In Social Psychology (2) *Fiedler, Keating, Steele* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 554 Seminar In Decision Processes (2) *Beach* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 555 Seminar In Metacognition (2) *W Beach, Butterfield, Nelson* Prerequisite: permission of instructor.

PSYCH 559 Seminar In Current Research In Vision (1) AWSpS *Teller* May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 560 Seminar (*) AWSpS May be repeated for credit. Prerequisite: permission of instructor.

PSYCH 570 Child Clinical Psychology (4) A Cause Issues and content of child clinical psychology, promotion of student's beginning work in research. Prerequisite: graduate major or minor standing in child-clinical psychology.

PSYCH 571 Child Psychopathology and Behavior Change (5) W McMahon Major theories and research literature of childhood disorders. Principal treatment modalities appropriate to children and families. Required for all graduate students majoring in child clinical psychology. Prerequisite: graduate standing in psychology or permission of instructor.

PSYCH 572 Approaches to Child Treatment (4) Sp Major approaches to child psychotherapy, including specific applications, issues in treatment, and research. Includes case assignment and supervision. Prerequisites: 526 and graduate major standing in child-clinical psychology, or permission of instructor.

PSYCH 575 The Family Process (3) Structures, relationships, and interactions within the family. Follows a developmental sequence based on the human life cycle, with two or more generations in synchrony. Prerequisites: second-year graduate major standing in clinical psychology and permission of instructor.

PSYCH 576 Intervention Techniques With Families (3) Theory and practice of principal methods of therapeutic intervention with families. Attention to clinical problems arising in a family context and use of family members and processes by the clinician. Prerequisites: 575, 592 and 593 or equivalent and permission of instructor.

PSYCH 577 Theory and Application of Social Network Intervention (3) Sp Interdisciplinary analysis of social networks and community mental health applications; natural support systems, cross-cultural implications and clinical interventions; practical considerations of program support and development; ethical issues; research design and participation. Prerequisites: advanced graduate standing in psychology or related disciplines; permission of instructor. Recommended: some background in family therapy.

PSYCH 578 Affective Disorders: Theory and Research (2) *Jacobson* Causes, sustainers, correlates, and consequences of affective disorders, including biological and psychosocial factors. Offered jointly with PBSCI 578. Prerequisite: graduate or professional student standing or permission of instructor; recommended: graduate course in psychopathology and personality.

PSYCH 579 Treatment of Affective Disorders: Methods and Evaluation (2) *Jacobson* Differential diagnosis of depression and depressive subtypes; emphasis on psychodynamic, cognitive-behavioral, and combined forms of psychological treatment of less severely incapacitated patients; biological approaches (i.e., antidepressant drugs, electroconvulsive therapy, etc.) as alternative or adjunctive treatments in severe, psychotic, and endogenous-like depressions. Joint with PBSCI 579. Prerequisites: 578, graduate or professional student standing or permission of instructor; recommended: graduate course in psychopathology and personality.

PSYCH 585 Research In Psychotherapy (5) *Marlatt* Research in psychotherapy, including process and outcome. Experience in research design. Prerequisites: graduate major standing and permission of instructor.

PSYCH 588 Clinical Personality Assessment (3) *R. Smith* Use of objective personality inventories in the description of normal and abnormal personality and use of such information in case conceptualization and treatment planning. Minnesota Multiphasic Personality Inventory, Millon Clinical Multiaxial Inventory. Prerequisite: clinical psychology graduate standing.

PSYCH 590 Practicum In Psychological Assessment (2) Sp Demonstration and practice of selected psychological test procedures and interviewing skills. Concurrent registration in 535 required. Required for all first-year graduate students majoring in clinical and child-clinical psychology. Prerequisites: graduate major standing in clinical or child-clinical psychology and permission of instructor.

PSYCH 591 Issues In Clinical Psychology (1, max. 3) AWSpS Personal and professional issues in clinical psychology. Required for all first-year graduate students majoring in clinical and child-clinical psychology. Prerequisite: graduate major standing in clinical psychology.

PSYCH 592, 593 Clinical Methods (1-6, max. 6; 1-6, max. 6) AWSpS, AWSpS *Vance* Advanced training in the application of psychological assessment and behavior change methods. Required for all second-year graduate majors in clinical psychology. Must be taken in sequence. Prerequisites: 591, graduate major standing, and permission of instructor.

PSYCH 594 Advanced Personality Theory (5) *Linehan* Conceptual models of behavioral functioning, cognition, emotion, and environment as organizers of behavior and other critical issues in personality theory. Opportunity to integrate previous courses, research, and practice, and arrive at a coherent theoretical framework. Required for graduate majors in clinical psychology. Prerequisite: third-year graduate standing.

PSYCH 595 Behavior Disorders (5) W *I. Sarason* Major types of behavior disorders, with emphasis on clinical manifestations, relevant research, and theoretical perspectives. Required for all graduate students majoring in clinical psychology. Prerequisite: graduate major standing in clinical psychology or permission of instructor.

PSYCH 596 Psychology of Behavior Change (5) Sp *Jacobson, Kohlenberg* Behavioral theory and behavioral approaches to treatment. Prerequisites: 595 and permission of instructor.

PSYCH 597 Fieldwork In Clinical Psychology (1-5, max. 36) AWSpS *Broedel, Jacobson, Kohlenberg, Linehan, Marlatt, N. Robinson, I. Sarason, R. Smith, Vance* Prerequisites: second-year graduate major standing and permission of departmental faculty.

PSYCH 598 Advanced Clinical Practicum (4) AWSpS *Jacobson, Kohlenberg, I. Sarason* Supervised psychotherapy involving several individual clients. Separate consultations with instructor for intensive supervision of each case. Occasional meetings in small groups of instructors and students to discuss case material. Assigned readings appropriate to each case with opportunities to discuss these with instructor. Prerequisites: clinical psychology graduate standing and permission of instructor.

PSYCH 599 Readings In Psychology (*) AWSpS Selected topics. Prerequisite: permission of a supervising psychology faculty member.

PSYCH 600 Independent Study or Research (*) AWSpS

PSYCH 700 Master's Thesis (*) AWSpS

PSYCH 800 Doctoral Dissertation (*) AWSpS

Romance Languages and Literature

C104 Padelford

The department offers a program designed to develop competence in the reading, speaking, and writing of the Romance languages (French, Spanish, Italian, Portuguese, Catalan, Provençal, Romanian) and to study Romance literatures, culture, and linguistics.

Undergraduate Program

Bachelor of Arts Degree

Adviser
C108 Padelford

MAJOR REQUIREMENTS

French: 59 credits beyond FREN 203. Required courses at the 300 level: FREN 301, 302, 303; 304, 305, 306; 350, 351, 352. Four approved electives in French at the 400 level: any four courses numbered 400-499 (except courses in translation) and ROM 401 may be used to satisfy this requirement. The department does not accept transfer courses at the 400 level or courses in translation.

Spanish: 56 credits in courses at the 300 and 400 levels, including SPAN 301, 302, 304, 305, 306, 307; 350, 351, 352; 25 credits, none of which may be transfer credits, of courses numbered 400 or higher. Courses in translation are not counted.

Italian: 50 credits in courses at the 300 and 400 levels, including ITAL 301, 302, 303; 6 credits of 327; 401; 404, 405, 406; 15 additional credits in literature courses at the 400 level. Students should consult Italian adviser about courses in translation.

Romance Linguistics: For admission, two college years (or equivalent) of study in each of two Romance languages. For graduation: 20 credits in third-year language courses in two Romance languages (recommended distribution: 10 credits each); 15 credits in literature, including a complete survey sequence at the 300 level; two 400-level courses in language structure; ROM 401 and 402; SPAN or FREN 474; a senior essay (2 credits). Recommended electives: general linguistics courses. Majors must begin course work in Romance and general linguistics by start of junior year.

Graduate Program

The Department of Romance Languages and Literature offers programs of graduate study leading to the degrees of Master of Arts and Doctor of Philosophy. Students may specialize in French, Italian, or Spanish languages and literature or in Romance linguistics.

The Master of Arts degree may be with thesis or without thesis and may have either of two main areas of specialization: language and literature or Romance linguistics.

Doctoral programs are offered in the following fields of specialization: Romance literature, Romance linguistics, and French or Spanish language and literature. Students specializing in a single Romance literature devote at least two-thirds of their course work to the field of specialization. In all programs, some training in basic principles of the nature of language and in bibliographic method is required.

The doctoral program in Romance literature allows a flexible combination of two or more Romance literatures. At least half the post-M.A. credits must constitute a major area within one of the departmental literary sections: French, Spanish, or Italian.

Special Requirements

Information on special requirements for the various degree programs is available upon request from the office of the graduate program coordinator.

Financial Aid

The department awards annually a number of teaching assistantships. The assistant normally participates in teaching three classes during the academic year. Each class is limited to approximately twenty-five students and meets five hours a week for the ten weeks of the quarter. The supervisors of language instruction meet with the assistants separately and in groups to discuss matters of teaching.

Correspondence and Information

Graduate Program Coordinator
C108 Padelford, GN-60

Faculty

Chairperson

Douglas P. Collins

Professors

Anderson, Farris F.,* 1967, M.A., 1962, Duke; Ph.D., 1967, Wisconsin; nineteenth- and twentieth-century Spanish literature.

Christofides, Constantine G.,* 1966, (Drama), (Art, Comparative Literature),† M.A., 1950, Ph.D., 1956, Michigan; seventeenth-century French literature, Romanesque art.

Contreras, Heles,* 1964, ‡(Linguistics), M.A., 1959, Ph.D., 1961, Indiana; Romance linguistics.

Creore, Alvin, 1940, (Emeritus), M.A., 1936, Rochester; Ph.D., 1939, Johns Hopkins; sixteenth-century poetry, phonetics, *chanson*.

Friedman, Lionel J.,* 1961, M.A., 1947, Ph.D., 1950, Harvard; medieval French literature.

Hanzell, Victor E.,* 1957, (Emeritus), M.A., 1955, Ph.D., 1961, Indiana; Romance linguistics and eighteenth-century French literature.

Keller, Abraham C.,* 1948, (Emeritus), M.A., 1937, Ohio State; Ph.D., 1946, California (Berkeley); sixteenth-century French literature.

Klausenburger, Jurgen,* 1969, A.M., 1966, Ph.D., 1969, Michigan; Romance linguistics.

Leiner, Jacqueline,* 1963, (Emeritus), (Comparative Literature),† Dr. es Lettres, 1969, Strasbourg (Germany); modern French literature.

Nostrand, Howard L.,* 1939, (Emeritus), M.A., 1933, Harvard; Docteur, 1934, Paris; French culture and civilization.

Pace, Antonio, 1967, (Emeritus), M.A., 1937, Syracuse; Ph.D., 1943, Princeton; Italian language and literature.

Penuelas, Marcelino C.,* 1963, (Emeritus), M.Ed., 1940, M.A., 1945, Valencia (Spain); Ph.D., 1949, Madrid (Spain); eighteenth-century Spanish literature, contemporary Spanish literature.

Saporta, Sol,* 1960, (Linguistics),† M.A., 1952, Ph.D., 1955, Illinois; Romance linguistics.

Wilson, Clotilde M., 1929, (Emeritus), M.A., 1927, Ph.D., 1931, Washington; French language and literature.

Wilson, William C., 1926, (Emeritus), M.A., 1925, Ph.D., 1928, Washington; Spanish language and literature.

Associate Professors

Borch-Jacobsen, Mikkel, 1986, Certificate de Maîtrise, 1972, Doctorate, 1981, Université des Sciences (Strasbourg); twentieth-century French literature.

Collins, Douglas P.,* 1980, (Comparative Literature),† M.A., 1972, Ph.D., 1978, Missouri; twentieth-century French literature.

Dale, Robert C.,* 1963, M.A., 1960, Ph.D., 1963, Wisconsin; nineteenth-century French literature, cinema.

Ellrich, Robert J.,* 1964, (Comparative Literature),† M.A., 1953, Ph.D., 1960, Harvard; eighteenth-century French literature.

Flores, Lauro H.,* 1980, Ph.D., 1980, California (San Diego); Chicano literature, contemporary Latin-American literature (narrative).

Friedrich, Pia,* 1965, Ph.D., 1946, Università degli Studi (Italy); pedagogy and twentieth-century Italian literature.

Geist, Anthony L., 1987, M.A., 1969, Ph.D., 1978, California; twentieth-century Spanish literature.

Levine, Suzanne J.,* 1984, (Comparative Literature),† M.A., 1969, Columbia; Ph.D., 1977, New York; Latin American literature, translation, theory and practice.

Petersen, Suzanne H.,* 1973, M.A., 1967, Ph.D., 1976, Wisconsin; medieval Spanish literature.

Shipley, George A.,* 1967, M.A., 1962, Ph.D., 1968, Harvard; Spanish Golden Age.

Wortley, W. Victor,* 1965, M.A., 1961, Ph.D., 1964, Oregon; seventeenth-century French theatre and prose (nonfiction).

Yarbro-Bejarano, Yvonne M.,* 1974, (Comparative Literature),† M.A., 1971, Ph.D., 1976, Harvard; sixteenth- and seventeenth-century literature of Spain.

Assistant Professors

Steele, Cynthia,* 1986, M.A., 1979, Ph.D., 1980, California (San Diego); Mexican literature, Spanish-American writers.

Strozer, Judith R., 1987, M.A., 1970, Ph.D., 1973, California (Los Angeles); Spanish linguistics.

Sugano, Marian Z., 1987, M.A., 1974, Middlebury; Ph.D., 1987, California; French literature.

Zagona, Karen T.,* 1987, Ph.D., 1982, Washington; Spanish linguistics.

Lecturer

Herschensohn, Julia, 1986, M.A., 1970, California; Ph.D., 1976, Washington; Romance linguistics and French syntax.

Courses for Undergraduates

Romance Literature

ROMAN 200 Classics of Romance Literature (5) *Ellrich* Representative masterpieces from Italian, Spanish, and French literature in English translation.

Romance Linguistics and Literature, General and Comparative

ROM 401 Introduction to Romance Linguistics (5) *Hanzell, Klausenburger* Descriptive analysis of the phonological, morphological, and syntactical structures of the modern Romance languages. Prerequisite: the equivalent of two college years of a Romance language, or permission of instructor.

ROM 402 Introduction to Romance Linguistics (5) *Klausenburger* Comparative historical survey of the development of the principal Romance tongues. Prerequisite: 401 or permission of instructor.

ROM 490 Senior Essay (2) *Hanzell, Klausenburger* Essay on linguistic problem of student's choice written with faculty consultant.

ROM 499 Special Topics (1-5, max. 10) *AWSpS* Prerequisites: permission of instructor and undergraduate adviser or graduate program coordinator.

French

FREN 101, 102, 103 Elementary (5,5,5) AW, AWSp,AWSp Methods and objectives are primarily oral-aural. Oral practice in the language laboratory is required. Prerequisite for 102: 101 or college equivalent, or placement; for 103: 102 or equivalent, or placement.

FREN 105 Elementary Reading (5) Prepares graduate students for the language reading examination. Credit granted only to students who have not received previous credit in French. Students receiving credit in 105 may not later register for credit in 101. Offered through Distance Learning by correspondence only. Prerequisite: graduate standing or permission of instructor.

FREN 107 First-Year Reading (5) A *Friedman* Development of vocabulary and skill in rapid reading of literary French. cursory presentation of French grammar in English. Students receiving credit for 107 may subsequently earn credit for 100-level French courses involving other skills, but students who have received credit for 103 may not receive credit for 107.

FREN 201, 202, 203 Intermediate (5,5,5) AW, AWSp,AWSp Systematic review of French grammar. Intensive practice in writing and conversation. Readings in literature, culture, and the sciences. Prerequisites: 103 or college equivalent or placement for 201; 201 or college equivalent or placement for 202; 202 or college equivalent or placement for 203.

FREN 207 Second-Year Reading (5) W *Friedman* Intermediate vocabulary building and reading of literary texts. Students receiving credit for 207 may subsequently earn credit for lower-numbered French courses involving other skills. Prerequisite: 107 or 103.

FREN 237 Conversational French (2-8, max. 8) For participants in the Foreign Study Program. Prerequisites: 103 or college equivalent and permission of Foreign Study Office.

FREN 241 Intensive (10) A Equivalent of 103 and 201. Review of basic grammar and development of speaking and reading skills. Students who have received credit for 103 or 201 may not receive credit for 241. Prerequisite: 102 or three years of high school French or permission of instructor.

FREN 242 Intensive (10) A Equivalent of 202 and 203. Review of basic grammar and development of speaking and reading skills. Students who have received credit for 202 or 203 may not receive credit for 242. Prerequisite: 201 or equivalent or 241.

Course Descriptions

Courses in English translation appear at the end of the listing of courses for undergraduates.

FREN 297 French Civilization (3 or 6) For participants in the Foreign Study Program. Literary tradition, social and cultural values as reflected in literature. Paper (in English) and higher degree of participation for 6 credits. In English. Prerequisites: two years of college-level French and permission of Foreign Study Office.

FREN 301, 302, 303 Advanced French (5,5,5) Prerequisites: 203 or college equivalent or placement for 301; 301 for 302; 302 for 303.

FREN 304 Survey of French Literature: Origins to 1600 (5) A Ellrich Thematic and formal developments in literature of the period with emphasis on movements and texts in relation to cultural background. Desirable preparation: at least one course in either the 301, 302, 303 series or the 350, 351, 352 series.

FREN 305 Survey of French Literature: 1600-1789 (5) W Emphasis on literary movements and texts in relation to cultural background. Desirable preparation: at least one course in either the 301, 302, 303 series or the 350, 351, 352 series.

FREN 306 Survey of French Literature: 1789 to the Present (5) Sp Development of modern literature through its most important writers and movements. Desirable preparation: at least one course in either the 301, 302, 303 series or the 350, 351, 352 series.

FREN 307 Third-year Reading (5) Sp Friedman Advanced vocabulary building and reading of literary texts. Students receiving credit for 307 may subsequently earn credit for lower-division French courses involving other skills. Prerequisite: 207 or 203.

FREN 308 Composition (3-5, max. 10) S For participants in the Foreign Study Program. Compositions on topical subjects of intermediate difficulty relating to the civilization of the French-speaking countries of Europe. Grammar review as needed. Prerequisites: 203 or college equivalent and permission of Foreign Study Office.

FREN 327 Advanced Conversation (2, max. 8) AWSp Not open to students whose native language is French. Prerequisite: 203 or college equivalent or placement.

FREN 337 Conversational French (2-8, max. 8) For participants in the Foreign Study Program. Prerequisite: 203 or college equivalent.

FREN 350 Drama (3) W Generic study of French drama. Prerequisite: 203 or college equivalent or placement.

FREN 351 Poetry (3) A Generic study of French poetry. Prerequisite: 203 or college equivalent.

FREN 352 Fiction (3) Sp Generic study of French fiction. Prerequisite: 203 or college equivalent.

FREN 378 The Making of Contemporary France, Studied in French (5) Study of the historical origins and subsequent development of contemporary problems and characteristics of French government and politics, economy, and society. Prerequisite: 203 or equivalent.

FREN 390 Supervised Study (2-6, max. 20) Prerequisites: permission of the instructor and the undergraduate French adviser.

FREN 397 French Civilization (3 or 6) S For participants in the Foreign Study Program. Literary tradition, social and cultural values as reflected in literature. Paper (in French) and higher degree of participation for 6 credits. In French. Prerequisites: two years of college-level French and permission of Foreign Study Office.

FREN 400 The Syntactic Structure of French (5) Hanzeli, Klausenburger Scientific study of the syntax of French: phrase structures and transformations (em-

phasis on passives, relativization, pronominalization, reflexive structures). Prerequisites: ROM 401 or LING 200 or 400, and two years of college-level French.

FREN 401 The Morphological Structure of French (5) Hanzeli, Klausenburger Linguistic study of French morphology. Prerequisite: ROM 401 or LING 400.

FREN 402 The Phonological Structure of French (5) The phonological component of the generative grammar of French: representations of syllabic and segmental units, phonological rules, distinctive features and their articulatory correlates. Prerequisites: 409 or ROM 401 or LING 200 or 400, and two years of college French; or three years of college French.

FREN 403 Background of Modern French (5) Klausenburger Linguistic analysis of the important developments in the history of the French language from its Latin origin to contemporary speech. Prerequisite: the equivalent of two college years of French.

FREN 404 Old French (5) Friedman Designed for acquisition of reading facility in Old French through intensive study of selected texts. Prerequisite: ROM 401 or permission of instructor.

FREN 406 Advanced French Grammar (5) Friedman, Klausenburger Problems of French grammar. Differences between forms and structures of French and English. Problems of effective teaching of French. For students with at least three years of college French and for beginning teaching assistants. Prerequisites: 301, 302, 303; and permission of instructor.

FREN 409 The Phonetics of French (5) Hanzeli Scientific study of the French sound system with special emphasis on "lower level" phonetic rules, with integral values. Focus on data from standard French as well as socioeconomic and geographic variations. Prerequisites: ROM 401 or LING 200 or 400, and two years of college-level French.

Most of the following 400-level courses require as prerequisites FREN 303; 304, 305, 306; 350, 351, 352. See adviser for exceptions.

FREN 410 French Literature of the Sixteenth Century: Prose (5) Sixteenth-century literature, with emphasis on cultural and intellectual background. Prerequisites: See note above.

FREN 411 French Renaissance: Poetry (5) Sixteenth-century literature with emphasis on poetry and the general artistic ambiance. Prerequisites: See note above.

FREN 412 Baroque Literature (5) AWSpS The whole phenomenon of baroque literature, including prose, poetry, and theater. Prerequisites: See note above.

FREN 413 French Literature of the Seventeenth Century: Classicism (5) Wortley Seventeenth-century literature, with emphasis on the development of classicism. Prerequisites: See note above.

FREN 414 French Literature of the Eighteenth Century: Enlightenment (5) Ellrich, Hanzeli Eighteenth-century literature, with emphasis on the development of the Enlightenment ideology. Prerequisites: See note above.

FREN 415 French Literature of the Eighteenth Century: Post-Enlightenment (5) Ellrich Eighteenth-century literature, with emphasis on the "dark side of the Enlightenment" and nascent romanticism. Prerequisites: See note above.

FREN 416 French Literature of the Nineteenth Century: Romanticism (5) Collins Nineteenth-century literature, with emphasis on romanticism and the early manifestations of realism. Prerequisites: See note above.

FREN 418 French Literature of the Early Twentieth Century (5) Collins Twentieth-century literature, with emphasis on the period 1900-1939. Prerequisites: See note above.

FREN 419 French Literature Since World War II (5) Collins Twentieth-century literature, with emphasis on the period 1939 to the present. Prerequisites: See note above.

FREN 421 Fiction: 1660-1800 (5) Ellrich Prerequisites: See note above.

FREN 424 Fiction: 1800-1850 (5) Dale Prerequisites: See note above.

FREN 425 Fiction: 1850-1900 (5) Dale Prerequisites: See note above.

FREN 427 Fiction: Twentieth Century (5) Collins Prerequisites: See note above.

FREN 444 Poetry: Romantic (5) Prerequisites: See note above.

FREN 445 Poetry: Parnassian and Symbolist (5) Collins Prerequisites: See note above.

FREN 446 Poetry: Twentieth Century (5) Prerequisites: See note above.

FREN 451 History and Literature of the French Religious Wars (5) Major political, social, and religious movements and events of, and related to, the French religious wars of 1560 to the end of the century, along with the treatment of these in the prose, poetry, and drama of the period. For students receiving French credit, readings must be done in French. Prerequisites: See note above.

FREN 454 Nonfiction of the Classic Period (5) Wortley Prerequisites: See note above.

FREN 457 Twentieth-Century Nonfiction (5) Collins Prerequisites: See note above.

FREN 461 Seventeenth-Century Drama (5) Wortley Prerequisites: See note above.

FREN 463 Nineteenth-Century Drama (5) Collins Prerequisites: See note above.

FREN 465 Twentieth-Century Drama (5) Collins Prerequisites: See note above.

FREN 470 Cinema (5) Dale Major films and figures of French cinema from the beginnings to the present. Prerequisites: See note above.

FREN 474 Linguistics and the Teaching of French (5) Hanzeli Areas of linguistics that can be particularly helpful to the French teacher. Prerequisites: See note above.

FREN 490 Honors Seminar (2-5, max. 10) AWSp Special studies in French literature. Required of candidates for honors and distinction in French. Open to others by permission of French honors adviser.

FREN 496 Poetry and Song as Elements in French Civilization (5) Relationship of poetry and music as expressed in the *chanson* in several periods of French culture. Emphasis on twentieth-century poet-composer-performers. Attention given to the medieval troubadours and to poet-musician collaboration in the Renaissance and later periods. Prerequisites: See note above.

FREN 499 Special Topics (1-5, max. 10) Topics to meet special needs. Prerequisites: See note above.

Italian

ITAL 101, 102, 103 Elementary (5,5,5) A,W,Sp Methods and objectives are primarily oral-aural. Language laboratory is required. Prerequisites: 101 or college equivalent or placement for 102; 102 or college equivalent or placement for 103.

ITAL 107 Reading (5) ASp Intensive study of selections from literary texts, essays, and newspaper articles, with attention to elements of grammar. Students receiving credit for 107 may subsequently earn credit for 100-level Italian courses involving other skills.

ITAL 201, 202, 203 Intermediate (5,5,5) A,W,Sp Intensive speaking, reading, and writing. Functional review of grammar. Prerequisites: 103 or college equivalent or placement for 201; 201 or college equivalent or placement for 202; 202 or college equivalent or placement for 203.

ITAL 301, 302 Advanced Syntax and Composition (3,3) A,W Prerequisites: 203 or college equivalent or placement for 301; 301 for 302.

ITAL 303 Italian Stylistics (3) Sp Functional grammar review; creative written and oral composition and reading, with special attention to problems of style. Prerequisite: 302.

ITAL 327 Advanced Conversation (2, max. 8) Not open to students whose native language is Italian. Prerequisite: 203 or college equivalent or placement.

ITAL 390 Supervised Study (2-6, max. 20) AWSp Prerequisites: permission of the instructor and the undergraduate Italian adviser.

ITAL 401 The Development of the Italian Language (5) Klausenburger Historical survey of Italian phonology, morphology, and syntax. Prerequisites: 301, 302, 303, or LING 400, or ROM 401, or permission of instructor.

ITAL 404, 405, 406 Survey of Italian Literature (5,5,5) A,W,Sp Prerequisite: 203 or college equivalent or placement test.

ITAL 413 Literature of the Renaissance: Quattrocento (5) The early Renaissance. Humanism; writings of Lorenzo de' Medici, Poliziano, Belcari, Alberti, Masuccio, Sannazzaro, Pulci, Boiardo. Prerequisites: 404, 405, 406.

ITAL 414 Literature of the Renaissance: Cinquecento (5) The high Renaissance. Bembo and the Petrarchans, Machiavelli, Guicciardini, Castiglione, Ariosto, Guarini, Tasso. Prerequisites: 404, 405, 406.

ITAL 423, 424 Eighteenth-Century Italian Literature (5,5) 423: poetry: the Arcadian movement, Parini, Monti, Foscolo. 424: drama: Metastasio, Goldoni, Alfieri. Prerequisites: 404, 405, 406.

ITAL 460 Verismo (5) Friedrich The development of Verismo with extensive readings from its main exponents—Capuana, Verga, Serao, Deledda, Fucini, and d'Annunzio. Prerequisites: 404, 405, 406.

ITAL 465 Contemporary Italian Narrative (5) Friedrich Critical reading of selected modern exponents of the short story and novel. Prerequisites: 404, 405, 406, or equivalent.

ITAL 490 Proseminar in Italian Literature (3-5) Friedrich Intended to help the student achieve a mature critical mastery of Italian literature. Required of Italian majors; others by permission of instructor.

ITAL 499 Special Topics (1-5, max. 10) Topics to meet special needs. Prerequisites: permission of the instructor and the undergraduate or graduate program adviser.

Portuguese

PORT 101, 102, 103 Elementary (5,5,5) A,W,Sp Methods and objectives are primarily oral-aural. Language laboratory is required. Prerequisites: 101 or college equivalent or placement for 102; 102 or college equivalent or placement for 103.

PORT 150 Accelerated (5) For graduate students in Spanish who wish to develop a rapid command of Portuguese primarily for reading purposes. Prerequisite: graduate standing in Spanish or permission of instructor.

PORT 201, 202, 203 Intermediate (5,5,5) A,W,Sp Modern texts, compositions, conversation, and functional grammar. Prerequisites: 103 or equivalent or permission of instructor for 201; 201 for 202; 202 for 203.

PORT 301, 302 Advanced Syntax and Composition (3,3) A,W Students with advanced standing in Spanish courses may apply to instructor for permission to enter 301 after 103. Prerequisites: 203 or equivalent, or permission of instructor for 301; 301 for 302.

PORT 303 Portuguese Stylistics (3) Sp Functional grammar review; creative written and oral composition and reading with special attention to problems of style. Prerequisite: 302 or permission of instructor.

PORT 327 Advanced Conversation (2, max. 8) Prerequisite: 203 or equivalent or permission of instructor.

PORT 390 Supervised Study (2-5, max. 20) AWSp Prerequisites: permission of instructor and undergraduate Portuguese adviser.

Romanian

RMN 401, 402, 403 Elementary Romanian (5,5,5) A,W,Sp 401, 402: comprehensive introduction to both spoken and literary Romanian. 403: designed to increase the student's vocabulary and enhance knowledge of grammar through the reading of short fictional material in modern Romanian. Joint with ROMN 401, 402, 403.

RMN 404, 405, 406 Advanced Romanian (5,5,5) Continuation of 401, 402, 403. Joint with ROMN 404, 405, 406. Prerequisite: 403 or permission of instructor.

RMN 420, 421 Structure of Romanian (3,3) Descriptive analysis of the phonological, morphological, syntactical, and lexical structures of modern Romanian. Prerequisite: ROM 401 or permission of instructor.

Spanish

SPAN 101, 102, 103 Elementary (5,5,5) AW, AWSp, AWSp Methods and objectives are primarily oral-aural. Language laboratory is required. Prerequisites: 101 or college equivalent or placement for 102; 102 or college equivalent or placement for 103.

SPAN 104 Spanish Grammar—Intensive (5) AW Thorough review of the basics of Spanish grammar. Not open to students who have taken 102 or 103. Prerequisite: one year preuniversity Spanish, or 101, or permission of instructor.

SPAN 128 Spanish for the Elementary School (5) Friedrich Practice in the basic language skills is combined with the demonstration and analysis of methods and techniques appropriate to FLES. Joint with EDC&I 132.

SPAN 201, 202, 203 Intermediate (5,5,5) AWSp, AWSp, AWSp Intensive practice in speaking, reading, and writing. Review of Spanish grammar. Oral practice based on selected pieces of Spanish literature. Prerequisites: 103 or college equivalent or placement for 201; 201 or college equivalent or placement for 202; 202 or college equivalent or placement for 203.

SPAN 204 Intensive Spanish Review—Intermediate (5) AWSp Intensive review of grammar, reading composition, and oral/aural skills. For highly motivated students with at least one year of college Spanish, or equivalent. Synthesis of 201, 202, 203, and preparation for third-year work in language and literature. Prerequisites: 103, 104, or 201; or four years of high school Spanish.

SPAN 231 Chicano Expressive Culture (3) AWSp Flores The folk and popular traditions of people of Mexican culture, both within the present borders of Mexico and in the United States.

SPAN 301, 302 Advanced Syntax and Composition (5,5) AW, WSp Prerequisites: 203 for 301; 301 for 302.

SPAN 304 Survey of Spanish Literature: 1140-1498 (3) A Masterpieces of Spanish literature from origins to 1498. Prerequisites: 203; completion of, or concurrent enrollment in, 350, 351, or 352.

SPAN 305 Survey of Spanish Literature: 1498-1681 (3) W Prerequisites: 203; completion of, or concurrent enrollment in, 350, 351, or 352.

SPAN 306 Survey of Spanish Literature: 1681 to the Present (3) Sp Prerequisites: 203; completion of, or concurrent enrollment in, 350, 351, or 352.

SPAN 307 Introduction to Latin American Literature (3) Study of selected works of twentieth-century Latin American literature and their sociohistorical context. Development of reading and writing skills. Prerequisites: 203; completion of, or concurrent enrollment in, 350, 351, or 352.

SPAN 327 Advanced Conversation (2, max. 8) Not open to students whose native language is Spanish. Prerequisite: 203 or equivalent or placement. No credit toward Spanish major.

SPAN 331 Themes in Mexican-American Studies (5) Flores Examination of significant historical and cultural themes of the Mexican-American experience. Prerequisite: speaking knowledge of Spanish.

SPAN 337 Conversational Spanish (2 or 4 or 6) For participants in the Foreign Study Program. Prerequisites: 203 or equivalent and permission of Foreign Study Office.

SPAN 348 Commercial Spanish (3) Intensive practice and basic theory of Spanish commercial correspondence; fundamentals of advertising, foreign trade, and business transactions in the Spanish-speaking countries (Latin America and Spain). Prerequisite: 302.

SPAN 350 Drama (3) Generic study of Spanish drama. Prerequisite: 203 or college equivalent or placement.

SPAN 351 Poetry (3) Generic study of Spanish poetry. Prerequisite: 203 or college equivalent or placement.

SPAN 352 Fiction (3)W Generic study of Spanish fiction. Prerequisite: 203 or college equivalent or placement.

SPAN 390 Supervised Study (2-6, max. 20) Prerequisites: permission of the instructor and undergraduate Spanish adviser.

SPAN 393 Study in Spain (2-10, max. 20) Study in Spain outside the standard Spanish curriculum of the UW. Prerequisites: 301, 302, and approval of undergraduate adviser.

SPAN 400 The Syntactic Structure of Spanish (5) Strozer, Zagana Scientific study of the syntax of Spanish: structure of phrases, transformationally derived structures, grammatical relations, principles of interpretation. Prerequisite: two years of college-level Spanish.

SPAN 401 The Morphological Structure of Spanish (5) Strozer, Zagana Principles of word formation, including derivational and inflectional morphology. Relationship between inflectional morphology and other components of grammar. Prerequisite: two years of college-level Spanish.

SPAN 402 The Phonological Structure of Spanish (5) Strozer, Zagana Phonological component of the generative grammar of Spanish; representations of syllabic and segmental units, phonological rules, distinctive features and their articulatory correlates. Prerequisite: two years of college-level Spanish.

SPAN 403 The Evolution of the Spanish Language (5) Historical survey of Spanish phonology, morphology, and syntax, from Latin origins to the modern language. Prerequisite: 302.

SPAN 406 Advanced Spanish Grammar (5) *Anderson* Problems of Spanish grammar. Difference from English grammar. Techniques for the effective teaching of Spanish. Prerequisite: 302.

SPAN 407 The Spanish of Latin America (5) *Contreras* Introduction to the dialectal variants of Latin-American Spanish through the reading of dialectological studies and selected literary works. Prerequisite: 302 or graduate standing.

SPAN 408 Spanish Translation Workshop (5) *Anderson, Levine* Intensive practice in translation to and from Spanish. Texts include literary prose, poetry, expository writing, newspaper and magazine articles. Problems of standard *versus* colloquial language, transposition of cultural references, concept of fidelity in translation. Prerequisites: 301, 302; recommended: 406.

SPAN 409 Advanced Phonetics (5) Analysis of sounds: training in pronunciation, intonation, and close transcription of Spanish language in its modalities. Prerequisite: 302 or graduate standing.

SPAN 410 Spanish Medieval Literature: Tenth Through Fourteenth Centuries (5) *Petersen* The first of a two-quarter advanced survey of Spanish and comparative literature. The literary forms of the Iberian Peninsula from the tenth to the fourteenth centuries. Taught in Spanish. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 411 Spanish Medieval Literature: Fifteenth Century (5) *Petersen* Principal literary forms of the fifteenth century. Taught in Spanish. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 412 Spanish Literature: Sixteenth Century (5) *Shipley* Golden Age and Age of Conflict. Key texts from all genres, as well as their sociohistorical contexts. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 413 Spanish Literature: Seventeenth Century (5) *Shipley, Yarbro* Golden Age and Age of Conflict. Key texts from all genres, as well as their sociohistorical contexts. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 414 Spanish Literature: Eighteenth Century (5) *A. Anderson* Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 415 Spanish Literature: Nineteenth Century (5) *Anderson* Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 416 Spanish Literature: 1900-1936 (5) *Sp* Spanish literature of the twentieth century prior to the Civil War (1900-1936). Concentration on Generations of 1898 and 1927. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 417 Spanish Literature From 1940 to the Present (5) Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 420 Spanish Poetry: Origins Through the Fifteenth Century (5) Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 423 Spanish Poetry: The Golden Age, Sixteenth Through Seventeenth Centuries (5) Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 424, 425, 426 Hispanic Poetry (5,5,5) *Geist* Modern lyric poetry of the Hispanic world. The period studied extends from 1870 to 1936 and deals with thirteen major poets, from Becquer to Hernandez. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 433 Golden Age Prose (5) *Shipley* Representative, and outstanding, prose works of sixteenth- and seventeenth-century Spain. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 436 Spanish Novel of the Nineteenth Century (5) *Anderson* Representative works of Galdós, Clarín, Pereda, Valera, and Blasco Ibáñez. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 437 Spanish Novel: 1900-1936 (5) Spanish novel from the generation of 1898 to the beginning of the Civil War (1936). Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 438 Spanish Novel: 1939 to the Present (5) Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352. (Offered alternate years.)

SPAN 440 Spanish Drama: 1150-1600 (5) From the beginning to Lope de Vega. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 441 Spanish Drama: 1600-1635 (5) Spanish theatre of the seventeenth century, with emphasis on Lope de Vega. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 445 The Modern Theatre in Spain, 1700-1900 (5) *Anderson* Literature and historical context of Spain's theatre in the eighteenth and nineteenth centuries. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 446 The Modern Theatre in Spain, 1900-1936 (5) *Anderson* Major currents and literature of Spain's theatre in this century, up to the Spanish Civil War in 1936. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 447 Spanish Theatre Since the Civil War (5) *Anderson* Works of Spain's major dramatists of the postwar period. Special attention given to the social and political context of the theatre in Spain under the Franco regime. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 449 Spanish Drama and Play Production (5, max. 10) *Anderson* Prerequisite: permission of instructor.

SPAN 453 Cervantes and His Times (5) Study of Cervantes and his moment in Spanish history, with special attention to his cultural and artistic environment. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 461 Cultural Background of Latin American Literature (5) Survey of ideas and art forms and their relationship to literature in four periods: pre-Columbian, colonial, early independence, and twentieth century. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 462 Early Spanish Civilization (5) Development of Spanish society and art forms from early times to 1700. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 463 Spanish Civilization Since 1700 (5) Spanish civilization and its major artistic products since 1700. Major moments in the development of Spanish society and intellectual life as reflected in music, painting, and especially literature. Taught in Spanish. Prerequisites: 301, 302, 304, 305, 306.

SPAN 465 Contemporary Chicano Literature (5) Examination of one or more problems, themes, and/or figures in the developing body of Chicano literature. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 466 Chicano Literature: Fiction (5) Nineteenth- and early twentieth-century fiction, as well as contemporary works, are examined in attempts to trace the development of Chicano fiction in the proper historical trajectory. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 470 Latin American Literature of the Conquest and the Colonial Period (5) Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 471 Latin American Literature: 1810-1916 (5) Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 472 Contemporary Latin American Literature (5) Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 473 Latin American Fiction: Nineteenth Century (5, max. 15) Study of prose fiction in Latin America in the nineteenth century. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 474 Latin American Fiction: Twentieth Century (5) Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 475 Latin American Poetry: Colonial Through Nineteenth Century (5) Poetic movements of the seventeenth, eighteenth, and nineteenth centuries in Spanish America, Renaissance, baroque, neoclassicism, romanticism, and modernism. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 476 Contemporary Latin American Poetry (5) Evolution of Latin American poetry, from postmodernism and vanguardism to the most recent poetic expression. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 477 Latin American Essay (5) Literary expression of ideas in Latin American countries, nineteenth and twentieth centuries. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 478 Modern Latin American Theater (5) *W* Study of the origin, development, and achievements of Latin American theater with an overview of its history prior to the twentieth century. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 490 Honors Seminar (2-5, max. 10) *AWSp* Special studies in Spanish literature. Required of candidates for Honors and Distinction in Spanish. Open to others by permission of Spanish honors adviser.

SPAN 491 Individual Authors and Special Topics in Spanish Literature (5, max. 10) Focus on an individual Spanish author or a special problem in Spanish literature. Prerequisites: 302, 304, 305, 306, 307, 350, 351, 352.

SPAN 493 Study in Spain (2-10, max. 20) Advanced study in Spain outside the standard Spanish curriculum of the UW. Prerequisites: 301, 302, 304, 305, 306, and approval of undergraduate adviser.

SPAN 495 Study in Spain (12) *Anderson* One-quarter study group in Spain. Course content varies from year to year. Consult the Department of Romance Languages and Literature for availability and further requirements.

SPAN 499 Special Topics (1-5, max. 10) Topics to meet special needs. Prerequisites: permission of instructor and undergraduate adviser or graduate program coordinator.

ENGLISH TRANSLATION

These courses are recommended as appropriate supporting studies for students majoring in other departments. Courses in English translation are not applicable toward undergraduate or graduate major programs in the Department of Romance Languages and Literature. Majors may take any of these courses for credit as one of their electives.

French

FREN 458 French Art and Literature: Period Studies (5) Comparative studies of theme and technique in art and literature to illustrate major concerns of a par-

ticular period as expressed in these two media. Prerequisite: background in French literature or art history (the appropriate 300-level course in art history or the appropriate 400-level survey course in French literature).

FREN 481 Twentieth-Century French Novel in English (5)

FREN 482 French Poetry From Baudelaire to the Present in English (5) Analysis in English of the major trends and movements in modern French poetry with representative works, from Baudelaire to the poets of the 1950s.

FREN 483 Trends in Twentieth-Century Theatre in English (5) Study of the evolution of the French theatre from the turn of the century to the present. Special emphasis is given the French theatrical scene since World War II.

FREN 484 Rabelais and Montaigne in English (5) Reading and discussion of selected passages from the works of Rabelais and the essays of Montaigne. Background information through informal lectures and outside reading on the two figures as illustrative of the Renaissance in France.

FREN 485 Racine and Molière in English (5) Wortley

FREN 486 Literature of the Enlightenment in English (5) Ellrich, Hanzell

FREN 487 Nineteenth-Century Fiction in English (5) Dale

FREN 488 Women in French Literature in English (5) Masterpieces of French literature are read in an attempt to understand French attitudes toward women. From the sixteenth century, with a concentration on the twentieth century.

Italian

ITAL 318 Italian Literature in English (5)

ITAL 319 The Italian Short Story in English (5) Friedrich The short story from the *Novellino* and Boccaccio to modern masters of the form. The translations are studied both as examples of narrative technique and as reflections of particular moments in Italian cultural history. Prerequisite: at least sophomore standing.

ITAL 384 Renaissance Literature of Italy in English (3)

ITAL 481 The Divine Comedy in English (5) Studies of Dante's *Divine Comedy* in English translation, with consideration of its background and influence.

ITAL 482 The Decameron in English (5) Friedrich An integral reading of the *Decameron*, with some consideration of its place in world literature and as an expression of the culture of its time. Prerequisite: upper-division standing.

Spanish

SPAN 317 Spanish Masterworks in English Translation (5) W Shipley Spanish literary masterpieces of the twelfth to sixteenth centuries, in English translation, with consideration of their background and influence. (Offered alternate years.)

SPAN 318 Spanish Masterworks in English Translation (5) Sp Shipley Spanish literary masterpieces of the seventeenth to twentieth centuries, in English translation, with consideration of their background and influence. (Offered alternate years.)

SPAN 320 Contemporary Latin American Literature in English Translation (3) Flores, Levine, Steele Selected texts of contemporary Latin American literature, including examples of magical realism, the New Novel, and Central American poetry, in their sociohistorical context.

SPAN 353 Cervantes's Don Quixote in English (5) W Shipley Cervantes's *Don Quixote de la Mancha*: close study of this comic masterpiece, and the life, times, and works of its author. Consideration of the work's enduring influence and vitality.

Courses for Graduates Only

Romance Literature

ROMAN 600 Independent Study or Research (*)

ROMAN 700 Master's Thesis (*) AWSp

ROMAN 800 Doctoral Dissertation (*)

Romance Linguistics and Literature, General and Comparative

ROM 505, 508 Advanced Romance Linguistics (5,5) Klausenburger Advanced problems in the phonological, morphological, and syntactical analysis of the Romance languages. Descriptive, comparative, and historical considerations. Prerequisites: FREN 401, 402, or SPAN 400, or FREN 541, 542, or SPAN 541, 542.

ROM 521, 522 Seminar in Romance Linguistics (5,5) Contreras, Hanzell, Klausenburger Specific problems in linguistic analysis of the Romance languages. Prerequisites: 401, 402.

ROM 531 Problems in Romance Linguistics (2-5, max. 15) Hanzell, Klausenburger, Saporta Group seminars, or individual conferences, are scheduled under this number to meet special needs. Prerequisite: permission of graduate program coordinator.

ROM 551 Romance Linguistics: History, Methodology, and Bibliography (5) A Hanzell, Klausenburger For new graduate students in the Romance linguistics program. History of Romance linguistics and linguistic science in the nineteenth and twentieth centuries as it relates to Romance studies. Comparative and descriptive methods used in contemporary scholarship. Prerequisite: 401 or LING 200 or equivalent.

ROM 590 Special Seminar and Conference (1-10, max. 20) Group seminars, or individual conferences, are scheduled under this number to meet special needs. Prerequisite: permission of graduate program coordinator.

ROM 600 Independent Study or Research (*)

French

FREN 515 French Literature of the High Middle Ages (5, max. 10) Friedman Old French literature, from the beginning to 1315. Prerequisite: permission of instructor.

FREN 516 Middle French Literature (5, max. 10) W Friedman French literature from 1315 to 1500. Prerequisite: permission of instructor.

FREN 520 Renaissance Prose: Rabelais (5)

FREN 521 Renaissance Prose: Montaigne (5)

FREN 523 Studies in Fiction: 1660-1800 (5, max. 10) Ellrich

FREN 525 Studies in Fiction: 1850-1900 (5, max. 10) Dale

FREN 528 Studies in Fiction: 1900-1950 (5, max. 10) Collins

FREN 530 Studies in Renaissance Poetry (5, max. 10)

FREN 532 Studies in Nineteenth-Century Poetry (5, max. 10)

FREN 534 Studies in Twentieth-Century Poetry (5, max. 10)

FREN 541, 542 History of the French Language (5,5) Klausenburger Survey of the phonological, morphological, and syntactical development of the French language from its origins to the present.

FREN 555 French Nonfiction (5, max. 10) Ellrich

FREN 561 Studies in Seventeenth-Century Drama (5, max. 10) Wortley

FREN 565 Studies in French Drama (5, max. 10) Sp Studies in French drama, sixteenth to twentieth centuries.

FREN 570 Seminar in Cinema (5, max. 10) Dale Prerequisite: permission of instructor.

FREN 575 Literary Criticism (5)

FREN 576 Critical Methodology (4) A Collins Basic scholarly tools of bibliography; historical review of literary doctrine; an introduction to critical methodology. Prerequisite: graduate standing.

FREN 577 Modern Critical Methods (4) W Collins Modern critical methodology and theory. Prerequisite: graduate standing.

FREN 590 Special Seminar and Conference (1-10, max. 30) AWSp Group seminars, or individual conferences, are scheduled under this number to meet special needs. Prerequisite: permission of the graduate program coordinator.

FREN 591 Literary Problems: Middle Ages (5, max. 10)

FREN 592 Literary Problems: Renaissance (5, max. 10)

FREN 593 Literary Problems: Seventeenth Century (5, max. 10)

FREN 594 Literary Problems: Eighteenth Century (5, max. 10)

FREN 595 Literary Problems: Nineteenth Century (5, max. 10)

FREN 596 Literary Problems: Twentieth Century (5, max. 10)

FREN 600 Independent Study or Research (*) AWSp

Italian

ITAL 514 Dante (3)

ITAL 570 Seminar in Cinema (5) Dale Studies in various areas of Italian cinema, concentrating on major directors, critics, and movements. Prerequisite: permission of instructor.

ITAL 590 Special Seminar and Conference (1-10, max. 30) AWSp Group seminars, or individual conferences, are scheduled under this number to meet special needs. Prerequisite: permission of graduate program coordinator.

ITAL 591 Literary Problems: Middle Ages and Fourteenth Century (5, max. 10)

ITAL 592 Literary Problems: Renaissance (5, max. 10)

ITAL 593 Literary Problems: Baroque (5, max. 10)

ITAL 594 Literary Problems: Eighteenth Century (5, max. 10)

ITAL 595 Literary Problems: Nineteenth Century (5, max. 10)

ITAL 596 Literary Problems: Twentieth Century (5, max. 10)

ITAL 600 Independent Study or Research (*) AWSp

Portuguese

PORT 590 Special Seminar and Conference (1-9, max. 30) AWSp Group seminars or individual conferences are scheduled under this number to meet special needs. Prerequisite: permission of graduate program coordinator.

Provençal

PROV 534 Provençal Language and Literature (5)

Spanish

SPAN 500 Seminar in Spanish Linguistics (3) Sp Contreras Problems in the phonological and grammatical analysis of modern Spanish. Prerequisite: 400.

SPAN 501 Graduate Study of Hispanic Literature (3) Close studies of literary texts exemplifying a variety of practical critical methods.

SPAN 521, 522 The Renaissance in Spain (5,5) Shipley Literary creation and the cultural, social, historical context of Spanish literature from *La Celestina* through the sixteenth century. Extensive study of secondary materials, intensive analysis of representative literary texts.

SPAN 541, 542 History of the Spanish Language (5,5) W,Sp Summary of the evolution of Spanish language from the fragmentation of Peninsular Romance to *Cantar de Mio Cid*. The main work consists of analysis of early Castilian texts.

SPAN 561 Spanish-American Novel From 1940 to the Present (5)

SPAN 571 The Modern Essay in Spanish America (5)

SPAN 572 Twentieth-Century Spanish Poetry (5, max. 10)

SPAN 573 Twentieth-Century Spanish-American Poetry (5, max. 10)

SPAN 575 Literary Criticism (5)

SPAN 590 Special Seminar and Conference (1-10, max. 30) AWSp Group seminars, or individual conferences, are scheduled under this number to meet special needs. Prerequisite: permission of the graduate program coordinator.

SPAN 591 Literary Problems: Middle Ages (5, max. 10)

SPAN 592 Literary Problems: Renaissance (5, max. 10)

SPAN 593 Literary Problems: Golden Age (5, max. 10)

SPAN 594 Literary Problems: Eighteenth Century (5, max. 10)

SPAN 595 Literary Problems: Nineteenth Century (5, max. 10)

SPAN 596 Literary Problems: Twentieth Century (5, max. 10)

SPAN 597 Literary Problems: Spanish-American Colonial Literature (5, max. 10)

SPAN 598 Literary Problems: Latin America (5, max. 10)

SPAN 600 Independent Study or Research (*) AWSp

Scandinavian Languages and Literature

318 Raitt

The Department of Scandinavian Languages and Literature is concerned with the study of languages, literatures, history, politics, and cultures of Denmark, Iceland, Norway, and Sweden. Emphasis is placed both on contemporary literature and culture and on their historical development. Although most courses designed for majors are taught in the original languages, a broad spectrum of courses designed primarily for nonmajors is offered in English.

Undergraduate Program

Patricia L. Conroy, Adviser
305Z Raitt

Bachelor of Arts Degree

Major Requirements—Danish, Norwegian, or Swedish: At least 50 credits, of which 25 are in upper-division courses. The 50 credits include 36 credits in first-, second-, and third-year training in the chosen Scandinavian language, three literature courses in the chosen language, one course in Scandinavian history, a course in history of Scandinavian languages, and a course in Scandinavian literature in translation. **Scandinavian Area Studies:** 55 credits, including two years in one Scandinavian language. Emphasis is on Scandinavian history and politics, theater and film, folklore and mythology, and philosophy. A senior essay is required. An adviser should be consulted for planning of individual programs.

Graduate Program

Lars G. Warne, Graduate Program Coordinator
Terje I. Leiren, Alternate

The Department of Scandinavian Languages and Literature offers graduate programs of study leading to the Master of Arts and Doctor of Philosophy degrees. For the M.A. degree, the emphasis may be placed on Old Icelandic (Old Norse), Danish, Norwegian, Swedish, or Scandinavian area studies. Each aspirant for the Ph.D. degree must complete one year's study of Old Icelandic and concentrate his or her studies primarily within one of four areas: Danish language and literature, Norwegian language and literature, Swedish language and literature, or Scandinavian philology and linguistics.

For the graduate student, the programs in Scandinavian languages and literature open several interesting areas of study: medieval, with extensive study of Old Scandinavian languages and literature, particularly Old Icelandic; modern, including (1) the eighteenth century, represented by writers such as Holberg and Bellman; (2) romanticism; (3) Ibsen, Strindberg, and their contemporaries; and (4) the twentieth century, represented by such figures as Dinesen, Hamsun, and Lagerkvist. Major attention is paid to the history of the Scandinavian languages, prose fiction, drama, and poetry. Opportunities for supervised study and specialization also exist in such areas as Scandinavian cinema, history, politics, mythology, and folklore. Opportunities for comparative literature study also exist.

Master of Arts Degree

For the M.A. degree, two options are available, each allowing the student to emphasize a target language while pursuing courses in Scandinavian languages, literature, or area studies.

1. An emphasis on Scandinavian languages and literature includes acquisition of a working knowledge of the methods of philology and literary history, theory and analysis, plus study of one secondary area.

2. An emphasis on Scandinavian area studies includes the study of Scandinavian cinema, folklore, mythology, history, politics, and society, with an emphasis in one of these areas.

Admission Requirement: Bachelor of Arts degree with major in Danish, Norwegian, Swedish, or Scandinavian area studies, or equivalent background.

Graduation Requirements: Minimum of 36 credits in courses or seminars in Scandinavian and related subjects approved by the department, of which at least 20 credits must be in courses numbered 500 and above; reading knowledge of French or German (another non-Scandinavian language may be substituted with faculty approval); written and oral examination; option between thesis and nonthesis program. Candidates in Scandinavian languages and literature must satisfy the departmental requirements in Old Icelandic.

Doctor of Philosophy Degree

For the Ph.D. degree, the student concentrates primarily on one of two areas: Scandinavian languages and literature or Scandinavian philology and linguistics, with an emphasis on the student's chosen target language. Major attention is given to the history of the Scandinavian languages, literary theory and genre study, and Scandinavian literary history. Opportunities for graduate work also exist in such areas as Scandinavian cinema, history, politics, mythology, and folklore.

Admission Requirement: Master of Arts degree with major in Scandinavian languages and literature or equivalent background.

Graduation Requirements: 36 credits beyond the master's degree in courses or seminars in Scandinavian languages and literature and related subjects approved by the department; one year's study of Old Icelandic; a reading knowledge of French and German (other non-Scandinavian languages may be substituted with faculty approval); General Examination for admission to candidacy; 27 credits of SCAND 800 (Dissertation) taken over at least three quarters and a Final Examination on the dissertation.

Financial Aid

Teaching assistantships in Danish, Norwegian, and Swedish are available.

Correspondence and Information

Graduate Program Coordinator
318 Raitt, DL-20

Faculty

Chairperson

Sven H. Rossel

Professors

Dietrichson, Paul,* 1955, ‡(Philosophy), Ph.D., 1955, Yale; philosophy of religion, Scandinavian philosophy.

Matthews, Donald R.,* 1976, ‡(Political Science), M.A., 1951, Ph.D., 1953, Princeton; Scandinavian politics.

Nyberg, Folke,* 1969, ‡(Architecture, Urban Design and Planning), M.Arch., 1960, Yale; Scandinavian architecture, theory, design.

Reinert, Otto,* 1956, ‡(Comparative Literature, Drama, English), M.A., 1948, Ph.D., 1952, Yale; Ibsen, drama, comparative literature.

Russian and East European Studies

See International Studies.

Rossel, Sven H.,* 1974, (Comparative Literature),† Magister, 1968, Copenhagen (Denmark); Danish language and literature, Scandinavian ballads, comparative literature.

Steene, Birgitta K.,* 1973, (Drama), (Comparative Literature),† M.A., 1955, Ph.D., 1960, Washington; Ph.D., 1966, Uppsala (Sweden); Scandinavian drama and film, children's literature, comparative literature.

Associate Professors

Conroy, Patricia L.,* 1972, M.A., 1968, Ph.D., 1974, California (Berkeley); philology, medieval literature, Danish language and literature.

Leiren, Terje I.,* 1977, (History), M.A., 1970, California State (Los Angeles); Ph.D., 1978, North Texas State; Scandinavian history, immigration, Norwegian language.

Sehmsdorf, Henning K.,* 1967, (Comparative Literature),† M.A., 1964, Ph.D., 1968, Chicago; folklore and mythology, Norwegian language and literature, comparative literature.

Sjåvik, Jan I.,* 1978, A.M., 1976, Ph.D., 1979, Harvard; Norwegian language and literature, prose fiction, literary theory.

Warme, Lars G.,* 1975, Fil.Mag., 1952, Lund (Sweden); Ph.D., 1974, California (Berkeley); Swedish language and literature, Scandinavian novel, comparative literature.

Course Descriptions

Courses for Undergraduates

Danish

DAN 101, 102, 103 Elementary Danish (5,5,5) A,W,Sp Fundamentals of oral and written Danish.

DAN 300, 301, 302 Studies in Danish Language and Literature (5, max. 10 each) A,W,Sp Conroy, Rossel Special emphasis on expanding the speaking, reading, and writing skills obtained in 101, 102, 103. Fictional texts, of varying degrees of difficulty, chosen from different genres and periods in Danish literary history. Prerequisites: 101, 102, 103 for 300; 300 for 301; 301 for 302.

DAN 490 Supervised Reading (*, max. 10) AWSp Conroy, Rossel Readings in a selected area of Danish language, literature, or related fields. Prerequisite: permission of adviser.

Norwegian

NORW 101, 102, 103 Elementary Norwegian (5,5,5) AW,WSp,Sp,A Fundamentals of oral and written Norwegian.

NORW 201, 202, 203 Second-Year Norwegian (5,5,5) A,W,Sp Intensive practice in speaking, reading, and writing. Functional review of grammar. Prerequisites: 101, 102, 103.

NORW 300 The Norwegian Contemporary Novel (3) A Sehmsdorf, Sjåvik Prerequisite: 203 or equivalent.

NORW 301 The Plays of Henrik Ibsen (3) Sehmsdorf, Sjåvik Study of selected plays by Ibsen. Prerequisite: two years of Norwegian or equivalent, or permission of instructor.

NORW 302 Drama After Ibsen (3) Sp Sehmsdorf, Sjåvik Prerequisite: 203 or equivalent.

NORW 303, 304, 305 Advanced Norwegian Conversation and Composition (2, max. 4; 2, max. 4; 2, max. 4) A,W,Sp Leiren, Sehmsdorf, Sjåvik Prerequisite: 203 or equivalent.

NORW 350 The Norwegian Short Story (3) Sehmsdorf, Sjåvik Generic study of the Norwegian short story. Prerequisite: 203 or permission of instructor.

NORW 351 Norwegian Romanticism (3) Sehmsdorf, Sjåvik Historical study of Norway's cultural and, specifically, literary renewal from 1814 to approximately 1865. Prerequisite: permission of instructor.

NORW 352 New Norwegian Writers (3) Sehmsdorf, Sjåvik Fiction and poetry in *Nynorsk* by Duun, Vesaas, Garborg, and others. Prerequisites: two Norwegian courses on the 300 level and permission of instructor.

NORW 490 Supervised Reading (*, max. 10) AWSp Leiren, Sehmsdorf, Sjåvik Readings in a selected area of Norwegian language, literature, or related fields. Prerequisite: 302 or permission of instructor.

Swedish

SWED 101, 102, 103 Elementary Swedish (5,5,5) AW,WSp,Sp,A Fundamentals of oral and written Swedish.

SWED 201, 202, 203 Second-year Swedish (5,5,5) A,W,Sp Steene, Warme Intensive practice in speaking, reading, and writing. Functional review of grammar. Prerequisites: 101, 102, 103.

SWED 300 Swedish Women Writers (3) A Steene, Warme Readings from works by Swedish women writers. Recommended: one Swedish 200-level course.

SWED 301 Swedish Poetry After 1940 (3) W Warme Poems by such poets as Karl Vennberg, Erik Lindegren, Werner Aspenstrom, Thomas Transtromer, and Harry Martinson. Prerequisite: 203 or equivalent.

SWED 302 The Swedish Contemporary Novel (3) Sp Warme Selected works by Delblanc, Gyllensten, Sara Lidman, and others. Prerequisite: 301 or equivalent.

SWED 303, 304, 305 Advanced Swedish Conversation and Composition (2, max. 4; 2, max. 4; 2, max. 4) A,W,Sp Warme Third-year conversation and composition, based on readings in Swedish newspapers and journals. Prerequisite: 203 or equivalent.

SWED 350 Selected Swedish Prose and Fiction (3) A Steene, Warme Essays, articles, and works of fiction reflecting social and literary concerns in twentieth-century Sweden. Prerequisite: 203 or permission of instructor.

SWED 351 The Swedish Novel Before 1940 (3) W Steene, Warme Selected works by S. Lagerlöf, H. Söderberg, H. Bergman, and others. Reading in the original. Prerequisite: permission of instructor.

SWED 352 Strindberg and His Works (3) Sp Steene, Warme Representative short stories, dramas, autobiographical works, poems, and one novel. Prerequisite: permission of instructor.

SWED 490 Supervised Reading (*, max. 12) AWSp Steene, Warme Readings in a selected area of Swedish language, literature, or related fields. Prerequisite: 302 or permission of instructor.

Scandinavian Courses in English

SCAND 100 Introduction to Scandinavian Culture (2 or 2½) AWSpS Conroy, Leiren, Steene, Sjåvik The Scandinavian experience from the Viking age to the present day; the background for contemporary Scandinavian democracy, with major emphasis on the cultural, political, and religious development of the Scandinavian countries. 2½ credits available Summer Quarter only.

SCAND 200 The Scandinavian Welfare State (3) Social, political, and economic aspects of the Scandinavian welfare state.

SCAND 232 Hans Christian Andersen and the Fairy Tale (3) Asp Conroy, Rossel Andersen and his tales, with particular emphasis on what they have to say about man and his world.

SCAND 251 Holberg and His Comedies in English (2) Rossel Holberg and his major dramas, with attention to the comic tradition in the Scandinavian theatre.

SCAND 280 Ibsen and His Major Plays in English (2-3) AS Sjåvik, Steene

SCAND 281 Strindberg and His Major Plays in English (2-3) WS Steene, Warme

SCAND 309 Sagas of the Vikings (2 or 2½) SpS Conroy Icelandic family sagas in the context of thirteenth-century society. 2½ credits available Summer Quarter only.

SCAND 312 Masterpieces of Scandinavian Literature (3) Sjåvik, Warme Major works of Scandinavian literature by such authors as Ibsen, Strindberg, Kierkegaard, Dinesen, Hamsun, Undset, Laxness, Lagerlöf, and Lagerkvist.

SCAND 326 Scandinavia in World Affairs (5) Introduction to the foreign relations of Scandinavia with a focus on Nordic security, international economic pressures, and global conflict resolution. Includes a survey of the national settings for international involvements and highlights the dilemmas for industrial societies exposed to the pressures of interdependence. Joint with POL S 326.

SCAND 330 Scandinavian Mythology (5) AS Sehmsdorf Introduction to the study of the mythology of Germanic, and especially the Scandinavian, peoples. Emphasis on the source material, particularly the *Poetic Edda* and *Prose Edda*; also historical and archaeological material.

SCAND 332 The Scandinavian Folktale (5) A Sehmsdorf The Scandinavian folktale and legend as oral literature and as expression of popular beliefs.

SCAND 335 Scandinavian Children's Literature (3) Steene Scandinavian children's literature from the authored fairytale to the stories of such writers as Hans Christian Andersen, Elsa Beskow, Astrid Lindgren, Maria Gripe, and Tove Jansson.

SCAND 360 Scandinavian Cinema (3 or 5) Steene Major Scandinavian films and film directors from the 1920s to the present.

SCAND 365 Kierkegaard and the Existentialist Tradition (3) Steene, Warme Kierkegaard's works. Impact of existentialism on Scandinavian literature, with attention to such authors as Ibsen, Kielland, Lagerkvist, E. Johnson, Dinesen, M. A. Hansen, and Ingmar Bergman.

SCAND 370 The Vikings (5) Asp Conroy, Leiren Vikings at home in Scandinavia and abroad, with particular emphasis on their activities as revealed in archaeological finds and in historical and literary sources. Joint with HSTEU 370.

SCAND 380 History of Scandinavia to 1521 (3) W Leiren Scandinavian history from the Viking Age to 1521, with emphasis on the efforts at unification among Iceland, Denmark, Finland, Norway, and Sweden and their relationship to the European continent. Joint with HSTEU 380.

SCAND 381 History of Scandinavia to 1809 (3) Sp Leiren Scandinavian history from 1521 to 1809 with emphasis on the Lutheran Reformation, the Thirty Years' War, and the Napoleonic Wars. Joint with HSTEU 381.

SCAND 382 History of Scandinavia From 1809 to the Present (3) A *Leiren* Scandinavian history from 1809 to the present with major emphasis on the political, social, cultural, and economic development of the Scandinavian countries. Joint with HSTEU 382.

SCAND 383 Scandinavian Immigration in History and Literature (3) *Leiren, Warne* History and literature of Scandinavian emigration to North America, including immigrant life and culture, community structures and traditions, and the literature about, and by, Scandinavian emigrants.

SCAND 437 Politics in Scandinavia (5) Twentieth-century politics in Scandinavia. How Scandinavian countries have been governed. Costs and consequences of their governmental style and its uncertain future. Optimal size of politics, problems of mature welfare states, process of leadership and representation in multiparty systems, decline of political parties. Joint with POL S 437.

SCAND 450 Scandinavian Literary History (3) *Conroy, Rossel, Sehmsdorf, Sjävik, Steene* Survey of Scandinavian literary history. Prerequisite: two years of a Scandinavian language or permission of instructor.

SCAND 460 History of the Scandinavian Languages (5) *Conroy* Development of languages from common Scandinavian to contemporary Danish, Norwegian, Swedish, Faroese, and Icelandic. Prerequisite: two years of a Scandinavian language or permission of instructor.

SCAND 484 The Films of Ingmar Bergman (5) A *Steene* Major films of Ingmar Bergman.

SCAND 485 Methods and Materials in Teaching the Scandinavian Languages (3) Foreign-language teaching methodology from audiolingualism to current developments. Materials designed to implement those methods in the teaching of the Scandinavian languages. Prerequisite: two years of a Scandinavian language or permission of instructor.

SCAND 490 Special Topics (1-5, max. 15) AWSpS Special topics in Scandinavian art, literature, culture, and history. Course offerings based on instructor's specialty and student demand.

SCAND 498 Senior Essay (5) Undergraduate research and the writing of a senior essay in Scandinavian area studies. Prerequisite: permission of instructor.

SCAND 499 Independent Study or Research (1-5, max. 10) Independent study or research in Scandinavian area studies. May be done in a Scandinavian language or in English. Prerequisite: permission of instructor.

Courses for Graduates Only

SCAND 500, 501, 502 Old Icelandic (3,3,3) A,W,Sp *Conroy*

SCAND 503 Scandinavian Literature: Methodology (3) A *Sehmsdorf, Sjävik* Bibliographical resources for Scandinavian literature; concepts and methods of literary scholarship (linguistics, textual criticism, literary history, literary criticism); various approaches to literary criticism.

SCAND 504 Contemporary Literary Theory (3) W *Sjävik* Contemporary literary theory and its application to Scandinavian texts. Prerequisite: graduate student standing or permission of instructor.

SCAND 505 Scandinavian Drama (5) A *Steene* Selective reading in Ibsen's dramas in the original.

SCAND 508 Scandinavian Novel (5) *Rossel, Sjävik, Warne* Seminar on the Scandinavian novel of the nineteenth and twentieth centuries.

SCAND 513 Scandinavian Linguistics (3) *Conroy, Warne* Selected topics in Scandinavian linguistics.

SCAND 515 Pre-Nineteenth-Century Scandinavian Literature (3) *Warne* Seminar on Scandinavian literature of the sixteenth, seventeenth, and eighteenth centuries.

SCAND 520 Scandinavian Poetry (5) *Rossel, Steene* Seminar on Scandinavian poetry from 1890 to the present.

SCAND 522 Scandinavian Romanticism (3) *Rossel, Sehmsdorf* Backgrounds: German idealism; organicist concept of history and esthetics; the poet as visionary genius; revolutionary tendencies and political conservatism; folklore and mythology. Genres: lyrical poetry, national epic, the beginnings of the novel and drama.

SCAND 524 Scandinavian Emigration: History and Literature (3) Sp *Leiren* The forces behind Scandinavian emigration to the United States, the structure of Scandinavian communities in certain parts of America, and the literature by, and about, Scandinavian emigrants.

SCAND 525 Modern Scandinavia: History and Politics (3) *Leiren* Seminar in the social, historical, political, and economic development of nineteenth- and twentieth-century Scandinavia.

SCAND 527 Scandinavian Short Prose (3) *Sjävik* Seminar on the Scandinavian short story and other forms of short prose.

SCAND 530 Old Norse Literature (3) *Conroy* Studies in the poetry and prose tradition of medieval Iceland and Norway.

SCAND 531 Scandinavian Ballads (3) *Rossel* Seminar on Scandinavian balladry from Middle Ages to present; origin of the ballad, its various genres in Scandinavia, and its oral and written transmission in folk tradition.

SCAND 541 Scandinavian Mythology (3) Sp *Sehmsdorf* Seminar on the historical development and special problems in Scandinavian mythology.

SCAND 542 Scandinavian Folklore I: Folk Beliefs (3) A *Sehmsdorf* Popular beliefs about the soul, the dead, magic, witchcraft, nature spirits, the agricultural year, as expressed in the oral traditions and customs of Scandinavia.

SCAND 590 Special Topics in Scandinavian Literature (1-5, max. 12) AWSp

SCAND 600 Independent Study or Research (*) AWSp

SCAND 700 Master's Thesis (*) AWSp

SCAND 800 Doctoral Dissertation (*)

Slavic Languages and Literature

111 Thomson

The Department of Slavic Languages and Literature offers instruction in the principal eastern European languages and literatures and in Slavic linguistics, working closely with the School of International Studies. Languages include Bulgarian, Czech, Old Church Slavonic, Polish, Russian, Serbo-Croatian, and Ukrainian.

Undergraduate Program

Advisers
Harold Swayze
Gretchen Kaapcke
111 Thomson

The Department of Slavic Languages and Literature offers undergraduate courses in Russian and other

Slavic and East European languages and literatures. The courses are designed both for majors planning careers as language and literature specialists in teaching, translation, government service, the media, or business, and for all students wishing to acquire a knowledge of Slavic and East European parts of the world, as it relates to their major field, their ethnic heritage, or as a part of their general education.

The department sponsors the Russian House, where students are provided with an opportunity to enhance their knowledge of Russian in a Russian-speaking environment.

Bachelor of Arts Degree

RUSSIAN LANGUAGE AND LINGUISTICS OPTION

Major Requirements: RUSS 301, 302, 303, or the equivalent; RUSS 401, 402, 403, or the equivalent; RUSS 321, 322, 323; RUSS 451, 452; 5 credits from approved electives within the department.

RUSSIAN LANGUAGE AND LITERATURE OPTION

Major Requirements: RUSS 301, 302, 303, or the equivalent; RUSS 401, 402, 403, or the equivalent; RUSS 321, 322, 323; RUSS 461, 463; 5 credits from approved electives within the department.

RUSSIAN LANGUAGE AND HISTORY OPTION

Major Requirements: RUSS 301, 302, 303, or the equivalent; RUSS 401, 402, 403, or the equivalent; RUSS 321, 322, 323; HSTAM 443, HSTEU 444, 445.

EAST EUROPEAN LANGUAGES OPTION

Major Requirements: Two years of a principal eastern European language, or the equivalent; one year of an additional eastern European language or RUSS 201, 202, 203, or the equivalent; course work in the literatures of the cultures involved, and in Slavic philology; senior research project.

Graduate Program

The Department of Slavic Languages and Literature offers a complete program of courses and seminars leading to the Master of Arts and Doctor of Philosophy degrees in Russian and East European literatures or Slavic linguistics with a strong component of advanced language study. Languages taught in the department include Bulgarian, Czech, Old Church Slavonic, Polish, Romanian, Russian, Serbo-Croatian, and Ukrainian.

The graduate program is organized to permit completion of the master's degree in four or five quarters and the doctoral degree in three additional years. The duration of each program, however, will depend on the extent of the student's preparation upon entrance into the program.

Research Facilities

The Suzzallo Library holdings include some two hundred thousand titles in the languages of eastern Europe. While the majority of these titles are in Russian, the collection is well provided with resources in Bulgarian, Czech, Hungarian, Polish, Romanian, and Serbo-Croatian languages and literatures.

Admission Qualifications

For the Master of Arts program: Bachelor of Arts degree with major in Russian or eastern European languages and literatures or equivalent background.

For the Doctor of Philosophy program: Master of Arts degree with major in a Slavic literature or linguistics.

Assistantship Opportunities

The department regularly offers a number of teaching assistantships. In conjunction with the Henry M. Jackson School of International Studies, students in the department are eligible for several other types of fellowships.

Correspondence and Information

Graduate Program Coordinator
111 Thomson, DR-30

Faculty**Acting Chairperson**

James E. Augerot

Professors

Augerot, James E.,* 1969, (Linguistics), (International Studies),† M.A., 1959, New Mexico Highlands; Ph.D., 1968, Washington; Slavic linguistics, Romanian, Bulgarian.

Haney, Jack V.,* 1967, (International Studies),† M.A., 1971, D.Phil., 1971, Oxford (England); medieval Russian literature, Slavic folklore.

Kapetanac, Davor,* 1972, (International Studies),† M.A., 1954, D.Sc., 1972, Zagreb (Yugoslavia); Serbo-Croatian language and Yugoslav literature, Slavic literary theory.

Micklesen, Lew R.,* 1953, (Linguistics), (International Studies),† Ph.D., 1951, Harvard; Slavic linguistics.

Associate Professors

Coats, Herbert S.,* 1968, (Linguistics), (International Studies),† M.A., 1964, Fordham; Ph.D., 1970, Illinois; Slavic linguistics, Russian phonology, Russian syntax, Slavic accentuation.

Gribanovsky, Paul V., 1960, (Emeritus), M.A., 1965, Ph.D., 1968, Washington; Russian language and literature.

Konick, Willis A.,* 1961, (Comparative Literature, International Studies),† M.A., 1954, Ph.D., 1964, Washington; Russian literature.

Kramer, Karl D.,* 1970, (Comparative Literature, International Studies),† M.A., 1957, Ph.D., 1964, Washington; Russian literature.

Swayze, E. Harold,* 1963, (International Studies),† M.A., 1954, Ph.D., 1959, Harvard; Soviet Russian literature.

West, James D.,* 1972, (International Studies),† M.A., 1969, Ph.D., 1970, Cambridge (England); modern Russian literature.

Assistant Professor

Niemczyk, Barbara A.,* 1984, (International Studies), M.A., 1971, Harvard; M.Phil., 1977, Ph.D., 1986, Yale; Polish and Russian language and literature.

Lecturers

Gross, Vladimir, 1959, M.A., 1965, Washington; Russian language.

Holdsworth, Nora G., 1965, B.A., 1965, Washington; Russian language.

Polack, Zoya M., 1975, M.A., 1975, Washington; Russian and Ukrainian languages.

Course Descriptions**Courses for Undergraduates****LANGUAGE COURSES****Bulgarian**

BULGR 401, 402, 403 Elementary Bulgarian (5,5,5) A,W,Sp 401, 402: Introduction to Bulgarian phonology and grammar in terms of the modern spoken language. Writing conventions of literary Bulgarian. 403: reading of modern texts to increase command of grammar and vocabulary.

BULGR 404, 405, 406 Advanced Bulgarian (5,5,5) A,W,Sp Continuation of 401, 402, 403. Selected readings in Bulgarian literature, history, and culture. Reinforces and extends basic knowledge of Bulgarian grammar and vocabulary. Prerequisites: 403 for 404; 404 for 405; 405 for 406; or permission of instructor.

Czech

CZECH 401, 402, 403 Elementary Czech (5,5,5) A,W,Sp 401, 402: introduction to spoken and written Czech. 403: modern Czech prose, leading to a command of the language as a research tool and providing an adequate basis for further study.

CZECH 404, 405, 406 Advanced Czech (5,5,5) A,W,Sp Continuation of 401, 402, 403. Selected readings from the main works of Czech authors of the nineteenth and twentieth centuries. Reinforces and extends basic knowledge of Czech grammar and vocabulary. Prerequisites: 403 for 404; 404 for 405; 405 for 406; or permission of instructor.

Polish

POLSH 401, 402, 403 Elementary Polish (5,5,5) A,W,Sp 401, 402: Principal morphological and syntactic features of the Polish language through the medium of a basic vocabulary. 403: designed to enlarge general vocabulary by the reading of short texts selected from Polish authors of the nineteenth and twentieth centuries.

POLSH 404, 405, 406 Advanced Polish (5,5,5) A,W,Sp Continuation of 401, 402, 403. Selected readings of the main works from nineteenth and twentieth centuries. Reinforces basic knowledge of vocabulary, grammatical patterns, and conversation. Prerequisites: 403 for 404; 404 for 405; 405 for 406; or permission of instructor.

Romanian

ROMN 401, 402, 403 Elementary Romanian (5,5,5) A,W,Sp 401, 402: comprehensive introduction to spoken and literary Romanian. 403: designed to increase vocabulary and enhance knowledge of grammar through readings in modern Romanian. Joint with RMN 401, 402, 403.

ROMN 404, 405, 406 Advanced Romanian (5,5,5) A,W,Sp Continuation of 401, 402, 403. Introduction to Romanian literature, history, and culture through selected readings. Reinforces and extends basic knowledge of grammar and vocabulary. Joint with RMN 404, 405, 406. Prerequisites: 403 for 404; 404 for 405; 405 for 406; or permission of instructor.

Russian

Undergraduate Russian language sequences: (A) RUSS 101 (5), 102 (5), 103 (5), 201 (5), 202 (5), 203 (5), 301 (5), 302 (5), 303 (5), 401 (5), 402 (5), 403 (5); (B) RUSS 150 (15), 250 (15), 350 (15), 450 (15).

Credit is not allowed for overlapping courses in two sequences (e.g., a student may receive a maximum of 15 credits for 101, 102, 103, and 150). Credit is allowed for courses in different sequences, though, if the courses are taken in progressively more advanced order (e.g., 150 followed by 201).

RUSS 101, 102 First-Year Russian (5,5) A,W Introduction to Russian. Emphasis on oral communication with limited vocabulary. Basic grammar; some reading. Conducted in Russian except for periodic lectures on pronunciation, grammar, and writing (see also 110). See credit note preceding 101, 102.

RUSS 103 First-Year Russian (5) Sp Continued extensive oral practice with short readings and compositions. Prerequisite: 102 or 110 or permission of instructor. See credit note preceding 101, 102.

RUSS 150 Intensive First-Year Russian (15) S Covers material of 101, 102, 103 in one quarter. For students who want to acquire rapidly a considerable

proficiency. Meets three to four hours daily. For continuation, see 250 or 201, 202, 203. See credit note preceding 101, 102.

RUSS 201, 202, 203 Second-Year Russian (5,5,5) Complete review of Russian grammar with continuing oral practice and elementary composition. Prerequisites: 150 or 103 or permission of instructor for 201; 201 or 115 or permission of instructor for 202; 202 or permission of instructor for 203. See credit note preceding 101, 102.

RUSS 221, 222, 223 Russian for Reading and Research (5,5,5) A,W,Sp Provides students with no previous knowledge of Russian the essentials of grammar needed to read expository prose. 223: students assigned readings based on interests. Aural-oral and writing skills receive some attention.

RUSS 250 Intensive Second-Year Russian (15) S Continuation of 150. For Summer Quarter students who wish to complete a second 15 credits of Russian. Prerequisite: 150, 103, or permission of instructor. See credit note preceding 101, 102.

RUSS 301, 302, 303 Intermediate Russian (5,5,5) A,W,Sp Extensive practice in spoken and written Russian based on prose readings. Intensive review and supplementation of strategic grammatical concepts. One hour of grammar per week conducted in Russian and English, four hours per week of conversation in Russian. Prerequisite: 203, 210 or 250 or permission of instructor. See credit note preceding 101, 102.

RUSS 304 Reading and Translation (1, max. 3) Translation techniques with emphasis on development of vocabulary and reading skills. Primarily for Russian regional studies majors. Prerequisite: 203 or 210 or permission of instructor.

RUSS 350 Intensive Third-Year Russian (15) S Covers 301, 302, 303 in one quarter. For those desiring intensive review and supplementation of structural knowledge of Russian. Prerequisite: 210, 250, or 203, or permission of instructor. See credit note preceding 101, 102.

RUSS 351 Intermediate Russian Phonetics (3) A Systematic study of the Russian sound system, including phonetic transcription and intonational patterns. Instruction in correcting individual pronunciation errors. Conducted partly in Russian. Prerequisite: 203, 210, or 250.

RUSS 352 Intermediate Russian Morphology (3) W Examination of Russian morphology with emphasis on topics that help to prepare the student for advanced courses in Russian. Conducted partly in Russian. Prerequisite: 203, 210, or 250.

RUSS 381 Phonetics in Leningrad (2, max. 6) AWSpS Systematic analysis of the Russian sound system as well as intonational patterns. Practical reading exercises. Special attention to correcting individual pronunciation errors. (2 credits for Summer Quarter program, 5 credits for semester program.) Prerequisite: 203 for Summer Quarter, 303 for semester.

RUSS 382 Advanced Syntax and Composition in Leningrad (2, max. 6) AWSpS Class lectures on Russian syntactic structures. Oral drilling and written exercises and compositions. (2 credits are offered for the six-week Summer Quarter program, 5 credits for the fourteen-week semester program.) Prerequisite: 203 for Summer Quarter, 303 for semester.

RUSS 383 Conversation in Leningrad (4, max. 12) AWSpS Designed to increase active vocabulary, to further the student's control of idiomatic Russian, and to develop oral skills. (4 credits are offered for the six-week Summer Quarter program, 8 credits for the fourteen-week semester program.) Prerequisite: 203 for Summer Quarter, 303 for semester.

RUSS 384 Soviet Culture in Leningrad (4, max. 12) AWSpS Lectures on education, history, economics, law, the arts, ethnography, architecture; complemented by visits to places of cultural and historical interest and meetings with Soviet groups. 4 credits for summer program, 6 for semester program. Prerequisite: 203 for Summer Quarter, 303 for semester.

RUSS 401, 402, 403 Advanced Russian (5,5,5) A,W,Sp Class conversation and composition based on reading. Prerequisites: 303 for 401; 401 for 402; 402 for 403; or permission of instructor. See credit note preceding 101, 102.

RUSS 404 Russian Literary Translation (5) Intensive practical work in the translation of Russian literary texts. Specific problems associated with the translation of particular kinds of texts. Prerequisite: 303 or 350.

RUSS 441 The Language of Russian Culture (3-5, max. 15) Improves language skills, especially vocabulary, while probing specific lexical areas that reveal cultural traits and habits of the Russian speaker. Seven to ten topics, from games to grammar to music, each developed by a specialist. Prerequisite: 301 or 350, or the equivalent, which may be taken concurrently.

RUSS 450 Intensive Fourth-Year Russian (15) S Intensive practice in conversation, composition, and reading. Equivalent to 401, 402, 403. Prerequisite: 303, 350, or permission of instructor. See credit note preceding 101, 102.

RUSS 451, 452 Structure of Russian (5,5) A,W Descriptive analysis of contemporary standard Russian. Detailed phonetic transcription, discussion of major Great Russian dialects as well as variations in popular speech, examination of common roots and productive derivational elements in Russian words, and elementary principles of syntax. Prerequisites: 303 or equivalent for 451; 451 for 452; or permission of instructor.

RUSS 461, 463 Introduction to Russian Literature in Russian (5,5) Analysis of original Russian literary texts representative of different varieties of Russian writing. Vocabulary of Russian literary analysis; typically Russian approaches to literature, some readings of secondary critical texts; discussion in Russian of passages studied. Prerequisite: four years of Russian or three years with current enrollment in fourth year.

RUSS 499 Directed Study or Research (1-5, max. 15) Individual study of topics to meet specific needs. By arrangement with the instructor and the Department of Slavic Languages and Literature office. Prerequisite: permission of instructor and undergraduate adviser.

Serbo-Croatian

SER C 401, 402, 403 Elementary Serbo-Croatian (5,5,5) A,W,Sp 401, 402: comprehensive introduction to spoken and written literary Serbo-Croatian. 403: designed to increase vocabulary and enhance knowledge of grammar through the reading of short stories in the modern literary idiom.

SER C 404, 405, 406 Advanced Serbo-Croatian (5,5,5) A,W,Sp Continuation of 401, 402, 403; reinforces basic grasp of language and enlarges both vocabulary and command of grammatical patterns. Prerequisites: 403 for 404; 404 for 405; 405 for 406, or permission of instructor.

Slavic

SLAV 351 History of the Slavic Languages (5) Sp External and internal history of Slavic literary languages from the beginnings to the present time, including the development of writing systems, external attempts at reform, and the development of vocabulary.

SLAV 499 Directed Study or Research (1-5, max. 15) Individual study of topics to meet specific needs. By arrangement with the instructor and the Department of Slavic Languages and Literature office. Prerequisite: permission of instructor and undergraduate adviser.

Ukrainian

UKR 401, 402, 403 Elementary Ukrainian (5,5,5) Introduction to spoken and written Ukrainian.

LITERATURE COURSES IN ENGLISH

Courses in this section usually do not require prerequisites. The 300-level courses generally deal with particular themes running through a body of literature or involve a comprehensive study of cultural history. The 400-level courses deal with Slavic literatures other than Russian or specific authors and periods in Russian literature. Both levels are primarily for juniors and seniors, but are open to freshmen and sophomores with an interest or background in the subject of the course.

Czech

CZECH 420 Modern Czech Literature in English (5) A Representative works of Czech literature from the 1920s to the present in the context of earlier Czech and general European literary trends. Emphasis on prose and drama of major writers, including Hasek, Capek, Vancura, Skvorecky, Kundera, Vaculik, and Havel.

Polish

POLSH 420 Modern Polish Literature in English (5) W Representative works by leading twentieth-century Polish writers. Presents modern Polish literature in a European context, stressing parallels in philosophy and art. Shows originality of Polish literature through acquaintance with the peculiar historical and political situation of twentieth-century Poland.

Russian

RUSS 321 Russian Literature and Culture to 1700 (5) Literature as an element in Russian culture. Art, architecture, music, philosophy, and popular culture also treated. Periods covered include monumental simplicity, ornamentalism, Renaissance, Reformation, and baroque.

RUSS 322 Russian Literature and Culture 1700-1800 (5) Literature as an element in Russian culture. Art, architecture, music, and philosophy also treated. Periods covered include the age of Peter the Great, romanticism, realism, and impressionism.

RUSS 323 Russian Literature and Culture of the Twentieth Century (5) Sp Literature as an element in modern Russian culture. Art, architecture, and music also treated. Periods covered include symbolism, revolution, postrevolution, Stalinist, the "thaw," and contemporary.

RUSS 324 Russian Folk Literature in English (5) Russian popular tradition, including paganism and its survival into modern times. Genres of the oral tradition, including the folktale, the epic, spiritual and historical songs, and legends. Special attention to modern theories and western European analogues.

RUSS 421 Russian Literature of the Soviet Period in English (5) A Major Russian authors of the twentieth century. Selections from the works of Blok, Mayakovsky, Akhmatova, Babel, Pasternak, Solzhenitsyn, and others.

RUSS 422 Russian Literature in Emigration and Exile (5) Examines writers who have left the Soviet Union since the 1950s or who, though they reside in the USSR, publish through unofficial channels. Discussion of Aksyonov, Siniavsky, Volnovich, Zinoviev, and others.

RUSS 423 Russian Film and Fiction (5) Sp Thematic and structural interrelationships of narrative in film and fiction in post-revolutionary Russia. Analysis of the work of film directors Eisenstein, Pudovkin, and Vertov and authors Bely, Pilnak, Zamyatin, Fedin, A. Tolstoy, Pasternak, and Solzhenitsyn.

RUSS 424 Songs and Singers of Soviet Underground (3) Works of major and lesser figures in the Soviet dissident song-poetry movement of the 1960s and 1970s. Vysotskii, Galich, Okudzhava, Dol'skii, and Kim are among those discussed.

RUSS 426 Pushkin, Gogol, Turgenev in English (5) A Selections include *Eugene Onegin* and *The Queen of Spades* by Pushkin, *Dead Souls* by Gogol, *Fathers and Sons* by Turgenev, and works of one or two of their contemporaries.

RUSS 427 Tolstoy in English (5) W Konick, Kramer *War and Peace* and *Anna Karenina*, particularly.

RUSS 428 Dostoevsky in English (5) Sp Konick *The Possessed* and *The Brothers Karamazov*, among others.

RUSS 429 Chekhov in English (5) A Kramer Short stories and plays, as well as works of one or two of Chekhov's contemporaries.

RUSS 490 Studies in Russian Literature (3-5, max. 15) In either Russian or English. Topics vary.

Serbo-Croatian

SER C 420 Yugoslav Literature in Its European Context in English (5) Sp Kapetanac Chief works of Yugoslav literature, in English translation. Yugoslav modifications of Renaissance genres as the comedy and pastoral drama; Yugoslav folk poetry and its impact on romantic movement in Europe; Yugoslav participation in general European movements of nineteenth and twentieth centuries; Yugoslav literature in the postwar period and its original and influential position in eastern Europe.

Courses for Graduates Only

Russian

RUSS 501 Russian Language for Graduate Students (2, max. 10) AWSp Develops skills of particular use to graduate students and students seeking employment using Russian language. Emphasis on rapid assimilation of a variety of written materials with sophisticated understanding and maximum retention of vocabulary, and an ability to discuss in Russian the more theoretical and abstract kinds of material. Prerequisites: 403 or equivalent.

RUSS 502 Russian Translation (3) Introduction to the theory of translation; translation to and from Russian of selected prose passages in a variety of styles, with emphasis on idiomatic accuracy and stylistic compatibility. Prerequisite: four quarters of 501, or the equivalent established by a diagnostic test.

RUSS 512 Russian Literary Criticism (3) A study of critical positions, problems, and literary values of major Russian literary critics from Belinski to the present.

RUSS 520 Seminar in Russian Poetry (5) Topics in Russian poetry and poetry criticism to be selected by the instructor and students. Some emphasis on recent theoretical approaches to poetry criticism that are current in the USSR and eastern Europe. For advanced M.A. and Ph.D. students.

RUSS 522 Russian Literature, 1800-1840 (5) Russian poetry and prose in the period 1800-1840. Readings cover prose from Karamzin to early Gogol, poetry from Zhukovsky to Lermontov with special emphasis on Pushkin.

RUSS 524 Russian Literature, 1840-90 (5) Russian poetry and prose in the period 1840 to 1890. Short prose works and excerpts from longer works, by Gogol, Turgenev, Leskov, Saltykov-Shchedrin, Pisemsky, Uspensky, Goncharov, and Dostoevsky; poetry by Tyutchev, Fet, and Nekrasov; plays by Gogol and Ostrovsky; and excerpted contemporary critical writings.

RUSS 525 Russian Literature, 1890-1917 (5) Survey of major trends in Russian literature around the turn of the twentieth century, based on texts and critical readings in Russian. Includes both the prose and the poetry of realists of the late nineteenth century, symbolists, acmeists, and futurists.

RUSS 527 Seminar in Nineteenth-Century Russian Poetry (5) Selected topics in nineteenth-century Russian poetry to be investigated in depth and with some critical sophistication. For Ph.D. and advanced M.A. students.

RUSS 528 Seminar in Nineteenth-Century Russian Prose (5) Topic course devoted to one specific problem or theme in nineteenth-century Russian prose literature, seen in its widest possible dimensions. Students must read, in Russian, the literary works involved and become familiar with the social, historical, and philosophical backgrounds that inspired them.

RUSS 529 Seminar in Early Twentieth-Century Russian Literature (5) One specific problem or theme in twentieth-century Russian poetry and prose, seen in the widest possible dimensions. Students must read, in Russian, the literary works involved and become familiar with the social, historical, and philosophical backgrounds that inspire them.

RUSS 532 Pushkin (5) Reading, in Russian, of the major works of Alexander Pushkin and important critical works on him, and discussion of them in depth. Strongly recommended: 522.

RUSS 533 Chekhov (5) Detailed analysis of the plays and short stories of Anton Chekhov in Russian.

RUSS 534 Dostoevsky (5) Analysis of the works of Fyodor Dostoevsky in Russian.

RUSS 535 Tolstoy (5) Close analysis of one or two works by L. Tolstoy in Russian.

RUSS 541 Russian Literature, 1917 to Present (5) Study of Russian poetry and prose since 1917. From Blok and Plinyak to contemporary Soviet and Russian émigré authors.

RUSS 542 Seminar in Contemporary Russian Poetry (5) One specific problem or theme in contemporary Russian poetry, seen in its widest possible dimensions. Students must read, in Russian, the literary works involved and become familiar with the social, historical, and philosophical backgrounds that inspire them.

RUSS 543 Seminar in Contemporary Russian Prose (5) Analysis of Russian prose fiction of the post-1917 period. Selected authors and topics.

RUSS 550 Advanced Russian Morphophonology (3) Study of Russian phonological and morphological data, with detailed discussion and evaluation of methods of incorporating these data in scientific grammars. Prerequisite: 452.

RUSS 551 Advanced Russian Syntax (3) Presentation and structural analysis of various simple and complex sentence types in the Russian literary language and an evaluation of ways in which these structures may be described in formal grammars. Prerequisite: 550.

RUSS 554 History of the Russian Literary Language (5) Russian literary language from the eleventh through the twentieth centuries, with special attention to syntax and lexicon and to the development of notions of literary styles. Offered in Russian. Prerequisites: 555 or SLAV 555, or permission of instructor.

RUSS 555 History of the Russian Language (4) Brief review of the development of Russian from Indo-European to late Common Slavic, followed by a detailed account of grammatical and lexical developments of literary Russian from the earliest documents to the present. Prerequisite: SLAV 550 or permission of instructor.

RUSS 556 Readings in the History of the Russian Language (4) Reading, translation, and detailed grammatical analysis of selected texts from various literary genres and periods in the development of the Russian literary language. Prerequisite: 555.

RUSS 565 Russian Eighteenth-Century Literature (5) Discussion of representative works of poetry, prose, fiction, and criticism in the eighteenth century.

RUSS 574 Russian Literature to 1800 (5) Representative works of East Slavic, Muscovite, and Russian literature from the beginnings to 1800. Studies include a varied selection of primary texts. Intended as an introduction to the study of modern literature for beginning graduate students in Russian literature.

RUSS 575 Kievan Literature (5) Analysis of representative works of prose and poetry of Kievan Rus' from the beginnings to the end of the fourteenth century.

RUSS 576 Muscovite Literature (5) Analysis of representative works of prose and poetry of the Muscovite period from the end of the fourteenth century to the reign of Peter I.

RUSS 577 Russian Folk Literature (5) Analysis of representative works of the various genres of folk literature, including the *byliny*, *skazki*, historical and lyrical songs, and the spiritual *stikhli*.

RUSS 578 Studies in Kievan Literature (4) Field course for students with a specialization in Kievan literature. Work with primary sources, textual tradition, and bibliography.

RUSS 579 Studies in Muscovite Literature (4) Field course for students with a specialization in Muscovite literature. Work with primary sources, textual tradition, and bibliography.

RUSS 588 Introduction to Literary Analysis (2) Russian literature, covering bibliographic materials, major critical problems, terms, schools, and genres.

RUSS 600 Independent Study or Research (*)

Slavic

SLAV 520 Slavic Literary Theory (3) Main works of the Russian, Czechoslovakian, and Polish theorists of the twentieth century, with special emphasis on formalist, structural, and semiotic schools.

SLAV 550 Historical Survey of Common Slavic (5) Slavic languages and their geographical and dialectal distribution; Slavic civilization throughout prehistoric and early historic periods; principal phonological and morphological features of Slavic as a subgroup of the Indo-European family of languages.

SLAV 552 History of the East Slavic Languages (3) Designed to acquaint majors in Slavic linguistics with the details of the historical development of the phonological and morphological structure of the Ukrainian and Byelorussian literary languages. Prerequisite: 550 or permission of instructor.

SLAV 553 History of the West Slavic Languages (3) Designed to acquaint majors in Slavic linguistics with the details of the historical development of the phonological and morphological structure of literary Polish, Czech, Slovak, and Upper and Lower Sorbian languages. Prerequisite: 550 or permission of instructor.

SLAV 554 History of the South Slavic Languages (3) Designed to acquaint majors in Slavic linguistics with the details of the historical development of the phonological and morphological structure of the South Slavic languages. Prerequisite: 550.

SLAV 555 Old Church Slavonic (4) Rise and development of earliest Slavic literary language and a descriptive study of its orthography, phonology, morphology, and syntax. Readings from normalized texts.

SLAV 556 Readings in Old Church Slavonic (4) Reading and grammatical interpretation of a selected group of canonical texts, as well as some examples of the various later recensions of Old Church Slavonic. Prerequisite: 555.

SLAV 557 Seminar on Slavic Linguistics (3) Investigation and discussion of special topics in Slavic linguistics. May be repeated for credit.

Slavic Languages and Literature

SLAVC 600 Independent Study or Research (*)

SLAVC 700 Master's Thesis (*)

SLAVC 800 Doctoral Dissertation (*)

Society and Justice

203 Smith

The criminal justice system and crime in our society are studied from a multidisciplinary, liberal arts, research-oriented point of view and are directly observed through field experience. Because students have a wide range of courses from which to choose and because the content of the seminar, research, and field courses is influenced by individual students' interests, a wide range of student goals can be accommodated.

Undergraduate Program

Bachelor of Arts Degree

Admission Requirements: Currently under review. Consult department.

Major Requirements: Currently under review. Consult department.

Faculty

Director

Hubert G. Locke (beginning 1989/90)

Acting Director

George S. Bridges (1988/89)

Lecturers

Anderson, Gene S., 1980, LL.B., 1962, Illinois; white-collar crime.

Bock, R. Stewart, 1983, J.D., 1970, Oregon; criminal law.

Browne, John H., 1980, J.D., 1971, American University; criminal law.

Ehlert, Charles E., 1981, LL.B., 1963, Illinois; white-collar crime investigation.

Gould, David D., 1982, M.B.A., 1962, Washington State; J.D., 1969, Washington; investigative auditing.

Newcomb, Mary R., 1982, M.A., 1963, Michigan; M.A., 1970, Ph.D., 1976, Oregon; research methods.

Redkey, William H., 1981, J.D., 1977, Puget Sound; organized-crime investigation.

Smith, Dale E., 1985, Ph.D., 1977, Florida; corrections.

Smith, David H., 1975, Ph.D., 1973, Washington; police.

Stotland, Ezra,* 1957, (Emeritus), M.A., 1949, Ph.D., 1953, Michigan; criminal justice.

Walsh, Marilyn E., 1982, M.A., 1970, Ph.D., 1974, State University of New York (Albany); organized crime.

Course Descriptions

Courses for Undergraduates

SO JU 310 Research in Society and Justice (1-5, max. 15) AWSp Individual research, under supervision, on some aspects of society and justice. Prerequisite: major standing. (May not be offered after 1988-89.)

SO JU 320- Field Experience in Society and Justice (5-1) AWSp Bock, Dale Smith Participant observation in some public or private agency relevant to the system of justice. Prerequisite: major standing.

SO JU 321-322 Case Study in the System of Justice (2-3) AWSpS, AWSp Bock, Dale Smith Follow a felony case through the agencies of the system of justice. Prerequisite: major standing. (May not be offered after 1988-89.)

SO JU 400 Seminar in Society and Justice (3, max. 6) AWSp Aspects of the administration of justice. Prerequisite: major standing.

SO JU 405 Seminar in White Collar and Organized Crime (*, max. 10) AWSp Examines aspects of institutionalized crime. Prerequisite: senior major standing.

SO JU 410 Legal Aspects of White-Collar Crime (3) A Anderson Legal definitions of economic "white-collar" crime; use of sanctions; the corporation and criminal responsibility; economic crime and government. Recommended: POL S 101 or 201 or SOC 110.

SO JU 415 Accounting, Government, and Auditing (5) Sp Gould Concepts and principles for the accumulation, processing, and reporting of financial information with emphasis on accounting systems, fund accounting, auditing and criminal investigation of accounting records. Recommended: ACCT 210, 220, I S 200. (May not be offered after 1988-89.)

SO JU 418 Methods for Investigating Institutionalized Crime (5) W Ehler, Redkey Investigative research methods in law enforcement, consumer protection, regulatory agencies, private security, the press, and public interest groups. Nature, location, acquisition, documentation, recording, organization, and dissemination of information. Legal, ethical, and public policy considerations. Prerequisites: SOC 110, POL S 101 or 202 or equivalent, or permission of director. (May not be offered after 1988-89.)

SO JU 420 Organized Crime and Criminal Organization (3) Sp Walsh Group criminal conduct. Nature, organization, permanency, maintenance, and relative strengths and weaknesses of various types of criminal groups and organizations, from highly structured to fluid and temporary associations. Attention to specific weaknesses of the criminal justice system in coping with such conduct. Prerequisite: SOC 371 or 372 or POL S 464.

SO JU 430 The Police (5) Sp David Smith Conceptual and empirical issues concerning multifaceted and changing roles of the American police. Prerequisite: POL S 101, 202 or 204; or SOC 110.

SO JU 440 Criminal Law and Procedure (4) W Browne Substantive and procedural criminal law for lay persons; analysis of the philosophy behind the law, with an emphasis on due process in adult and juvenile courts; case-analysis teaching technique. Recommended: POL S 464 or SOC 372 or permission of instructor.

SO JU 450 Special Topics in Society and Justice (1-5, max. 15) Examination of various current topics or issues concerning the criminal justice system in our society.

SO JU 470 Evaluation Research in Criminal Justice (5) W Newcomb Social science research methods relevant to criminal justice evaluation and operations research. Ethical considerations, formulation of goals and objectives, problem definition and research design, sources and methods of data collection, descriptive statistics, data interpretation, and utilization of research results. Prerequisite: major standing or permission of director.

SO JU 473 Corrections (5) Analyzes research on diversionary methods, treatment of convicted offenders. Emphasis on program evaluation. Community treatment, fines, restitution, probation, parole, halfway houses, other alternatives to incarceration; correctional institutions. Organization of state, federal systems. Problems of administration. Subsidies, governmental control. Planning, public participation. Joint with SOC 473. Prerequisites: SOC 371, 372.

SO JU 499 Readings in Society and Justice (1-5, max. 10) AWSp Individual readings in society and justice. Prerequisite: major standing.

Sociology

202 Savery

The Department of Sociology has a strong commitment to research, publication, and training and has dedicated itself to providing a rich undergraduate program, both for students majoring in sociology and for others who wish to learn about human society and social relations.

Undergraduate Program

Ken Tokuno, Administrator of Student Services
210 Savery

Bachelor of Arts Degree

Admission Requirement: No fewer than 10 credits of course work in sociology with a 2.50 GPA for all sociology courses earned at the time of declaring a sociology major. Special circumstances will be reviewed on a case-by-case basis. Students with less than a 2.50 GPA for at least 10 credits of sociology may submit a personal statement detailing their interests and commitment to sociology. Students from an underrepresented minority group who have at least 10 credits of sociology may assume their records will receive special attention.

Major Requirements: 50 credits in sociology, including the following: (1) SOC 328-329. This requirement should be fulfilled as soon as possible after declaration of a major in sociology; (2) one course in sociological theory: SOC 410, 411, 415, or 416; (3) a special topics course: SOC 401. Topics will be announced each quarter; (4) 35 credits of sociology electives to include at least 5 credits of 400 level and at least 5 credits of 300 level or above; (5) a minimum grade of 1.7 must be received in any sociology course used for the major, and a student must have a cumulative grade-point average of 2.50 or above in all sociology courses.

It is recommended that one or more of the following Introductory courses be taken: SOC 110, 240, 271.

Graduate Program

Sociology seeks to explain population growth and distribution, social interaction, group behavior, deviance, organizations, and social change.

Emphasis is on empirical research aimed at testing theories and generating new principles. Students are trained in problem formulation, research design, data

gathering and analysis, and bringing data to bear on significant questions. Instruction is offered in various methods: statistical, survey, computer, demographic and ecological, interaction observation, experimental, case study, and historical. Students learn social research by participating in faculty projects or developing their own studies.

Graduate instruction is offered in the following fields: methodology, theory, social change, demography-ecology, social psychology, the family, organizations, stratification and ethnic relations, and criminology and deviant behavior.

The graduate program aims at completion of the Master of Arts degree in two calendar years and the Doctor of Philosophy degree in three years beyond the M.A. degree, although not all students finish in this time. A thesis is required for the M.A. degree. For the Ph.D. degree, the student must be certified in general methodology and in a major and a minor substantive area. An approved dissertation is also required.

Special Requirements

Applicants for admission to the Master of Arts program are evaluated on their undergraduate performance, Graduate Record Examination scores, statement of educational plans, and recommendations. For admission to the Ph.D. program, students are expected to have completed an M.A. degree in sociology in this department or elsewhere.

Financial Aid

Fellowships, research assistantships, and teaching assistantships are available to qualified graduate students, including those in their first year of training.

Correspondence and Information

Ken Tokuno, Administrator of Student Services
210 Savery, DK-40

Faculty

Chairperson

Herbert L. Costner

Professors

Barth, Ernest A. T.,* 1955, (Emeritus), M.A., 1953, Ph.D., 1955, North Carolina; family, race and ethnic relations, stratification.

Bialock, Hubert M.,* 1971, (Political Science), M.A., 1953, Brown; Ph.D., 1954, North Carolina; methodology, theory construction, race relations.

Borgatta, Edgar F.,* 1981, (Education), M.A., 1949, Ph.D., 1952, New York; Director, Institute on Aging; social psychology, methodology, aging.

Campbell, Frederick L.,* 1966, (Environmental Studies), M.A., 1962, Ph.D., 1967, Michigan; population and ecology, social organization.

Chirot, Daniel,* 1974, (International Studies), Ph.D., 1973, Columbia; international studies, the Balkans.

Cook, Karen S.,* 1972, M.A., 1970, Ph.D., 1973, Stanford; Director, Center for Studies in Social Psychology; experimental social psychology, complex organizations, medical sociology.

Costner, Herbert L.,* 1959, M.A., 1956, Ph.D., 1960, Indiana; methodology, social change.

Faris, Robert E. L., 1948, (Emeritus), M.A., 1930, Ph.D., 1931, Chicago; sociology.

Gross, Edward,* 1967, (Management and Organization), M.A., 1945, Toronto; Ph.D., 1949, Chicago; formal organizations, industrial sociology, symbolic interaction.

Guest, Avery M.,* 1972, (Geography), M.S., 1964, Columbia; M.A., 1967, Ph.D., 1970, Wisconsin; demography, ecology, stratification.

Hirschman, Charles,* 1987, M.A., 1969, Ph.D., 1972, Wisconsin; demography, ethnic relations, social stratification, Southeast Asia.

Lang, Gladys Engel,* 1984, (Communications, Political Science),† M.A., 1942, Washington; Ph.D., 1954, Chicago; press and politics, public opinion, mass communication.

Larsen, Otto N., 1949, (Emeritus), M.A., 1949, Ph.D., 1955, Washington; mass communications, public opinion, collective behavior.

Miyamoto, S. Frank, 1941, (Emeritus), M.A., 1938, Washington; Ph.D., 1950, Chicago; social psychology, collective behavior.

Schmid, Calvin F., 1937, (Emeritus), Ph.D., 1930, Pittsburgh; sociology.

Schmitt, David R.,* 1968, M.A., 1962, Ph.D., 1963, Washington (St. Louis); experimental social psychology.

Schrag, Clarence C., 1967, (Emeritus), M.A., 1944, Ph.D., 1950, Washington; deviant behavior, social control, methodology.

Scott, Joseph W.,* 1985, (American Ethnic Studies),† M.A., 1959, Ph.D., 1963, Indiana; race and ethnic relations, social organization, deviance.

Stark, Rodney,* 1971, M.A., 1965, Ph.D., 1971, California (Berkeley); theory, religion, deviance.

van den Berghe, Pierre,* 1965, (Anthropology), M.A., 1953, Stanford; M.A., 1959, Ph.D., 1960, Harvard; race and ethnic relations, kinship, sociobiology.

Wager, L. Wesley,* 1954, M.A., 1952, Washington; Ph.D., 1959, Chicago; organizations/occupations, theory, macrosociology.

Weis, Joseph,* 1974, M.Crim., 1970, D.Crim., 1974, California (Berkeley); Director, Center for Law and Justice; deviance, criminology, delinquency.

Associate Professors

Blumstein, Philip W.,* 1970, (Women Studies), M.A., 1967, Ph.D., 1970, Vanderbilt; gender roles, social psychology, symbolic interaction.

Bridges, George S.,* 1982, M.A., 1974, Ph.D., 1979, Pennsylvania; deviance, crime, law.

Burstein, Paul, 1985, M.A., 1971, Ph.D., 1974, Harvard; political sociology, social stratification, public policy.

Cohen, Joseph, 1932, (Emeritus), M.A., 1927, Washington; Ph.D., 1936, Michigan; sociology.

Crutchfield, Robert D.,* 1979, M.A., 1976, Ph.D., 1980, Vanderbilt; deviance, crime, social control.

Howard, Judith A.,* 1982, (Women Studies), M.A., 1976, M.A., 1977, Oregon; Ph.D., 1982, Wisconsin; social psychology, gender roles.

McCann, James C.,* 1969, M.A., 1966, Connecticut; Ph.D., 1972, Brown; methodology, demography.

Raftery, Adrian E.,* 1986, (Statistics),† M.Sc., 1977, Trinity (Dublin); Doctorate, 1980, Paris; social mobility, social dynamics, categorical data, methodology, statistical methods.

Schwartz, Pepper J.,* 1972, (Women Studies, Psychiatry and Behavioral Sciences), M.A., 1968, Washington (St. Louis); M.Phil., 1970, Ph.D., 1974, Yale; family, human sexuality, field methods.

Yamagishi, Toshio,* 1985, M.A., 1972, Hitotsubashi (Japan); Ph.D., 1981, Washington; experimental social psychology, methodology, and Japanese society.

Assistant Professors

Gillmore, Mary,* 1983, (Research), ‡(Social Work), M.S., 1970, Michigan; M.A., 1977, Ph.D., 1983, Washington; social psychology, power relationships, gender roles, family sociology.

Grembowski, David E., 1981, (Research), ‡(Community Dentistry, Health Services), M.A., 1975, Washington State; Ph.D., 1982, Washington; dental care demand, fluoridation, dental health services research.

Kasaba, Resat,* 1985, ‡(International Studies), M.A., 1978, Ph.D., 1986, State University of New York (Binghamton); Middle Eastern studies, sociology.

Lavelly, William R.,* 1985, (International Studies),† M.A., 1977, California (Berkeley); Ph.D., 1982, Michigan; social demography, family, Chinese society.

Wolf, Diane L.,* 1985, M.S., 1979, Ph.D., 1986, Cornell; development, family/household, gender, demography.

Lecturer

Black, Albert W., Jr.,* 1972, ‡(Afro-American Studies), M.A., 1965, Wayne State; Ph.D., 1976, California (Berkeley); sociology.

Course Descriptions

Courses for Undergraduates

SOC 105 Sociology of Black Americans (5) Evaluates the sociocultural context of the Black person's environment and consequences of interaction with that environment. Joint with AFRAM 105.

SOC 110 Survey of Sociology (5) AWSp Human interaction patterns shaped by ecology, social structure, and culture. Communication, family processes, social differentiation, and formal organization as integrative mechanisms. Deviance, adaptation, social change. Course content may vary, depending upon instructor.

SOC 240 Introduction to Social Psychology: Perspectives on Individual Behavior (5) Howard, Schmitt Major theoretical perspectives on individual behavior in social settings. Social cognition, behaviorism, symbolic interaction, and attitudes. Ways people develop as social beings.

SOC 241 Introduction to Social Psychology: Perspectives on Social Interaction (5) Major perspectives on social interaction. Social exchange, cooperation and competition, group dynamics, social influence, leadership, altruism and aggression. Situational and personal variables that determine social interaction.

SOC 260 Black Male/Female Family Relationships (5) The Black family in the United States as a social institution. Effects of residence in a race-conscious society on the interpersonal relationships between Black men and women. Exploration of proposals for strengthening the Black family in the United States. Joint with AFRAM 260.

SOC 270 Social Problems (5) Processes of social and personal disorganization and reorganization in relation to poverty, crime, suicide, family disorganization, mental disorders, and similar social problems.

SOC 271 Introduction to the Sociology of Deviance (5) AWSp Bridges, Crutchfield, Weis Examination of deviance, deviant behavior, and social control. Deviance as a social process; types of deviant behavior (e.g., suicide, mental illness, drug use, crime, "sexual deviance," delinquency); theories of deviance and deviant behavior; nature and social organization of societal reactions; and social and legal policy issues.

SOC 301 War (5) Chirot Origins and conduct of war, readings from anthropology, political science, economics, and history, as well as two novels and some recent articles on the arms-control controversy. Modern forms of warfare, including guerrilla war, world war, and nuclear war. Joint with SIS 301.

SOC 320 Introduction to Sociological Research (5) Guest, McCann Basic methods of sociological research. Various research strategies such as participant observation, experimentation, and survey research presented; emphasis may vary across sections. Major problems in research design such as hypothesis formulation, sampling of subject population, data analysis, and report writing. Recommended: introductory course in sociology.

SOC 328-329 Methodology of Sociological Research (5-5) Logic of formulating, testing, and modifying hypotheses. Methods of producing social data (survey research, evaluation research, field observation) and utilizing stored data (census tapes, historical materials). Methods of quantitative data analysis techniques commonly used in contemporary sociological analysis. Not open for credit to students who have taken 320 or 323. Prerequisite: at least two prior courses in sociology.

SOC 330 Human Ecology (5) Campbell Factors and forces that determine the distribution of people and institutions.

SOC 331 Population and Society (5) Campbell, Guest Population growth and distribution, population composition, population theory, urbanization. Determinants and consequences of fertility and mortality trends and migration in economically developed and underdeveloped areas.

SOC 340 Symbolic Interaction (5) W Blumstein Role of language and culture in changing the human organism into a socialized human being; interpersonal processes and how they are shaped by the symbolic environment. Prerequisite: introductory course in social psychology.

SOC 341 Tutoring Sociology (2-4) Trains students to serve as tutors in designated courses. Teaches how to assist with writing assignments, explain course material, and lead group discussions. Prerequisites: 240, 241, or equivalents.

SOC 344 Cognitive Social Psychology (5) W Howard Cognitive structures and processes and their antecedents and consequences, both societal and individual. Reciprocal influences of social roles, social institutions, and social cognition. Prerequisite: 240 or equivalent or permission of instructor.

SOC 345 Collective Behavior (5) Behavior of large numbers in crowds, masses, publics, and social movements where institutional definitions for joint action are minimal and the collectivity seeks to define new patterns of collective action. Prerequisite: 240 or permission of instructor or adviser.

SOC 346 Group Processes (5) Cook, Schmitt Systematic analysis of social processes in small groups, including conformity, deviance, cooperation, competition, coalition formation, status and role differentiation, inequity, communication, and authority and power. A variety of methods of research are considered: field studies, field experiments, laboratory studies, and the simulation of social processes. Prerequisite: 240 or equivalent.

SOC 347 Socialization (5) How social systems control the behavior of their constituent groups, and persons, through the socialization process, sanctions, power, allocation of status and rewards.

SOC 349 Religious Movements: The Sociology of Cults and Sects (3) Stark Understanding religion, what it is, and what it does. Examines the formation of new religious movements, cults, and sects, and the conditions under which they succeed or fail. Joint with RELIG 349. Prerequisite: 110.

SOC 350 Contemporary American Institutions (5) Guest Origins and developments of major social institutions. Sociology of economic structure, political organization, religion, education, recreation, and other institutionalized patterns.

SOC 352 The Family (5) Schwartz The family as a social institution; personality development within the family; marriage adjustment; changing family patterns; disorganization and reorganization.

SOC 353 The Family in Cross-Cultural Perspective (5) Wolf Form, content, and functions of families through case studies of different countries. Family organization, including family structure, inheritance, sex-

ual division of labor, and socialization with attention given to life-cycle stages. Case studies include Taiwan, Indonesia, Japan, and early industrializing Britain. Prerequisite: 110.

SOC 354 The Comparative Study of Societies (3) *van den Berghe, Wolf* Entire societies at various levels of technological complexity are compared to explore problems of their development and structural organization. Both historical and contemporary and Western and non-Western societies are examined. Joint with ANTH 354.

SOC 355 Social Change in Latin America (5) *van den Berghe* Problems of development and dependency in Latin America. Relations of power and production between social classes and ethnic groups, with special emphasis on Meso-America (Mexico, Guatemala) and the Andes (Peru, Bolivia). Joint with SIS 355. Prerequisite: introductory course in sociology, anthropology, political science, or economics.

SOC 356 Society and Politics (5) *Burstein* Causes of political change in democratic countries, including public opinion, social movements, interest group activity, and party organization. Joint with POL S 356.

SOC 360 Introduction to Social Stratification (5) Social class and social inequality in American society. Status, power, authority, and unequal opportunity are examined in depth, using material from other societies to provide a comparative and historical perspective. Sociological origins of recurrent conflicts involving race, sex, poverty, and political ideology.

SOC 361 Age and Sex Differentiation (3) Physiological and social bases of age and sex differentiation in human societies. The implications of age and sex distinctions for kinship, economic, and political structures. The relationship between age, sex, and other bases of social inequality.

SOC 362 Race Relations (5) Interracial contacts and conflicts. Offered jointly with AFRAM 362.

SOC 364 Women in the Social Structure (5) *Howard* Women's current roles within social institutions, focusing on women's work roles both in the labor force and in the home. Women in political organizations, religion, education, and law. Includes attention to women of racial, age, class, and sexual orientation minority statuses. Examines the structural, ideological, and historical determinants of women's position. Joint with WOMEN 364.

SOC 365 Urban Community (5) *Guest* Comparative and analytic study of organization and activities of urban groups.

SOC 366 Bureaucracy in Society (5) *A Gross* The coming of organizational societies; causes of bureaucracy; informal relations and work groups; ideologies; authority and the division of labor; social change in bureaucracies; the "faceless" bureaucrat in relationship to client needs; comparative organizations; complex organizations as settings for research.

SOC 371 Criminology (5) *Bridges, Crutchfield, Weis* Survey of legal definitions, types of criminal behavior, trends and patterns, recidivism, characteristics of offenders, environmental influences, diagnostic methods, prediction, theories of crime and delinquency prevention, social policy. Recommended: 271.

SOC 372 Introduction to Criminal Justice (5) *Bridges, Weis* Examines roles of police, courts, and corrections in criminal justice. Traces cases from reporting of offense through investigation, detention, charging, prosecution and defense, adjudication, sentencing, and punitive sanctions or correctional treatment. Treatment alternatives. Community corrections. Legislative reforms. Innovations in policy. Recommended: 271.

SOC 373 Social Factors in White Collar Crime (5) *W Weis* Concept and etiology of white collar crime, its forms, costs, victims, and innovative developments. Prospects for theoretical explanations and social control.

SOC 401 Special Topics in Sociology (5, max. 15) *AWSp* Selected topics of contemporary interest taught by a sociologist active in the field. Topics vary and may be substantive, theoretical, or methodological. Prerequisite: major standing or permission of instructor.

SOC 410 History of Sociological Thought (5) *Campbell* Contributions of individual theorists (from Comte to the present); emphasis on cumulative development of concepts and principles, emergence of sociology as a science, probable future developments.

SOC 411 Selected Topics in History of Sociological Thought (5) *Campbell* Specific areas or eras in the history of sociological thought. Emphasis on the development of sociological theory in relation to the intellectual and social setting of the time. Topics change from quarter to quarter. Some topics are: the development of concepts of order in sociological thought; conflict theories; the development of action theory in sociology; German sociology; Marx, Weber, and Simmel.

SOC 415 Theory of Social Organization (5) *Wager* State and usages of theory in social organization; importance of linkage between theory and methodology; major features of social organization demonstrated by intensive examination of representative theories of social organization with particular focus on complex forms.

SOC 416 Sociological Theory (5) Theories of individual action, social order, and institutional change. Cumulative development of solutions rather than on works of given theorists. Theories of social order. How sociological treatments of these issues compare with those offered by economists and other social scientists.

SOC 419 Fieldwork: Observations and Interviewing (5) *Schwartz, Wolf* Perspective, logic, and techniques of qualitative social research and analysis. Nature and uses of intensive interviewing, participant observation, and analytic ethnography. Application of field research principles. Research project required in addition to reading and analysis of classic studies. Recommended: 240 or 352.

SOC 424-425 Applied Social Statistics (3-3) *Blalock, Borgatta, Costner* Applications of statistics in sociology and related social sciences. Emphasis on problems of analysis with imperfect data. Theory construction, and reporting results. Probability in statistical inference. Analysis of variance; contingency table analysis; nonparametric procedures; regression analysis in social research. Prerequisites: 323 for 424-; 424- for 425.

SOC 426 Methodology: Quantitative Techniques in Sociology (3) *Raftery* Measures of relationships among variables and among attributes; calculation techniques; application to typical sociological problems; interpretation. Prerequisite: 323.

SOC 427 Statistical Classification and Measurement (3) *Blalock, Costner* Application of statistical principles and methods to problems of classification and measurement in social research. Prerequisites: 426, 428-429.

SOC 428-429 Principles of Study Design (3-3) *Costner, Guest* Study design from problem formulation to the analysis and interpretation of data. Prerequisite: 323.

SOC 432 Population and Modernization (3) Examines role of demographic factors in the process of social modernization and economic growth. The approach is both historical, focusing on populations of de-

veloped countries since 1700, and analytic, stressing the attempts made by different disciplines to model demographic relationships, with attention to less-developed regions. Prerequisite: 331 or permission of instructor or adviser.

SOC 442 Public Opinion (3) *Larsen* The nature of public opinion; formation and measurement of public opinion; the operation of public opinion polls. Recommended: 240.

SOC 443 Mass Communication (5) *Larsen* Control, structure, and functioning of mass media of communications as a force in social life; methods of research. Recommended: 240.

SOC 447 Social Movements (5) Social movements as collective attempts to change society: why people join; characteristics of successful and unsuccessful movements; consequences of social movement activities. Prerequisite: previous course in political sociology or political science.

SOC 449 Social Relationships (5) The structure of different kinds of relationships and the nature of interaction within them. Concept of social relationships in general; several specific types of relationships. Close personal relationships: marriage, nonmarital sexual relationships, and the parent-child relationship. Prerequisites: course in social psychology and 352 or equivalent.

SOC 451 Theory and Process of Social Change (5) *Wager* Basic trends in American life; frames of reference for analysis of social change; forces causing social change. Prerequisite: 15 credits in social sciences.

SOC 453 Social Factors in the Family (5) Review and analysis of empirical research in courtship and marriage, marital adjustment, and specific areas of marriage and family life. Prerequisites: 323 and 352.

SOC 456 Political Sociology (5) *Burstein* Bases of political legitimacy; modern and traditional structures of domination: theories of democracy, authoritarianism, and totalitarianism; relationship to social classes, status groups, and economic organization.

SOC 457 Sociology of Religion (5) *Stark* The relations between religion, polity, economy, and social structure; in particular, the political, economic, and social impact of religious beliefs and organizations, as well as the social determination of these beliefs and organizations; the rise of secularism, the rationalization of modern life, and the emergence of political quasi-religions.

SOC 460 Social Differentiation (5) Analysis of societal organization based on sex, age, residence, occupation, community, class, caste, and race.

SOC 462 Comparative Race and Ethnic Relations (5) *van den Berghe* Race and ethnicity are examined as factors of social differentiation in a number of Western and non-Western societies in Europe, Africa, Asia, and the Americas. Recommended: 362. (Formerly 363.)

SOC 464 Contemporary Society in the People's Republic of China (5) *Lavelly* Separate evolution of rural and urban institutions in China since 1949. Nature of rural-urban relations. Reasons for divergence of Chinese rural and urban societies, including economic systems and control of mobility. Joint with SISEA 464. Prerequisite: 110 or HSTAS 454 or permission of instructor.

SOC 465 Complex Organizations (3) *Cook, Gross* Examination of the structure of complex organizations. Attention to developing generalizations applicable to industrial organizations, businesses, hospitals, prisons, labor unions, governments, universities, armies, and similar formally instituted organizations. The major focus is on empirical research, with some attention to methodological problems in studying such organizations. Prerequisite: 15 credits in sociology.

SOC 486 Industrial Sociology (5) *Wager* Changing focus of field; cultural variation, work, and the worker; technology, society, and the evolution of industrial forms; types and forms of industrial organizations; industrial organizations as social and technical systems; issues of control, process, and change; the individual in social and technical systems.

SOC 488 Sociology of Occupations and Professions (5) Frameworks for study of occupations and professions; occupational structure and mobility in American society and relation to adult socialization and career development; occupational and professional associations and society. Prerequisites: 240 and 15 credits in social sciences.

SOC 489 Balkan Societies (3) *Chirot* Examination of the roots of Balkan problems (economic backwardness, minority-group conflicts, peasant problem), the failure of pre-1945 attempts to solve these problems, and the post-1945 communist attempts at solution. Particular emphasis placed upon Romania and Yugoslavia. Prerequisite: at least one introductory social science course.

SOC 472 Juvenile Delinquency (5) *Crutchfield, Wels* Factors in delinquency, juvenile courts. Programs of treatment and prevention. Recommended: 371 or equivalent.

SOC 473 Corrections (5) *Wels* Analyzes research on diversionary methods and treatment of convicted offenders. Emphasis on program evaluation. Community treatment, fines, restitution; probation, parole, halfway houses, and other alternatives to incarceration; correctional institutions. Organization of state and federal systems. Problems of administration. Subsidies and governmental control. Planning and public participation. Joint with SO JU 473. Prerequisite: 371 or 372. Recommended: 323.

SOC 481, 482, 483 Issues in Analytic Sociology (5, max. 15; 3, max. 9; 1-3, max. 9) Examination of current issues in sociological analysis. The specific content of the course varies according to recent developments in sociology and according to the interests of the instructor. Any of the sequence may be repeated with permission of instructor.

SOC 486 Human Family Systems: Biological and Social Aspects (3) *van den Berghe* Biological bases for human mating and reproduction, and an examination of the range of cross-cultural variability in human systems of kinship and marriage; compares wide range of human and nonhuman species, and between Western and non-Western human societies; interplay of biological, ecological, and sociocultural factors in determining the structure and function of human family systems. Joint with ANTH 486.

SOC 488 Sociological and Psychological Theories of Sexuality (5) *Blumstein, Schwartz* Advanced course on human sexuality covering psychological and sociological theories of sexual identity and life-styles, analysis of present research in sexuality, and generation of new research. Topics include acquisition of sexual identity differences in male and female sexual patterns, sex in relationships, sexual malfunctioning, etc. Paper and research proposal are required. Recommended: 323.

SOC 495 Honors Senior Thesis (5) Preparation of senior honors thesis. Sociology majors only.

SOC 496, 497, 498 Honors Senior Seminar (3 or 5, 3 or 5, 3 or 5) A,W,Sp Exploration of selected sociological problems with emphasis on research experience and the interpretation of data. For sociology majors only, primarily for honors students. Prerequisites: senior standing and permission of instructor.

SOC 499 Undergraduate Independent Study or Research (2-5, max. 10) AWSp Open only to qualified undergraduate students by permission of instructor (see departmental adviser).

Courses for Graduates Only

SOC 510 Seminar in Sociological Theory (3) *Campbell* Macrosociological theories; functionalism and neoevolutionism; conflict and consensus approach; comparative strategies; models and long-range theories; ideology and sociology. From Marx and de Tocqueville to contemporary literature.

SOC 513 Demography and Ecology (3) *Guest, Hirschman, McCann* Review of selected research problems related to demography and ecology. Provides substantive knowledge of determinants and consequences of population patterns to delimit areas where current knowledge is deficient and to begin instilling the analytic skills required to advance knowledge in the area.

SOC 514 Current Theories in Social Psychology (3) *Blumstein, Cook, Howard, Schmitt* Broad graduate-level introduction to the theories in the field of social psychology.

SOC 515 Current Research in Social Psychology (3) *Blumstein, Howard, Schmitt* Broad graduate-level introduction to the research in the field of social psychology.

SOC 516 Organizations (3) *Cook, Gross, Wager* Broad graduate-level introduction to the theory and research on complex organizations.

SOC 517 Deviance and Social Control (3) *Bridges, Crutchfield, Wels* Survey of current research on deviant behavior and mechanisms of social control; definitions and forms of deviant behavior, causal analysis, and legal or other methods of social control.

SOC 518 Social Stratification (3) *Chirot, Guest* Intensive preparation in theoretical, methodological, and substantive topics in social stratification.

SOC 519 Political Sociology and Social Change (3) *Burstein* The course is intended to thoroughly familiarize graduate students with basic perspectives in the area of political sociology and social change, which is an examination field for the Ph.D., with some classical works and some exemplary empirical studies of recent date.

SOC 525 Experimental Methods in Social Research (3) *Borgatta, Schmitt* For graduate students who wish additional understanding of techniques, problems, and issues involved in the design and conduct of experimental social research. Considers strengths and weaknesses of various experimental designs, artifacts and their control, problems in going from the laboratory to the field, and ethical issues. Prerequisites: 424-425 and 428-429, or equivalents.

SOC 526 Causal Approach to Theory Building and Data Analysis (3) *Blalock* Theory construction and testing from a causal models perspective. Path analysis, standardized versus unstandardized measures, feedback models, identification problems, estimation in overidentified models, difference equations, differential equations, stability conditions. Multiplicative models as alternatives to additive ones. Causal approach to measurement error.

SOC 527 Measurement of Basic Sociological Concepts (3) *Blalock* Conceptualization and measurement problems in sociology, using major concepts as illustrations of basic issues. Causal approach to measurement to deal with problems of indirect measurement, cross-level measurement problems, aggregation and disaggregation. Consequences of crude measurement for data analyses. Prerequisite: 424; recommended: 426.

SOC 528 Seminar on Selected Statistical Problems in Social Research (3) *Costner, Raftery* Prerequisite: 426.

SOC 529 Multiple Indicators in Social Measurement (3) *Costner* Repeated measures, alternate measures and multiple observers in estimating the reliability, assessing the validity, and analyzing conceptual and indicator problems in social measurement. Implications of measurement error for research conclusions. Prerequisites: 424, 426.

SOC 530 Advanced Human Ecology (3) *Campbell, Guest*

SOC 531 Demography (3) *Guest, Hirschman, McCann* Research problems in population and vital statistics.

SOC 533 Research Methods in Demography (3) *McCann* Measures of population composition, fertility, and mortality. Life table analysis, standardization procedures, population projects and estimates.

SOC 534 Demographic Issues in the People's Republic of China (3-5) Focuses on recently released demographic data to provide insights into China's recent social and economic history, regional variation, and prospects for social change. Utilizes demographic indicators of health, education, family structure, and fertility to assess the extent and character of regional variation in China. Joint with SISEA 564.

SOC 539 Selected Topics in Demography and Ecology (3, max. 9) Specialized problems in demography or ecology are covered; for example, migration, fertility, mortality, language, race and ethnic relations, metropolitan community. See quarterly announcement for specific problem to be covered.

SOC 542 Selected Topics in Group Processes (3) *Cook, Schmitt* Theories, methodology, and studies in the area of small-group research. May be repeated for credit. Prerequisite: permission of instructor for nonmajors.

SOC 544 Seminar on Social Power (3) Examination of basic principles concerning power, influence, and authority in small groups, organizations, and communities. Recommended: 240, 415, 460.

SOC 545 Methods of Experimental Analysis in Social Research (3) Application of the method of experimental analysis to problems in sociology and social psychology.

SOC 546 Seminar on Symbolic Interaction (3) *Blumstein* Focuses on several key areas in, and related to, the symbolic interactionist perspective (e.g., language, the self, the dramaturgic perspective, ethnomethodology, attribution theory, etc.). Prerequisite: permission of instructor for nonmajors.

SOC 548 Seminar in Interpersonal Attraction (3) Nature of interpersonal attraction, the social and psychological factors that underlie it, and the ways in which it is structured in social relationships. Examines various theoretical approaches to attraction and research ranging from initial attraction among strangers to the development of ongoing social relationships. Prerequisite: previous course in social psychology.

SOC 550, 551 Marriage and the Family (3,3) *Schwartz* Analysis of marriage and family patterns and problems, with initial emphasis on research findings and methods. Individual research on selected projects. Prerequisite: 453 or equivalent.

SOC 555 Methods in Macro, Comparative, and Historical Sociology (3) *Chirot*

SOC 556 The Evolution of the Family (3) Sp *van den Berghe* Biological evolution of species-specific behaviors and forms of sociality linked to human mating, reproduction, and parenting. Cultural evolution of human systems of kinship and marriage as fitness-maximizing adaptations to a wide range of habitats. Prerequisite: upper-division course in evolutionary theory, population genetics, behavioral ecology, primatology, or animal behavior. Joint with ANTH 556.

SOC 559 Seminar on Gender Roles (3) Theoretical issues concerning gender and society. Current

state of empirical knowledge on the sociology of gender and strategies for research. Cross-cultural variations in gender roles, how these develop in people, how gender roles develop in society and their effects on social structure, social institutions, and the effects of gender role interaction. Prerequisite: graduate student standing in a social science. (Offered alternate years.)

SOC 561 Sociology of Health and Illness: An Organizational and Managerial Perspective (3) Critical examination and discussion of sociological approaches—methodological, theoretical, and empirical—in the health-care field. Attention to applied studies in the field and, more broadly, to the implications for decision making from the sociological perspective. Joint with HSERV 554. Prerequisite: HSERV 511 or undergraduate major in sociology, or permission of instructor.

SOC 562 Seminar in Comparative Race Relations (3) *van den Berghe* Cross-cultural approach to race and ethnic relations, including case studies from Africa and Latin America. Prerequisite: graduate standing in social sciences.

SOC 563 Advanced Seminar in Medical Sociology (3) *Cook* Development and testing of theories related to illness behavior, health occupations and professions, and the organization of health services. Emphasis given to provider-patient relationships and the sociology of health-care-delivery organizations. Joint with HSERV 564. Prerequisite: admission to health services doctoral opportunities program or graduate status in sociology, or permission of instructor.

SOC 566, 567 Seminar in Complex Organizations (3,3) *Gross, Wager* Special topic seminars in the field of complex organizations or industrial sociology.

SOC 574 Seminar on Methods of Criminological Research (3) *Bridges, Wels* Provides training in the technical analysis of published research in criminology; designs and processes studies in parole prediction, prediction of prison adjustment, and prediction of treatment effect.

SOC 581, 582, 583 Special Topics in Sociology (3,3,3) A,W,Sp Examination of current substantive topics in sociology. Content varies according to recent developments in sociology and the interests of the instructor.

SOC 588 Sociological Aspects of Human Sexuality (3) *Blumstein, Schwartz* Research-oriented seminar. Sociological literature on sexuality. Individual project based on readings and discussions of strategies for studying sexuality. Topics include: cross-cultural perspectives on sexuality, the social scripting of sexual conduct, sex roles, sexual identity, gender identity, sexual life-styles, prostitution, pornography.

SOC 600 Independent Study or Research (*) AWSp

SOC 700 Master's Thesis (*) AWSp

SOC 800 Doctoral Dissertation (*)

South Asian Studies

See *International Studies*.

Speech and Hearing Sciences

203 Eagleson

The speech and hearing sciences concern the processes and disorders of verbal communication. The

undergraduate programs include the study of normal language development, speech acoustics, speech physiology and perception, hearing, the nature of language, speech and hearing disorders in children and adults, and the clinical processes involved in identification, prevention, and remediation of those disorders.

Undergraduate Program

Advisers
Pamela Rosendahl
Betty Moering
253 Eagleson

Bachelor of Science Degree

Admission Requirements: 2.50 overall grade-point average. Recommended preparation includes high school physics or equivalent; introductory exposure to human learning, sensory, perceptual, and cognitive processes, general physiology and the physiology of behavior, and college mathematics.

Core requirements for all options: 29 credits in the following courses—SPHSC 201, 250, 303, 307, 310, 311. Students following Options II, III, or IV below must have a 3.00 grade-point average in courses that make up the common core. Students following Options III or IV must meet additional grade-point requirements to participate in clinical practicum.

OPTION I, GENERAL ACADEMIC

Intended to provide broad perspectives of the field, but not to prepare students for professional careers in the speech and hearing sciences.

Major Requirements: Core requirements listed above; 25 credits in courses dealing with normal and abnormal language, speech, and hearing taken from the following: SPHSC 315, 330, 332, 370, 380, 401, 402, 410, 411, 416, 420, 430, 431, 444, 499.

OPTION II, BASIC SCIENCES

Intended for students who wish to continue graduate study in speech and hearing that leads to university teaching and research careers, but does not include clinical training in audiology or speech pathology.

Major Requirements: Core requirements listed above; 28-37 credits, including SPHSC 401, 402, 410, 416, 420, 499, and 6 credits in the speech pathology or clinical audiology areas; 16-20 credits outside the department, including a mathematics course that deals with calculus, and one course each in statistics, psychology (learning, memory, or cognition), and human physiology.

OPTION III, CLINICAL SCIENCES—AUDIOLOGY

Intended for students who wish to continue graduate study and to obtain clinical training in audiology.

Major Requirements: Core requirements listed above; 38 credits, including SPHSC 315, 330, 332, 350, 351, 370, 380, 401, 420, 431, 451 (audiology); at least 9 credits outside the department, in psychology (deviant personality, cognitive development, developmental psychology, neural and sensory bases of behavior), educational psychology (behavior measurement and management, statistics).

OPTION IV, CLINICAL SCIENCES—SPEECH/LANGUAGE PATHOLOGY

Intended for students who wish to continue graduate study and to obtain clinical training in speech/language pathology.

Major Requirements: Core requirements listed above; 38 credits, including SPHSC 315, 330, 332, 350, 351, 370, 380, 451 (audiology), 401, 430, 431; two courses outside the department in developmental psychology or deviant personality.

Graduate Program

The Department of Speech and Hearing Sciences offers the Master of Science and Doctor of Philosophy degrees. The program consists of a wide range of course work and seminars providing opportunities for the development of scholarly and professional competence in various areas of specialization: language acquisition; phonology; speech production and transmission; hearing; psychoacoustics; speech perception; computer recognition and generation of meaningful speech; and human communication disorders related to language, speech, and hearing and the clinical procedures involved in their identification, prevention, and remediation. To complement departmental curricula in various specialization areas, close interdisciplinary relationships are maintained with other University departments and off-campus centers. Advanced degrees in the speech and hearing sciences equip the student to do research, to teach at the college and university level, and to provide clinical services to the communicatively impaired.

Special Requirements: Prospective candidates for advanced degrees are expected to have earned 50-60 credits in the speech and hearing sciences at the undergraduate level, depending upon the specific area of graduate specialization chosen. The M.S. (thesis) degree requires a minimum of 30 credits of approved course work, plus an acceptable thesis (9 credits). This degree program is recommended for students who plan to continue graduate study for the Ph.D. degree. The M.S. (non-thesis) degree is intended primarily for students who desire careers as speech and hearing clinicians, but who do not intend to continue study for the Ph.D. degree. A minimum of 45 credits is required, of which 23 must be at the 500 level or above in this program. Students also complete the academic and practical experience requirements for the Certificate of Clinical Competence of the American Speech-Language-Hearing Association. These requirements necessitate more than the minimum 45-credit program for most students. A thesis is not required. For the Ph.D. degree, individually tailored programs of study are developed to focus on specialized areas of interest within speech science, experimental and clinical audiology, and speech/language pathology.

Financial Aid

A number of teaching and research assistantships are available for qualified graduate students. In addition, the department has traineeships supported by the U.S. Department of Education and the Veterans Administration.

Research Facilities

The department's research laboratories contain sophisticated equipment for the collection and analysis of data related to the study of human communication and its disorders. The University Speech and Hearing Clinic and the Child Development and Mental Retardation Center also provide laboratories to support applied research in communication processes and remedial procedures.

Correspondence and Information

Chairperson
204 Eagleson, JG-15

Faculty

Chairperson

Fred D. Minifie

Professors

Kuhl, Patricia K.,* 1976, (Psychology), M.A., 1971, Ph.D., 1973, Minnesota; speech perception.

Miner, Adah L., 1965, (Emeritus), M.A., 1948, Washington; Ph.D., 1962, Wisconsin; speech pathology, clinical supervision.

Minifie, Fred D.,* 1971, M.A., 1962, Ph.D., 1963, Iowa; speech science.

Palmer, John M.,* 1952, (Prosthodontics),† M.A., 1950, Washington; Ph.D., 1952, Michigan; disorders of voice and orofacial deformities.

Prins, David,* 1969, M.A., 1957, Ph.D., 1961, Michigan; stuttering.

Thompson, Gary,* 1966, M.A., 1955, Iowa; Ph.D., 1967, Minnesota; pediatric audiology, clinical evaluation.

Thompson, Marie D.,* 1979, ‡(Education), M.A., 1968, Ph.D., 1970, Washington; special education (hearing impaired).

Tiffany, William R., 1951, (Emeritus), M.A., 1947, Washington; Ph.D., 1951, Iowa; phonetics and speech sciences, clinical evaluation.

Wilson, Wesley R.,* 1969, M.A., 1961, Redlands; Ph.D., 1969, Washington; audiology, infant assessment.

Yantis, Phillip A.,* 1965, M.A., 1952, Ph.D., 1955, Michigan; audiology, clinical evaluation.

Associate Professors

Burns, Edward M.,* 1984, M.S., 1966, Arizona; Ph.D., 1977, Minnesota; psychoacoustics.

Carpenter, Robert L.,* 1970, M.A., 1965, Ph.D., 1969, Northwestern; language and language disorders.

Coggins, Truman E.,* 1974, M.S., 1971, Redlands; Ph.D., 1976, Wisconsin; language disorders in children.

Cooker, Harry S.,* 1976, M.A., 1961, Ph.D., 1963, Iowa; speech science.

Dale, Phillip S.,* 1968, ‡(Linguistics, Psychology), M.A., 1964, M.S., 1966, Ph.D., 1968, Michigan; language development.

Folsom, Richard C.,* 1977, M.S., 1970, Portland State; Ph.D., 1979, Washington; electrophysiologic audiology.

Matteer, Catherine A.,* 1980, (Research), M.S., 1972, Wisconsin (Madison); Ph.D., 1977, Western Ontario; neuropsychology and neurolinguistics.

Olswang, Lesley B.,* 1978, M.A., 1971, Illinois; Ph.D., 1978, Washington; language development and disorders.

Reich, Alan R.,* 1977, M.A., 1969, Connecticut; Ph.D., 1975, Iowa; speech physiology and voice disorders.

Stoel-Gammon, Carol,* 1983, M.A., 1968, Ph.D., 1974, Stanford; developmental phonology and phonetics.

Lecturers

Branson, Cynthia W., 1974, M.A., 1970, Northwestern; language disorders, dysarthria.

Brooks, Carla S., 1985, M.A., 1975, California (Santa Barbara); language disorders in children.

Cerf, F. Ann, 1973, M.A., 1950, West Virginia; M.A., 1970, Ph.D., 1972, Washington; stuttering.

Lablak, James A., 1974, M.A., 1971, Washington; audiology.

McHenry, Monica, 1986, M.S., 1978, Pennsylvania State; Ph.D., 1983, Washington; speech pathology.

Moering, Betty C., 1983, M.S.P.A., 1975, Washington; speech/language disorders.

Rosendahl, Pamela D., 1979, M.S.P.A., 1975, Washington; speech pathology.

Course Descriptions

Courses for Undergraduates

SPHSC 100 Voice and Articulation Improvement (3) AWSpS Only for persons for whom English is the primary language. Voice production and the sound

system of standard American speech. Speech standards, regional and social dialects, voice quality and basic language-oriented characteristics. Practice for improving speech style.

SPHSC 111 The American English Sound System (2, max. 4) AWSpS For persons for whom English is not the primary language. Speech sounds of American English. Practice in listening and using American phonetic features. Prerequisite: college-level reading knowledge of English.

SPHSC 201 Anatomy of the Speech and Hearing Mechanisms (5) Asp Palmer Anatomy and functional coordination of those parts of the human body associated with phonation, articulation, resonance, and hearing. Required for majors; open to nonmajors.

SPHSC 250 Human Communication and Its Disorders (5) WS Palmer Normal and disordered oral communication. Includes speech, language, and hearing disorders as well as normal processes. Required for majors, open to nonmajors.

SPHSC 300 Speech Science (5) AWSpS Cooker Basic physiological and acoustical attributes of speech. For nonmajors.

SPHSC 303 Language Science (5) AW Stoel-Gammon Introduction to techniques of linguistic analysis in the areas of phonetics, phonology, morphology, syntax, and semantics.

SPHSC 307 Speech and Language Development (4) WSp Study of the normal acquisition of speech and language in children. Required for majors. Prerequisite: 250, 303, or permission of instructor.

SPHSC 310 Introduction to Hearing Science (5) Asp Folsom, Wilson Acoustic properties of simple and complex sounds; description of normal audition; elementary structure and function of the hearing mechanism. Required for majors. Prerequisite: MATH 105 or equivalent.

SPHSC 311 Speech Science: Speech Production (5) Asp Cooker, Minifie, Reich Physiological, acoustical, and perceptual aspects of speech production. Examples and laboratory work directed toward students with interests in speech pathology and audiology. Required for majors and open only to them. Prerequisites: 201 and 310; 310 may be taken concurrently.

SPHSC 315 Survey of Hearing Impairment (3) Asp Thompson, Wilson, Yantis Causes of hearing impairment and their psychological, social, and educational/vocational effects on the individual. Prerequisite: 310.

SPHSC 330 Disorders of Articulation (3) Asp Nature, etiology, and treatment. Prerequisites: 250, 303, 307.

SPHSC 332 Clinical Processes I: Assessment (4) Asp Olswang Principles and procedures for the assessment of speech and language disorders. Prerequisites: 307, 330.

SPHSC 350 Clinical Processes II: Treatment (4) WS Olswang Principles and procedures for planning the effective treatment of speech and language disorders. Prerequisites: 330, 332, and permission of undergraduate adviser.

SPHSC 370 Basic Audiometry (5) WS Thompson Theory and practice of the assessment of hearing function, including standard pure-tone audiometry, speech audiometry, and basic impedance audiometry. Prerequisites: 315 and permission of undergraduate adviser.

SPHSC 380 Introduction to Aural Rehabilitation (4) WS Principles and methods of amplification and use of residual hearing, speech reading, speech conservation, and general counseling toward acceptance of hearing impairment. Considerations for education and special populations.

SPHSC 391 Practicum in Audiology (1-4, max. 10) AWSpS Supervised practicum in audiological assessment (section A) and aural rehabilitation (section B) of children and adults. Prerequisites: 350 for section A; and 380 for section B, and permission of undergraduate adviser.

SPHSC 401 Neural Bases of Speech and Language (4) AS Neuroanatomical and neurophysiological bases of motor speech production and language processes. Laboratory. Prerequisite: 201 or permission of instructor.

SPHSC 402 Advanced Phonetic Analysis (2) W Advanced transcriptional and feature analysis of abnormal and nonstandard speech patterns. Prerequisite: 303 or equivalent Introductory phonetics course or permission of instructor.

SPHSC 410 Psychology and Physiology of Audition (4) A Burns Physiological and behavioral bases of hearing. Correlation of human hearing with acoustic, anatomic, and physiological factors.

SPHSC 411 Perceptual Development (5) A Kuhl, Meltzoff Origins, development of perception in human infancy; nature-nurture controversy as applied to perceptual development. Topics from visual, auditory domains. Development of object and face perception; auditory pattern perception; speech perception; categorization; perception of three-dimensional space; auditory localization; cross-modal relations among touch, vision, audition. Joint with PSYCH 411.

SPHSC 416 Speech Acoustics and Perception (3) AW Kuhl Historical perspectives and current research on speech acoustics and perception: neurophysiology and brain organization underlying speech and language; machine recognition of speech; animal communication; speech evolution; implications for people with impaired communication skills.

SPHSC 420 Instrumentation for Speech and Hearing Sciences (3) A Wilson General problems in design and application of electronic equipment used in the speech and hearing sciences. Laboratory problems and demonstrations.

SPHSC 430 Nature of Stuttering (3) Asp Prins Major theories of stuttering are studied in light of research concerning the characteristics of stutterers and their symptoms. Prerequisite: 250 or permission of instructor.

SPHSC 431 Language Disorders of Children (4) Asp Carpenter, Coggins Consideration of descriptions and theories, both historical and contemporary, of disordered language in children and related problems. Prerequisites: 250, 303, 307.

SPHSC 444 Speech, Language, and Hearing Disorders in the Elderly (3) S Reich, Yantis Speech, language, and hearing changes caused by aging. Communication disorders in the elderly population and their management. Offered for students or practitioners involved in the delivery of health care and social services to the elderly.

SPHSC 449 Special Studies in Speech Pathology and Audiology (*) AWSpS Selected special problems in speech pathology and audiology. Prerequisite: permission of instructor.

SPHSC 450 Treatment of Stuttering (3) W Prins Description and evaluation of therapy systems for children and adults who stutter. Two hours per week of therapy observation are integrated with class material. Prerequisites: 350 and 430, or permission of instructor.

SPHSC 451 Speech Pathology-Audiology Practicum in the Schools (1-10, max. 10) AWSp Special projects in clinical practicum, offered only in the school setting. Provides an opportunity for students to extend practicum experiences in this special environment; does not fulfill requirements for teaching practicum in the College of Education. Prerequisites: 350 and permission of undergraduate adviser.

SPHSC 453 Communication Augmentation for Non-Speaking Individuals (3) S Communication needs of nonspeaking individuals. Interdisciplinary approaches to the evaluation, selection, and implementation of aided and unaided communication augmentation systems. Joint with REHAB 458. Prerequisite: basic course work in either speech and hearing sciences, physical therapy, occupational therapy, or engineering, or permission of instructor.

SPHSC 470 Survey of Audiological Assessment (3) S *Yantis* General review of methods, techniques, and instruments used in the measurement of auditory function. Designed for majors in speech pathology, speech science, and special education. Not open to audiology majors except by permission. Prerequisite: 370 or permission of instructor.

SPHSC 479 Pediatric Audiology (3) Sp *Thompson* Assessment of auditory disorders in infants and young children. Emphasis on behavioral and electrophysiologic techniques and on the role of the audiologist in the clinical management of the young hearing-impaired child. Prerequisite: 370 or equivalent.

SPHSC 499 Undergraduate Research (1-5, max. 15) AWSpS Prerequisite: permission of instructor.

Courses for Graduates Only

SPHSC 502 Advanced Anatomy of Speech and Hearing Structures (2) AWSp *Palmer* Directed individual dissection and study of selected anatomic structures of the speech and hearing mechanisms. Prerequisites: 201 and permission of instructor.

SPHSC 503 Current Issues in Speech and Hearing Sciences (3, max. 9) Application of experimental methods to research in speech science.

SPHSC 504 Research Methods in Speech and Hearing Science (3) AW *Kuhl, Minifie* Introduction to empirical methods in the speech and hearing sciences.

SPHSC 505 Clinical Research in Communication Disorders (3) W *Olswang* Introduction to clinical research. Methodological issues concerning the evaluation of treatment for speech, hearing, and language disorders. Primary emphasis on time series designs. Prerequisite: 504 or permission of instructor.

SPHSC 510 Physiological Acoustics (3) W *Burns* Study of pertinent literature and experimental techniques incident to the scientific study of the normal and abnormal auditory system. Prerequisites: 410 and familiarity with algebra and trigonometry. (Offered alternate years.)

SPHSC 511 Psychoacoustics (3) Sp *Burns* Review of significant literature and theory pertinent to normal auditory sensitivity, pitch, loudness, and other attributes of auditory sensation. Prerequisites: 410 or permission of instructor, familiarity with intermediate mathematics (MATH 105 or equivalent). (Offered alternate years.)

SPHSC 514 Speech Physiology (3) A *Cooker* Study of the physiological parameters of speech production. Prerequisites: 310, 311, or permission of instructor. (Offered alternate years.)

SPHSC 515 Speech Acoustics (3) W *Minifie* Study of the acoustical correlates of the distinctive parameters of speech. Prerequisites: 310, 311, 514, or permission of instructor. (Offered alternate years.)

SPHSC 516 Speech Perception (3) Sp *Kuhl* Study of the perceptual and linguistic parameters of speech perception. Prerequisites: 310, 311, 515, or permission of instructor. (Offered alternate years.)

SPHSC 519 Seminar in Speech Science (2, max. 6)

SPHSC 520 Advanced Instrumentation for Speech and Hearing Sciences (3) WS *Cooker, Wilson* Design and use of electronic and electroacoustic devices in the speech and hearing sciences. Four hours of laboratory required each week. Prerequisite: 420.

SPHSC 530 Maxillofacial Bases of Speech Disorders (3) A *Palmer* Causation and remediation of speech disorders derived from upper vocal tract defects, including cleft palate and other craniofacial defects. Thorough grounding in vocal tract anatomy and physiology, speech acoustics, and multidisciplinary rehabilitation approaches. Recommended: 201 or permission of instructor.

SPHSC 531 Neurogenic Motor Speech Disorders (5) Sp The nature of dysarthria and apraxia of speech and the evaluation and treatment of those disorders. Prerequisite: 401 or permission of instructor.

SPHSC 532 Neurogenic Language Disorders (5) W Nature of aphasia and other neurogenic language disorders; evaluation and treatment of those disorders. Prerequisite: 401 or permission of instructor.

SPHSC 533 Speech Pathology in a Medical Setting (3) Sp For speech pathology students who intend to work in a hospital. Prerequisites: 531 and 532 or permission of instructor.

SPHSC 534 Dysphagia and Associated Disorders (3) Sp *Palmer* Anatomophysiological bases of function and dysfunction associated with speech-language disorders. Mastication and swallowing problems, their causes, assessments, and management. Prerequisites: 201, 401.

SPHSC 535 Voice Disorders (4) WS *Reich* Physiology, acoustics, and perception of the normal and disordered human voice. Etiology, evaluation, and treatment of phonatory disorders.

SPHSC 536 Assessment of Language Impairment in Children (5) ASp *Carpenter, Coggins, Olswang* Principles and procedures used in the assessment of speech- and language-disordered children and adolescents. Prerequisites: 332, 431, and permission of instructor.

SPHSC 540 Phonological Development (3) Sp Selected topics in the developmental sequence of phonological systems in normal-speaking children. Relationships between possible phonological inventories and rule systems in different languages. Joint with LING 540. Prerequisites: LING 451, 452, or permission of instructor.

SPHSC 541 Syntactic and Semantic Development (3) Sp *Dale* Advanced topics in the study of first-language acquisition by children, including cognitive bases of language, cross-linguistic research, early semantic systems and their reorganization, learnability theory, and other theories of acquisition. Joint with LING 541. Prerequisite: PSYCH 457 or LING 447 or permission of instructor.

SPHSC 550 Intervention with Communication Disorders in the School Setting (2) W Study of administrative and clinical issues in implementation of programs to remediate communication disorders in the school-aged population. Field experiences and professional issues. Open only to graduate students in speech and hearing sciences.

SPHSC 551 Advanced Practicum in Speech Pathology Evaluation (1-9, max. 10) AWSpS Laboratory experience in the evaluation of speech and language disorders. Prerequisites: 536 and permission of instructor.

SPHSC 552 Advanced Practicum in Speech Pathology Management (1-8) AWSpS Laboratory experience in the management of speech and language disorders. Prerequisites: 551 and permission of instructor.

SPHSC 555 Preinternship (1-9) AWSpS Practicum in speech pathology or audiology designed to teach the clinical regimen of a participating professional center prior to assuming a full internship assignment. Prerequisite: 150 hours of supervised practicum.

SPHSC 566 Seminar in Speech-Language Development (2, max. 6) Prerequisites: 307, 431.

SPHSC 569 Seminar in Speech-Language Pathology (2, max. 6)

SPHSC 570-571 Assessment of Auditory Dysfunction I, II (5-5) A,W *Yantis* Strategies and procedures in the auditory evaluation of hearing-impaired adults. Laboratory required. Prerequisite: 370 or equivalent.

SPHSC 572 Immittance Audiometry (3) A *Wilson, Yantis* Instrumentation and approaches to evaluation of auditory function through determination of impedance characteristics, including tympanometry, and detection of the acoustic reflex. Prerequisite: 370 or equivalent.

SPHSC 573 Electrophysiologic Assessment of Auditory Function (3) Sp *Folsom* Consideration of electrophysiologic techniques that may be used to evaluate the normal and disordered auditory system. Outside laboratory required. Prerequisite: 310 or permission of instructor.

SPHSC 575 Medical Backgrounds in Audiology (3) A *Snyder* Diseases and injuries of the ear resulting in reduced audition. Prerequisite: -571 or permission of instructor.

SPHSC 581 Management of Hearing-Impaired Children (3) S Management of hearing-impaired children, including identification of target behaviors and methods for modification such as individualized therapy programs and parent and teacher involvement.

SPHSC 582 Hearing Aid Amplification (4) W Acoustic amplification and methods of determining electroacoustic characteristics. Includes earmold technology. Prerequisites: 370, 380, or permission of instructor.

SPHSC 583 Hearing Aid Selection (3) Sp *Yantis* Consideration of strategies utilized in selecting acoustic amplification for the hearing impaired, including review of pertinent research literature. Prerequisite: 582 or permission of instructor.

SPHSC 584 Industrial and Community Hearing Conservation (2) W *Yantis* Psychophysiological effects of environmental noise on man. Techniques of noise measurement and attenuation, including the planning of hearing conservation programs in industry and in the community. Prerequisite: 370 or permission of instructor. (Offered alternate years.)

SPHSC 588 Proseminar (1, max. 3) ASp Consideration of professional issues and student/faculty research in specific areas of interest.

SPHSC 589 Seminar in Audiology (2, max. 6) Prerequisite: permission of instructor.

SPHSC 591 Advanced Practicum in Audiology (1-9, Max. 10) AWSpS Prerequisite: forty hours of practicum.

SPHSC 599 Research Practicum (*, max. 12) AWSpS Supervised laboratory experience in experimental approach to problems in speech and hearing sciences. Prerequisite: permission of instructor.

SPHSC 600 Independent Study or Research (*) AWSpS Prerequisite: permission of instructor.

SPHSC 601 Internship (3-9, max. 9) AWSpS Prerequisite: 150 hours of supervised practicum.

SPHSC 700 Master's Thesis (*) AWSpS

SPHSC 800 Doctoral Dissertation (*) AWSpS

Speech Communication

205 Raftt

Speech communication is the study of the ways people share meanings and make their ideas known to each other in face-to-face interaction. The major in speech communication is designed to enable students to analyze and evaluate their own and others' communication behavior, to understand speech as a form of behavior and a social process, and to become better communicators themselves.

Undergraduate Program

Advisers
Robert M. Post
Beatrice Restoule
206B Raftt

Students in the department begin their study in introductory courses in public speaking, interpersonal communication, and small-group decision making. In advanced courses, students study and analyze specialized forms of communication—persuasion, argumentation, small-group facilitation, and communication in instructional settings and large organizations.

Bachelor of Arts Degree

Admission Requirements: A minimum of 30 quarter credits completed and a minimum 2.50 overall grade-point average (2.50 guarantees consideration, but not acceptance). Recommended courses include 10 credits in quantitative and symbolic reasoning; 10 credits in history, literature, and philosophy; and 10 credits in English composition (see department for list of recommended courses). Students submit an application packet that includes: (1) application form; (2) current class schedule; (3) copies of transcripts and grade reports; (4) statement of objectives. Applications are due the end of the third week of the quarter. Admission is once a quarter—Autumn, Winter, and Spring.

Major Requirements: 60 approved credits, which includes 32-33 credits of core requirements (students should consult with departmental adviser upon entering the program regarding distribution of core requirements), and 27-28 elective credits, of which 15 credits must be in courses at the 400 level, excluding 499. For core requirements, students should complete: 10 credits from SPCH 103, 140, 220; 5 credits from 334, 373; 14-15 credits from 270, 305, 310, 476; and 400. A 2.50 overall grade-point average in all speech courses taken is required.

Graduate Program

Graduate study is guided by the principle that speech communication is a unified discipline concerned with the ways persons share meanings and how shared meanings affect, and are affected by, persons and society at large. Specialty areas include: communication theory; interpersonal, small-group, organizational, instructional, cultural, and developmental communication; communication education; oral interpretation; freedom of speech; argument; rhetorical theory; criticism; and public address. Emphasis is on both "social scientific" and "humanistic" methods of scholarly inquiry.

The M.A. program with thesis requires at least 31 credits of approved course work and a thesis (9 credits). The M.A. program without thesis: 45 credits and completion of a creative project.

The Ph.D. program usually requires four to five years of study beyond the baccalaureate degree.

Special Research Facilities

A laboratory complex accommodates studies on groups of varying sizes and includes one-way mirrors, audio and video capabilities, and event recorders that feed observations directly into computers. A computer workroom houses the microcomputer system and contains terminals and printers linked to all five of the University's computer centers. An instructional resource center provides support for the development and use of audio, video, and visual materials for teaching and research.

Admission Qualifications

Baccalaureate degree in speech communication or equivalent background.

Financial Assistance

The department annually awards a number of teaching assistantships.

Correspondence and Information

Graduate Program Coordinator
205 Raftt, DL-15

Faculty

Chairperson

Ann Q. Staton-Spicer

Professors

Baskerville, Barnet, 1948, (Emeritus), M.A., 1944, Washington; Ph.D., 1948, Northwestern; public address, rhetorical criticism.

Bosmajian, Haig A.,* 1965, M.A., 1951, Pacific; Ph.D., 1960, Stanford; rhetoric, freedom of speech.

Crowell, Laura L., 1949, (Emeritus), M.A., 1940, Ph.D., 1948, Iowa; public address, discussion.

Nilsen, Thomas R., 1950, (Emeritus), M.A., 1948, Washington; Ph.D., 1953, Northwestern; contemporary rhetorical theory, ethics of rhetoric.

Scheidel, Thomas M.,* 1976, M.A., 1955, Ph.D., 1958, Washington; communication theory and research, small-group processes.

Associate Professors

Albrecht, Terrance L.,* 1979, M.A., 1975, M.Lir., 1978, Ph.D., 1978, Michigan State; organizational communication, persuasion.

Campbell, John A.,* 1968, M.A., 1967, Ph.D., 1968, Pittsburgh; modern rhetorical theory, British public address.

Nelson, Oliver W., 1945, (Emeritus), M.A., 1939, Ph.D., 1949, Washington; speech education.

Parks, Malcolm R.,* 1978, M.A., 1975, Ph.D., 1976, Michigan State; communication theory, interpersonal communication, research methods.

Phillipsen, Gerry F.,* 1978, Ph.D., 1972, Northwestern; ethnography of communication.

Post, Robert M.,* 1960, M.A., 1958, Ph.D., 1961, Ohio; oral interpretation of literature.

Staton-Spicer, Ann Q.,* 1977, M.A., 1973, Baylor; Ph.D., 1977, Texas; instructional communication.

Stewart, John R.,* 1969, M.A., 1964, Northwestern; Ph.D., 1970, Southern California; philosophy of qualitative research and interpersonal communication.

Warnick, Barbara P.,* 1980, M.A., 1972, Marshall; Ph.D., 1977, Michigan; rhetorical theory and criticism.

Assistant Professor

Kline, Susan L.,* 1984, M.A., 1977, Ph.D., 1981, Illinois (Urbana); interpersonal communication, communication development.

Lecturers

Hogan, Michael, 1949, (Emeritus), M.A., 1950, Washington; oral interpretation.

Nyquist, Jody D., 1967, M.A., 1967, Washington; communication education.

Course Descriptions

Courses for Undergraduates

SPCH 102 Speech, the Individual, and Society (5)
AWSp Kline, Phillipsen, Stewart Provides a basic understanding of human speech communication. Covers three major areas: (1) the nature of human communication, including models, principles, settings; (2) elements of verbal and nonverbal communication; and (3) approaches to, and functions of, human communication including persuasion, interpersonal communication, argument, propaganda, free speech.

SPCH 103 Interpersonal Communication (5)
AWSp Stewart Emphasizes analyzing and understanding communication variables affecting human relationships, such as person perception, feedback, idea development, nonverbal cues. Focus on informal communication settings.

SPCH 140 Oral Interpretation of Literature (5)
AWSp Post Analysis and critical study of imaginative literature through the medium of oral performance. Includes verse, prose, and drama.

SPCH 203 Communication in the Classroom (5)
AWSp Staton-Spicer Theory and practice of interpersonal communication in instructional settings. Designed to prepare prospective teachers to employ communication effectively as a medium of teaching and learning, to create a classroom communication environment in which interaction is open and productive. Recommended for all teacher candidates in any discipline.

SPCH 220 Introduction to Public Speaking (5)
AWSp Campbell Emphasizes choice and organization of material, sound reasoning, audience analysis, oral style, and delivery. Overview of history of rhetoric. Classroom speeches followed by conferences with instructor.

SPCH 222 Speech Communication in a Free Society (3) W Bosmajian Problems and arguments related to freedom of speech; early English writers on freedom of expression; background of freedom of speech in the United States; contemporary freedom of speech issues.

SPCH 235 Parliamentary Procedure (3) A Bosmajian Principles and practice: a study of the historical bases and contemporary uses of parliamentary procedure; methods and practice in organizing and conducting public meetings.

SPCH 270 Introduction to Empirical Research in Speech Communication (5)
Albrecht Basic research principles in speech-communication science; survey of substantive research findings. Recommended: any 100- or 200-level speech communication course.

SPCH 301 Interviewing (5)
Warnick Interviewing principles and practices, with emphasis on information gathering and persuasive interviews. Purposes and types of interviews, structure of interviews, and influence of communication patterns on interview outcomes.

SPCH 305 Perspectives on Language in Speech Communication (5)
Phillipsen, Stewart Study of language and meaning, and survey of several influential modern approaches, including: the semantic, general-semantic, behavioral, and analytic philosophical. Relates theories of language and meaning to the study of speech communication.

SPCH 308 Humanistic Approaches to Interpersonal Communication (5) *Stewart* Exploration of several humanistic approaches to interpersonal speech communication, emphasizing the theorists' philosophical orientations.

SPCH 310 The Rhetorical Tradition in Western Thought (5) *Purcell, Warnick* Analysis of the major theories that prescribe and describe the use of symbols to change attitudes and behavior. Principal emphasis is placed upon defining the nature and scope of rhetoric and upon analyzing the art's underlying assumptions about human beings as symbol users. Some background in history, philosophy, and literature is desirable. Recommended: junior standing.

SPCH 320 Public Speaking (5) Practice in preparation and presentation of a variety of types of public speeches based on study of their structure and form; emphasis on organization and delivery. Recommended: 220.

SPCH 329 Rhetoric of Social and Political Movements (5) *Sp Bosmajian* Inquiry into the rhetoric of social and political movements; emphasis on investigation of persuasive discourse; examination of the non-verbal symbols of persuasion.

SPCH 334 Essentials of Argument (5) *Purcell* Argument as a technique in the investigation of social problems; evidence, proof, refutation, persuasion; training in argumentative speaking.

SPCH 335 Methods of Debate (5) *Warnick* Debate as a method of advocacy, with emphasis on the analysis of value and policy questions. Prerequisite: 220 or 334.

SPCH 341 Oral Interpretation of Children's Literature (3) *Post* Study and performance of children's literature, emphasizing oral interpretation as a method of teaching literature in the elementary school.

SPCH 349 Readers Theatre (2, max. 10) *Post* Preparation and public presentation of programs of literary works. Prerequisites: 140 and permission of instructor.

SPCH 368 Small-Group Facilitation (3) Methods for facilitating discussion in small groups formed for the purposes of instruction. Emphasis is on each student's practical application of the insights derived. Prerequisites: permission of instructor, concurrent registration in 369; recommended: 102.

SPCH 369 Small-Group Facilitation Practicum (2) Implementation of the theoretical principles taught in 368. Emphasis on direct application of those principles to an assigned group of students from 102. Prerequisite: concurrent registration in 368.

SPCH 373 Principles of Group Discussion (5) *Philipsen* Discussion as an everyday community activity, with emphasis on the informal cooperative decision-making methods of committee, conference, and roundtable groups.

SPCH 375 Ethics in Interpersonal and Public Speech Communication (5) *W* Ethical problems in interpersonal and public speech communication. Alternative ways of evaluating and responding to moral problems in a variety of communication situations.

SPCH 400 Theoretical Backgrounds in Speech Communication (3) *Philipsen* Speech viewed as a form of individual and social behavior, with emphasis on the function of symbols in speech communication in informal and societal settings. The development of speech as a field of study, and its contemporary emphases.

SPCH 421 Advanced Speech Composition (5) Preparation and delivery of public speeches, with emphasis on style, thought organization, and proof. Analysis of model speeches. Recommended: 220 or 320.

SPCH 424 Rhetorical Perspective in Revolutionary Documents (5) *Campbell* Rhetorical investigation of selected major writings. Examines the rhetorical dimension in the progress of ideas through analysis of revolutionary documents as persuasive works. Relates principal revolutions in Western thought to contemporary controversy. Examines *Rights of Man*, *Communist Manifesto*, *The Origin of Species*, etc.

SPCH 425 American Public Address (5) *Campbell* Historical and critical study of principal speakers and speeches and of their relationship to American political, social, and intellectual life. Oratory of the American Revolution; the "golden age" of American oratory; debates on ratification of the federal Constitution, the slavery question, Reconstruction, woman suffrage, populism, imperialism.

SPCH 426 American Public Address (5) *Campbell* Historical and critical study of principal speakers and speeches and of their relationship to American political, social, and intellectual life. The public lecture—Lyceum to Chautauqua; academic addresses; the progressive era; League of Nations debate; polemics of the New Deal era; isolationism versus one world; the Cold War era; controversy over civil rights. Recommended: 425.

SPCH 428 British Public Address (5) *Campbell* Historical and critical analysis of significant speeches and speakers and of their relationship to British social, political, and religious life. Historical overview of the major periods of British oratory and of the unique role of the oration in each as a means of exhortation and advocacy.

SPCH 434 Argumentation Theory (5) *Kline, Warnick* Theory and research on the structure and properties of argument, argument fields, argument modeling, the influence of audience, argument criticism, and related topics.

SPCH 440 Oral Interpretation of Poetry (3) *W Post* Study of forms of verse through analysis and oral presentation. Recommended: 140.

SPCH 442 Oral Interpretation of Fiction (3) *A Post* Analysis and oral interpretation of narrative perspectives in the novel and the short story. Recommended: 140.

SPCH 444 Oral Interpretation of Modern Dramatic Literature (3) *Sp Post* Study of dramatic literature from Ibsen to the present for purposes of developing understanding, appreciation, and ability to communicate its meaning. Recommended: 140.

SPCH 455 Communication in Children's Environments (4) *Nyquist, Staton-Spicer* Study of the communication capacity of children with emphasis on the analysis of the communication process in formal and informal learning environments. Includes examination of communication-based educational approaches and instructional strategies.

SPCH 456 Communication in Youth Environments (4) *Nyquist, Staton-Spicer* Study of the communication process in youth environments with a primary focus on formal and informal learning. Includes critical analysis of communication in contemporary instructional settings, and the development of communication strategies for teaching and learning.

SPCH 471 Persuasion (3) *Kline* Analysis of the ways in which beliefs, values, attitudes, and behavior are deliberately influenced through communication. Recommended: junior standing.

SPCH 472 Empirical Approaches to Interpersonal Communication (5) *Parks* Examination of major theoretic positions and empirical research findings in current speech communication literature on interpersonal influence. Emphasis on the insights that such theory and research provides on human speech-communication behavior in common interpersonal situations. Recommended: junior standing.

SPCH 473 Problems of Discussion Leadership (3) *Schedel* Critical analysis of leadership in committee and conference, with emphasis on the development of speech effectiveness in the cooperative achievement of goals. Recommended: 373.

SPCH 475 Organization Communication (5) *Albrecht* Role of communication in organizations, the types of problems arising, and approaches to their resolution. Communication in the human relations and productivity of organizations. Applying communication skills in various organization roles. Recommended: junior standing.

SPCH 476 Models and Theories in Speech Communication (4) Examination of selected theories and models of speech communication from the behavioral sciences, as well as of criteria applicable to them. Emphasis on the nature and function of theories and models, especially as these relate to basic principles underlying the scientific study of speech communication phenomena. Recommended: junior standing.

SPCH 484 Cultural Codes in Communication (5) *Philipsen* Social and cultural codes in interpersonal communication, with special reference to contemporary American subcultural groups and their communication patterns.

SPCH 488 Special Topics in Speech Communication (2-5, max. 15) *AWSp* Lecture, seminar, and/or team study. Topics vary.

SPCH 499 Undergraduate Research (1-5, max. 10) *AWSpS* Prerequisite: permission of instructor.

Courses for Graduates Only

SPCH 501 Introduction to Graduate Research in Speech Communication (3) *A Schedel, Warnick*

SPCH 521 Studies in Greek and Roman Rhetoric (5) *Purcell* Development of the Greek tradition in rhetorical theory, criticism, and pedagogy from Homer to Augustine; analysis of the contributions of major figures and works to that tradition.

SPCH 522 Studies in Medieval Rhetoric (5) *Purcell* Critical analysis of selected persons, works, and topics related to the development of rhetorical theory during the Middle Ages.

SPCH 523 Studies in Renaissance and Modern Rhetoric (5) *W* Development of rhetorical theory from the mid-sixteenth to early nineteenth centuries. Examines the contributions of Wilson, Ramus, Bacon, Port Royalists, Vico, Campbell, Blair, and Whately.

SPCH 524 Studies in Contemporary Rhetoric (5) *Sp Warnick* Critical analysis of theories of rhetoric from early twentieth century.

SPCH 525 Rhetorical Criticism (5) History and method of rhetorical criticism. Application of critical standards to notable British and American speeches.

SPCH 540 History of Oral Interpretation (3) *Post* Critical analysis of writings by Sheridan, Walker, Rush, Delsarte, Bell, Curry, Emerson, and others.

SPCH 550 Instructional Design in Speech Communication (4) *Staton-Spicer* Research, theory, and practice relevant to instructional design in speech communication. Instructional models, writing instructional objectives, strategies, and evaluative measures.

SPCH 555 Instructional Communication (5) *Staton-Spicer* Communication in instructional environments. Nature of instructional communication, paradigms for instructional communication research, quantitative and qualitative approaches to instructional communication, verbal and nonverbal classroom interaction.

SPCH 560 Social Scientific Perspectives on Interpersonal Communication (5) *A Parks* Social scientific research and theory on the role of communica-

tion in developing and maintaining interpersonal relationships. Nature of interpersonal communication, relationship change processes, interpersonal control through communication, and personal communication networks.

SPCH 570 Organizational Communication (5) Albrecht Examination of social scientific theory and research on communication in organizations. Topics include quantitative and qualitative approaches to process of organizational communication, function and structure of macro networks, superior-subordinate relationships, and the role of communication in organizational change, development, and effectiveness. Prerequisite: graduate standing in the social sciences.

SPCH 575 Philosophy of Interpretive Research in Communication (5) Phillipsen, Stewart Introduces interpretive researchers to foundations of this approach in Dilthey, Gadamer, Schutz, Weber, Wittgenstein, and others. Emphasizes Gadamer's philosophical hermeneutics.

SPCH 576 Research Methods in Speech Communication (5) Parks Application of behavioral research principles to problems in quantification, design, and analysis of data in speech communication research.

SPCH 577 Research Problems in Speech Communication (3-6, max. 12) Application of methodology and design principles to research problems in speech communication.

SPCH 588 Small-Group Communication (5) Scheidel Major small-group theories relevant to communicative behavior. Descriptive and experimental research findings in current speech communication literature. Prerequisite: 473.

SPCH 590 Seminar in Theory of Speech Communication (3-4, max. 12)

SPCH 592 Seminar in Public Address (3-4, max. 12)

SPCH 593 Seminar in Rhetorical Theory (3-4, max. 12)

SPCH 595 Seminar in Speech Communication Education (3-4, max. 12) Sp

SPCH 597 Seminar in Interpersonal Communications (3-4, max. 12) WSp Examination of experimental literature on selected topics. Subject changes from year to year; topics include conflict resolution, information processing, communication networks, feedback systems, audience composition research, communication effects.

SPCH 598 Small-Group Discussion and Communication (3-4, max. 12) Introduction to study of communication within small problem-solving groups. Theoretical as well as methodological dimensions of selected studies. Emphasis on role communication in decision-making process. From a communication viewpoint, examines such topics as conformity, consensus, interpersonal attraction, and emergent phases of discussion.

SPCH 600 Independent Study or Research (*) AWSps

SPCH 700 Master's Thesis (*) AWSps

SPCH 800 Doctoral Dissertation (*)

lege of Engineering; the Departments of Computer Science, Economics, Genetics, Geological Sciences, Mathematics, and Psychology; Quantitative Science; the Applied Physics Laboratory; and the Applied Statistics Division of the Boeing Company. The department has an especially close relationship with the Department of Biostatistics.

Undergraduate Program

Bachelor of Science Degree

Major Requirements: MATH 124, 125, 126; 302, 303; 328, 329; (the honors sequences in calculus may replace the corresponding regular sequences); C SCI 210, 211, (or ENGR 141, MATH 238, ENGR 341); STAT 311, 341, 342, 421, 423 and two other upper-division statistics courses chosen with prior approval of the statistics adviser. Electives (9 credits): one upper-division course in mathematics, statistics, or computer science, plus two upper-division courses in any discipline (including mathematics, statistics, and computer science), all subject to prior approval by the statistics adviser. The first elective gives an opportunity to define the flavor of the major within interrelated fields, and the other two give a chance to broaden the basis of the major into a special interest area, chosen from the full range of upper-division courses offered at the University. Grades of 2.0 or better in all courses used to satisfy major requirements. Cumulative grade-point average of 2.50 in required statistics courses.

Graduate Program

The graduate program emphasizes both the theory and application of statistics, including probability theory, mathematical statistics, data analysis, statistical computing, and scientific applications. An ongoing statistical consulting program provides the students with practical experience in using statistics and in communicating with clients. Under faculty supervision, participants in the program assist members of the University community in applying statistical methodology. The department offers Master of Science and Doctor of Philosophy degrees. A new master's degree option within the existing Master of Science degree having special emphasis on data analysis and statistical computing has been proposed and is in preparation.

Master of Science Degree

Graduation Requirements: At least twelve approved courses numbered 400 or above with a value of 36 credits or more; of these, at least six courses must be numbered in the 500 series (exclusive of 511, 512, 513) with a value of 18 credits or more, and with a coherent theme. Approved proficiency in statistical computing. Satisfactory participation in statistical consulting and the departmental seminar. Passage of an appropriate final master's examination. Successful completion of a master's thesis can count as up to three courses worth 9 credits (may not replace any of the six courses in the 500 series mentioned above). All programs must be approved in advance by the departmental graduate program coordinator.

Doctor of Philosophy Degree

Admission Requirements: Background in mathematics, statistics, or a quantitative field.

Graduation Requirements: Appropriate training in statistics and related sciences. Appropriate General Examination of basic graduate-level knowledge in statistics and probability (including two preliminaries). Satisfactory performance in MATH 424, 425, 426 and STAT 581, 582, 583. Satisfactory performance in STAT 521, 522, 523 (in some circumstances, other graduate-level mathematical science courses may be used as a substitute). Approved performance in statistical consulting (typically continuing participation in

STAT 599). Demonstration of proficiency in computing. 1 credit of STAT 590 per quarter. Demonstration of ability to read technical literature in French, German, or Russian. Dissertation. Final Examination.

Typically, the Ph.D. program includes a minimum of course work equivalent to STAT 570, 571, 572; 581, 582, 583; 521, 522, 523; six other 500-level courses in a coherent program; 599; and demonstrated computing ability.

Computing Facilities

Computing facilities in the Department of Statistics rank among the best of any statistics program in the country and reflect the department's expertise in the field of statistical computing. For graduate instruction, the department relies partially on a VAX 11/785 owned jointly with computer science and mathematics departments. In addition, there is an instructional laboratory of IBM advanced workstations. Part of the research computing is done on a VAX 11/750 shared among statistics, mathematics, and biostatistics departments. Both VAX computers run Unix and the statistical languages S and ISP. In addition, the department owns three Symbolics-3600 Lisp machines, used mainly for research in statistical computing environments and graphics, ten UNIX workstations, and a number of microcomputers.

Faculty

Chairperson

Galen R. Shorack

Professors

Birnbaum, Z. W.,* 1939, (Emeritus), (Mathematics),† LL.M., 1925, Ph.D., 1929, John Casimir (Poland); nonparametric statistics, probability, theory competing risks.

Felsenstein, Joseph,* 1967, ‡(Genetics), Ph.D., 1968, Chicago; estimation of evolutionary trees, models of long-term evolutionary processes, and theoretical population genetics.

Fleming, Thomas R.,* 1984, (Biostatistics),† M.A., 1974, Ph.D., 1976, Maryland; survival analysis, clinical trials, sequential analysis.

Ford, E. David,* 1985, ‡(Biostatistics, Fisheries, Forest Resources), Ph.D., 1968, University College (London); modelling plant response to environment, interpreting ecological processes from spatial patterns, statistical inference for complex models, measurement theory for ecological processes, time-series analysis.

Kronmal, Richard A.,* 1964, (Biostatistics),† Ph.D., 1964, California (Los Angeles); nonparametric density estimation, computer algorithms, cardiovascular data analysis.

Lunneborg, Clifford E.,* 1962, (Psychology),† M.S., 1957, Ph.D., 1959, Washington; applied multivariate analysis, linear models, educational and psychological measurement.

Martin, R. Douglas,* 1969, M.S.E., 1965, Washington; Ph.D., 1969, Princeton; robust methods, time series, data analysis.

Nelson, Charles R.,* 1975, ‡(Economics), M.A., 1967, Ph.D., 1969, Wisconsin; econometrics, time-series analysis, monetary economics.

Perlman, Michael D.,* 1979, M.S., 1965, Ph.D., 1967, Stanford; multivariate analysis, decision theory.

Shorack, Galen R.,* 1966, (Mathematics), M.A., 1962, Oregon; Ph.D., 1965, Stanford; empirical processes, tolerance bounds, nonparametric statistics.

Thompson, Elizabeth A.,* 1985, M.A., 1974, Ph.D., 1974, Cambridge; statistical analysis of human genetic data, population genetics.

Wellner, Jon A.,* 1983, (Biostatistics),† Ph.D., 1975, Washington; large-sample theory, asymptotic efficiency, empirical processes, survival analysis.

Statistics

B313 Padelford

By means of joint faculty appointments, the Department of Statistics maintains active academic contracts with the School of Business Administration; the Col-

Associate Professors

Buja, Andreas,* 1982, M.S., 1975, Ph.D., 1980, Eidgenössische Technische Hochschule (Switzerland); statistical computing, data analysis, robust statistics.

O'Sullivan, Finbarr,* 1987, (Biostatistics),† Ph.D., 1983, Wisconsin; nonparametric function estimation.

Raftery, Adrian E.,* 1986, (Sociology),† M.Sc., 1977, Trinity (Dublin); Ph.D., 1980, Université de Paris VI; time series, point processes, discrete data, applications in sociology.

Scholz, Friedrich W.,* 1981, (Affiliate), Ph.D., 1971, California (Berkeley); tests of fit, software reliability, tolerance bounds.

Siegel, Andrew F.,* 1983, ‡(Management Science), (Finance and Business Economics, Zoology), M.S., 1975, Ph.D., 1977, Stanford; exploratory data analysis, statistical computing and graphics, robust methods, geometric probability, applications in business, economics, and zoology.

Stuetzle, Werner,* 1984, (Computer Science), Ph.D., 1977, Eidgenössische Technische Hochschule (Switzerland); nonparametric methods in multivariate analysis, statistical applications of computer graphics, programming environments.

Assistant Professors

Guttorp, Peter,* 1980, M.A., 1976, Ph.D., 1980, California (Berkeley); point processes, stochastic models, time series, applications to hydrology and geophysics.

McDonald, John A.,* 1985, (Research), Ph.D., 1982, Stanford; computer graphics for data analysis, programming environments and languages.

Possolo, Antonio,* 1984, (Geological Sciences), Ph.D., 1983, Yale; spatial statistics, point processes.

Course Descriptions**Courses for Undergraduates**

STAT 220 Basic Statistics (5) AWSpS Objectives and pitfalls of statistical studies. Structure of data sets, histograms, means, and standard deviations. Correlation and regression. Probability, binomial and normal. Interpretation of estimates, confidence intervals, and significance tests. (Students may receive credit for only one of 220, 301, 311, and ECON 311.) Prerequisite: 1½ years of high school algebra.

STAT 311 Elements of Statistical Methods (5) AWSpS Elementary concepts of probability and sampling; binomial and normal distributions. Basic concepts of hypothesis testing, estimation, and confidence intervals; t-tests and chi-square tests. Linear regression theory and the analysis of variance. (Students may receive credit for only one of 220, 301, 311, and ECON 311.) Prerequisite: MATH 105 or 156.

STAT 316 Regression Analysis and Design of Experiments (3) Introduction to the analysis of data from planned experiments. Analysis of variance and regression analysis with applications in engineering. Joint with IND E 316. Prerequisite: IND E 315 or permission of instructor.

STAT 341, 342 Introduction to Probability and Statistical Inference I, II (4,4) AW, WSp Sample spaces, random variables, probability. Distributions: binomial, normal, Poisson, geometric. Expectation, variance, moment generating functions. Central limit theorem. Basic concepts of estimation, testing and confidence intervals. Maximum likelihood estimators and likelihood ratio tests; efficiency. Introduction to regression and analysis of variance. (Students may not receive credit for both 341 and 481.) Prerequisite: 311, MATH 126.

STAT 361, 362 Statistics for Social Scientists (3,3) A,W Sampling, normal distribution, regression, correlation, analysis of variance, multiple regression, analysis of covariance, experimental design. Applications in the social sciences.

STAT 390 Probability and Statistics in Engineering and Science (4) AWSpS Concepts of probability and statistics. Conditional probability, independence, random variables, distribution functions. Descriptive statistics, transformations, sampling errors, confidence intervals, least squares and maximum likelihood. Exploratory data analysis and interactive computing. Joint with MATH 390. (Students may not receive credit for both 390 and 481.) Prerequisites: MATH 126 and MATH 205 or 302.

STAT 394 Probability I (3) AWS Sample spaces; basic axioms of probability; combinatorial probability; conditional probability and independence; binomial, Poisson and normal distributions. Joint with MATH 394. Prerequisite: MATH 126.

STAT 395 Probability II (3) WSpS Random variables; expectation and variance; laws of large numbers; normal approximation and other limit theorems; multidimensional distributions and transformations. Joint with MATH 395. Prerequisite: 394.

STAT 396 Probability III (3) Sp Characteristic functions and generating functions; recurrent events and renewal theory; random walk. Joint with MATH 396. Prerequisite: 395 or 511.

STAT 403 Introduction to Data Analysis (4) W Philosophy, methods of exploratory data analysis, robustness, statistical graphics. Structure in data sets: groups of numbers, several groups, bivariate, time series, two-way tables. Includes plotting, transformation, outlier identification, regression, smoothing, median polish. Joint with QMETH 403. May not be taken for credit if credit received for 503. Prerequisite: 220 or 311 or QMETH 201 or ECON 311.

STAT 421 Applied Statistics and Experimental Design (4) A Computer-aided data analyses using comparisons between batches, analysis of variance and regression. Evaluation of assumptions, data transformation, reliability of statistical measures (jackknife, bootstrap). Fisher-Gosset controversy. Prerequisites: 342, 390, 481, or grade of 3.0 in 311 plus MATH 126 or permission of instructor.

STAT 423 Applied Regression and Analysis of Variance (4) W Regression analysis. Problems in interpreting regression coefficients. Estimation, including two-stage least squares. Guided regression: building linear models, selecting carriers. Regression residuals. Analysis of variance. Nonparametric regression. Factorial designs, response surface methods. Prerequisites: 342, 390, 421, 481, or grade of 3.0 in 311 plus MATH 126, or permission of instructor.

STAT 425 Introduction to Nonparametric Statistics (3) Overview of nonparametric methods, such as rank tests, goodness of fit tests, 2x2 tables, nonparametric estimation. Useful for students with only a statistical methods course background. Joint with BIOST 425. Prerequisites: 311, BIOST 473, 511, or permission of instructor.

STAT 427 Introduction to Analysis of Categorical Data (4) Techniques for analysis of count data. Log-linear models, logistic regression, and analysis of ordered response categories. Illustrations from the behavioral and biological sciences. Computational procedures. Prerequisites: 362, 421, or permission of instructor.

STAT 428 Multivariate Analysis for the Social Sciences (4) Multivariate techniques commonly used in the social and behavioral sciences. Linear models for dependence analysis (multivariate regression, MANOVA, and discriminant analysis) and for interdependence analysis (principal components and factor analysis). Techniques applied to social science data using computer statistical packages. Prerequisites: 362, 421, or permission of instructor.

STAT 480 Sampling Theory for Biologists (3) Sp Simple random sampling, stratified random sampling, ratio estimates, regression estimates, systematic sam-

pling, cluster sampling, sample size determinations, applications in fisheries and forestry. Sampling plant and animal populations, sampling distributions, estimation and statistical treatment of data. Joint with Q SCI 480. Prerequisites: Q SCI 482, 483, or permission of instructor.

STAT 481 Introduction to Mathematical Statistics (5) A Probability, generating functions; the δ -method, Jacobians, Bayes theorem; maximum likelihoods, Neyman-Pearson, efficiency, decision theory, regression, correlation, bivariate normal. Joint with ECON 481. (Students receiving credit for either 341 or 390 may not receive credit for 481.) Prerequisites: 311, ECON 311 or equivalent; MATH 124, 125, 126; and a course in linear algebra, which may be taken concurrently.

STAT 486 Experimental Design (3) Sp Topics in analysis of variance and experimental designs; choice of design, comparison of efficiency, power, sample size, use of computer for standard analyses. Joint with Q SCI 486. Prerequisite: Q SCI 483.

STAT 491, 492 Introduction to Stochastic Processes (3,3) A,W Random walks, Markov chains, branching processes, Poisson process, point processes, birth and death processes, queueing theory, stationary processes. Joint with MATH 491, 492. Prerequisites: 396 for 491; 491 for 492.

STAT 498 Special Topics (1-5, max. 15) Reading and lecture course intended for special needs of students. Prerequisite: permission of instructor. (Offered when demand is sufficient.)

STAT 499 Undergraduate Research (1-5, max. 15) Prerequisite: permission of instructor.

Courses for Graduates Only

STAT 503 Practical Methods for Data Analysis (3) Sp Basic exploratory data analysis with business examples. Groups of numbers, multivariate data, time series, multiway tables. Techniques, include plotting, transformation, outlier identification, cluster analysis, smoothing, regression, median polish, and robustness. Joint with QMETH 503. May not be taken for credit if credit received for 403. Prerequisite: 342 or QMETH 500 or equivalent, or permission of instructor.

STAT 506 Applied Probability and Statistical Inference (4) Overview of probability models, random variables, independence and conditional probability, Markov chains, stationary time series, statistical inference, estimation and testing. Joint with AMATH 506. Prerequisites: some advanced calculus and linear algebra.

STAT 511 Probability (5) Fundamental concepts; discrete and continuous random variables; expectation, law of large numbers; important distributions; characteristic functions; central limit theorem. No more than 6 credits from among 394, 395, and 511 can be counted toward any degree. Prerequisites: MATH 328 and senior or graduate standing, or permission of instructor.

STAT 512, 513 Statistical Inference (4,4) A,W General theory of statistical inference; estimation and hypothesis testing; multivariate theory; regression, correlation, and analysis of variance. Prerequisites: 395 (concurrent registration permitted) or 511, and 421, 423, or BIOST 512 (concurrent registration permitted for these three) for 512; 512 for 513.

STAT 516-517 Stochastic Modeling of Scientific Data (4-4) Models and statistical analysis of data with a significant temporal and/or spatial structure. Markovian and semi-Markovian models, point processes, cluster models, queueing models, likelihood methods, estimating equations. Prerequisites: 511 or 396 for 516; 516 for 517.

STAT 519 Time Series Analysis (3) Descriptive techniques. Stationary and nonstationary processes, including ARIMA processes. Estimation of process

mean and autocovariance function. Fitting ARIMA models to data. Statistical tests for white noise. Forecasting. State space models and the Kalman filter. Robust time series analysis. Regression analysis with correlated errors. Statistical properties of long memory processes. Prerequisite: 513.

STAT 520 Spectral Analysis of Time Series (4) Estimation of spectral densities for single and multiple time series. Nonparametric estimation of spectral density, cross-spectral density, and coherency for stationary time series, real and complex spectrum techniques. Bispectrum. Digital filtering techniques. Aliasing, prewhitening. Choice of lag windows and data windows. Use of the fast Fourier transform. The parametric autoregressive spectral density estimate for single and multiple stationary time series. Spectral analysis of nonstationary random processes and for randomly sampled processes. Techniques of robust spectral analysis. Joint with E E 520. Prerequisite: one of 342, 390, 481, or permission of instructor.

STAT 521, 522, 523 Advanced Probability (3,3,3) A,W,Sp Measure theory and integration, independence, laws of large numbers. Fourier analysis of distributions, central limit problem and infinitely divisible laws, conditional expectations, martingales. Joint with MATH 521, 522, 523. Prerequisite: MATH 426.

STAT 524 Design of Medical Studies (3) Emphasis on randomized controlled clinical trials. Bias elimination, controls, treatment assignment and randomization, precision, replication, power and sample size calculations, stratification, and ethics. Suitable for students in biostatistics and other scientific fields. Joint with BIOST 524. Prerequisites: BIOST 511 or equivalent, and one of 421, 423, BIOST 513 or EPI 512; or permission of instructor. (Offered even-numbered years.)

STAT 529 Sample Survey Techniques (3) Design and implementation of selection and estimation procedures. Emphasis on human populations. Simple, stratified, and cluster sampling; multistage and two-phase procedures; optimal allocation of resources; estimation theory; replicated designs; variance estimation; national samples and census materials. Joint with BIOST 529 and QMETH 529. Prerequisites: 421, 423, QMETH 500 or BIOST 511 or equivalent; or permission of instructor.

STAT 534 Statistical Computing I (3) Computational methods in statistics: sorting, searching and calculation of order statistics, data interpolation and approximation, numerical methods for least squares and principal components, computational geometry, calculation of probabilities, data structures, and data-base management. Joint with BIOST 534.

STAT 535 Statistical Computing II (3) Computational methods in statistics: generation of pseudo random numbers, Monte Carlo quadrature, variance reduction techniques, design of Monte Carlo studies, nonlinear optimization, nonlinear least squares, selected special topics. Joint with BIOST 535.

STAT 542 Multivariate Analysis (3) Multivariate normal distribution; partial and multiple correlation; Hotelling's T^2 ; Bartlett's decomposition; various likelihood ratio tests; discriminant analysis; principal components. Prerequisite: 513 or permission of instructor.

STAT 543 Nonparametric Statistics (3) Linear rank statistics, asymptotics, ties; tests of fit; the Hodges-Lehmann estimator. Nonparametric analysis of variance; Kruskal-Wallis, Friedman, and aligned-rank tests. Prerequisite: 512 or permission of instructor.

STAT 544 Bayesian Statistical Methods (3) Statistical methods based on the idea of a probability distribution over the parameter space. Coherence and utility. Subjective probability. Likelihood principle. Conjugate families. Structure of Bayesian inference. Limit theory for posterior distributions. Sequential experiments. Exchangeability. Bayesian nonparametrics. Empirical Bayes methods. Prerequisite: 513 or permission of instructor.

STAT 545 Statistical Decision Theory (3) Formulation of the statistical decision problem; decision rules and their risk functions; Bayes rules. Game theory and the minimax theorem; admissibility and Wald's complete class theorem. Sufficiency, invariance, and the Hunt-Stein theorem. Applications in estimation, testing, and multiple-decision problems. Sequential decision theory. Prerequisite: 513 or permission of instructor.

STAT 546 Sequential Statistical Methods (3) Advantages of sequential sampling schemes. Stein's two-stage procedure for fixed-width confidence intervals. Optimality of Wald's sequential probability ratio test. Sequential decision theory; Bayes rules; the method of backward induction. Sequential t , chi-square, and F -tests. Sequential estimation of regression functions, the Robbins-Munro procedure. Martingales; theory of optimal stopping and its applications. Prerequisite: 513 or permission of instructor.

STAT 548 Robust Statistical Methods (3) Robust statistical methods: algorithms, data analysis, and theory. Basic robustness concepts. Robust estimation techniques for the following estimation problems: location, scale, correlation, covariance matrices, regression. Use of robust methods for exploratory data analysis and outlier detection diagnostics. Nonlinear optimization and root-finding algorithms for computing robust estimates. Prerequisite: 513 or permission of instructor.

STAT 561, 562, 563 Special Topics in Applied Statistics (1-5, max. 15; 1-5, max. 15; 1-5, max. 15) AWSp Data analysis, spectral analysis or robust estimation, etc. Prerequisite: permission of instructor.

STAT 565 Inference in Stochastic Processes (3) Methods for statistical inference from dependent observations. Emphasis on one or more of the following: Markov chains in discrete or continuous time; diffusion processes; point processes; asymptotic theory; filtering and smoothing of linear models. Prerequisite: 581 or permission of instructor.

STAT 570 Linear Models (3) Sp Review of linear algebra and matrix manipulations. Statistical distribution theory for quadratic forms of normal variables. Fitting of the general linear model by least squares. Computer data analysis for classical experimental designs. Joint with BIOST 570. Prerequisites: 421, 423, or BIOST 513; and 513; and a course in matrix algebra.

STAT 571 Topics in Applied Regression Analysis (3) A Advanced statistical methods course for biostatistics, statistics, and other graduate students already familiar with the general linear hypothesis. Develops extensions of the usual linear least squares theory and discusses the effects of departures from this theory. Examples of analyses for nonstandard problems are presented; computers are used for homework assignments. Analysis of residuals, use of transformations, polynomial models, methods of model selection and robust methods. Joint with BIOST 571. Prerequisite: 570.

STAT 572 Topics in Applied Linear Models (3) W Advanced topics in applied regression analysis: generalized linear models, nonlinear regression, robust regression. ANOVA models with random effects: methods of estimation; mixed, nested, and unbalanced design; repeated measures and longitudinal data. Statistical computing and data analysis. Joint with BIOST 572. Prerequisites: 570, 571.

STAT 573 Statistical Methods for Categorical Data (3) Sp Exact and asymptotic methods for 2×2 contingency tables. Maximum likelihood estimation of logistic regression models for binary response. Examples in epidemiologic and clinical research. Theory and applications of log-linear models for discrete data. Selected special topics. Joint with BIOST 573. Prerequisites: 571 and 581; or permission of instructor.

STAT 574 Multivariate Statistical Methods (3) Use of multivariate normal sampling theory, linear transformations of random variables, one- and two-

sample tests, profile analysis, partial and multiple correlation, multivariate ANOVA and least squares, discriminant analysis, principal components, factor analysis, robustness, and some special topics. Some computer use included. Joint with BIOST 574. Prerequisite: 570 or permission of instructor.

STAT 576 Statistical Methods for Survival Data (3) Statistical methods for censored survival data arising from follow-up studies on human or animal populations. Covers parametric and nonparametric methods, Kaplan-Meier survival curve estimator, comparison of survival curves, log-rank test, regression models including the Cox proportional hazards model, competing risks. Joint with BIOST 576. Prerequisites: 581 and either 423, BIOST 513, or Q SCI 483, or equivalent. (Offered alternate years.)

STAT 577 Advanced Design and Analysis of Experiments (3) Concepts important in experimental design: randomization, blocking, confounding. Application and analysis of data from randomized blocks designs, Latin and Greco-Latin squares, incomplete blocks designs, split-plot and repeated measures, factorial and fractional replicates, response surface experiments. Joint with BIOST 577. Prerequisite: 570 or 421 (minimum grade 3.0), or permission of instructor.

STAT 578 Special Topics in Advanced Biostatistics (*, max. 3) Advanced-level topics in biostatistics offered by regular and visiting faculty members. Joint with BIOST 578. Prerequisite: permission of instructor.

STAT 579 Advanced Data Analysis (4) Resampling methods; jackknife, bootstrap, cross-validation. Smoothing techniques; local averages; projection-pursuit regression; recursive partitioning regression. Selected aspects of linear regression. Robust-resistant methods. Density estimation. Clustering techniques. The EM algorithm. Graphical exploratory methods. Prim-81. Joint with BIOST 579. Prerequisites: 513; one of 571, 421, 423; or permission of instructor.

STAT 581, 582, 583 Advanced Theory of Statistical Inference (3,3,3) A,W,Sp Limit theorems, asymptotic efficiency, maximum likelihood statistics; sufficient and ancillary statistics; Neyman-Pearson theory, uniformly most powerful unbiased and invariant tests; sequential analysis; distribution-free statistics. Likelihoods emphasized. Prerequisites: 513 and MATH 424, 425, 426 for 581 (concurrent enrollment in MATH 424, 425, 426 permissible); 570 and 581 for 582; 582 for 583.

STAT 590 Statistics Seminar (*, max. 15) AWSp Prerequisite: permission of graduate program adviser.

STAT 591, 592, 593 Special Topics in Statistics (1-5, max. 15; 1-5, max. 15; 1-5, max. 15) A,W,Sp Distribution-free inference, game and decision theory, advanced theory of estimation (including sequential estimation), robustness, advanced probability theory, stochastic processes or empirical processes, etc. Prerequisite: permission of instructor.

STAT 598 Techniques of Statistical Consulting (3) Instruction and practice in planning studies, analyzing data, writing reports, and interacting with clients. Includes applied statistics and consulting literature not covered elsewhere in graduate curriculum. Significant data analysis projects and critiques of actual consulting sessions. Prerequisites: two or more courses in the application of statistical methods.

STAT 599 Statistical Consulting (*, max. 12) AWSps Consulting experience in data analysis, applied statistics, etc. Student required to provide consulting services to students and faculty three hours per week. Prerequisite: permission of graduate program coordinator.

STAT 600 Independent Study or Research (*, max. 12) AWSps Prerequisite: permission of graduate program coordinator.

STAT 700 Master's Thesis (*) AWSpS Prerequisite: permission of graduate program coordinator.

STAT 800 Doctoral Dissertation (*) Prerequisite: permission of graduate program coordinator.

Women Studies

C254 Padelford

Women Studies is an interdisciplinary program that offers students the opportunity to select courses from a variety of academic disciplines while pursuing concentrated study in a particular department or track within the program. Women Studies courses are planned to foster open, vigorous inquiry about women, to challenge curricula in which women are absent or peripheral, to question cultural assumptions in light of new information, and to create a supportive environment for those interested in studying women.

Undergraduate Program

Major Requirements: Although an undergraduate degree in Women Studies is not offered, students may work toward a Bachelor of Arts degree in General Studies with a concentration in Women Studies. Course requirements are as follows: WOMEN 200 or equivalent; 5 additional lower-division credits in Women Studies; 15 credits selected from WOMEN 310, 353, 357, 364, 368, ENGL 375 or 376; one course of 3-5 credits in an ethnic area; WOMEN 300; senior seminar (WOMEN 400) and senior thesis (G ST 493). 30 additional credits may be satisfied under one of three options: (1) 30 credits in a single department relevant to Women Studies curriculum; (2) 30 credits in a Women Studies track (an interdisciplinary series of courses); or (3) 30 credits in an individual course of study arranged between the student and a Women Studies adviser, with approval by the Director.

Faculty

Director

Sydney J. Kaplan

Professors

Blake, Kathleen A., * 1971, ‡(English), M.A., 1967, California (Los Angeles); Ph.D., 1971, California (San Diego); English.

Bynum, Caroline W., * 1976, ‡(History), M.A., 1963, Ph.D., 1969, Harvard; history.

Deyrup-Olsen, Ingrid J., * 1964, ‡(Zoology), Ph.D., 1944, Columbia; zoology.

Eastman, Carol M., * 1967, ‡(Anthropology, Linguistics), Ph.D., 1967, Wisconsin; anthropology.

Gerstenberger, Donna, * 1960, ‡(English), M.A., 1952, Ph.D., 1958, Oklahoma; English.

Gottlieb, Naomi, * 1970, ‡(Social Work), M.S.W., 1949, D.S.W., 1970, California (Berkeley); social work.

Levi, Margaret A., * 1974, ‡(Political Science), Ph.D., 1974, Harvard; American government and politics, political economy.

Lunneborg, Patricia W., * 1967, ‡(Psychology), M.S., 1959, Washington; Ph.D., 1962, Texas; psychology.

McElroy, Colleen W., * 1972, ‡(English), M.A., 1963, Kansas State; Ph.D., 1973, Washington; English.

Russ, Joanna, * 1977, ‡(English), M.F.A., 1960, Yale; English.

Teller, Davida Y., * 1965, ‡(Physiology and Biophysics, Psychology), Ph.D., 1965, California (Berkeley); psychology.

Associate Professors

Allen, Carolyn R. J., * 1972, ‡(English), M.A., 1966, Claremont; Ph.D., 1972, Minnesota; English.

Bereano, Philip L., * 1975, ‡(Engineering), J.D., 1965, Columbia; M.R.P., 1971, Cornell; social management of technology.

Blumstein, Philip W., * 1970, ‡(Sociology), M.A., 1967, Ph.D., 1970, Vanderbilt; sociology.

Butler, Johnnella, 1988, M.A.T., 1969, Johns Hopkins; Ed.D., 1979, Massachusetts (Amherst); Afro-American literature, multicultural studies.

Case, Sue-Ellen, * 1981, ‡(Drama), M.A., 1968, California State (San Francisco); Ph.D., 1981, California (Berkeley); dramatic criticism.

Clatterbaugh, Kenneth C., * 1966, ‡(Philosophy, Psychology), Ph.D., 1966, Indiana; philosophy.

Hartsock, Nancy, * 1984, (Political Science), ‡ M.A., 1967, Ph.D., 1972, Chicago; philosophy of feminism, feminist theory, political theory.

Howard, Judith A., * 1982, ‡(Sociology), M.A., 1976, M.A., 1977, Oregon; Ph.D., 1982, Wisconsin; social psychology, gender roles.

Jacobs, Sue Ellen, * 1974, (Anthropology), M.A., 1966, Ph.D., 1970, Colorado; woman studies, anthropology.

Kaplan, Sydney J., * 1971, (English), ‡ M.A., 1966, Ph.D., 1971, California (Los Angeles); woman studies.

Kenney, Nancy J., * 1976, (Psychology), ‡ M.A., 1972, Ph.D., 1975, Virginia; woman studies, psychology.

Kotchek, Lydia D., * 1975, ‡(Parent and Child Nursing), M.A., 1964, Ph.D., 1975, Washington; maternal and child nursing.

Palomo, Dolores J., 1971, ‡(English), M.A., 1966, Wayne State; Ph.D., 1972, State University of New York (Buffalo); English.

Richey, Cheryl A., * 1973, ‡(Social Work), M.S.W., 1971, D.S.W., 1974, California (Berkeley); social work.

Schwartz, Pepper J., * 1972, ‡(Psychiatry and Behavioral Sciences, Sociology), M.A., 1968, Washington (St. Louis); Ph.D., 1974, Yale; sociology.

Silberstein, Sandra V., * 1982, ‡(English), M.A., 1971, Ph.D., 1982, Michigan; English, sociolinguistics.

Course Descriptions

Courses for Undergraduates

WOMEN 200 Introduction to Women Studies (5) AWSpS Interdisciplinary course drawing selectively from the following fields: anthropology, art history, economics, history, law, literature, psychology, and sociology. Not open for credit to students who have taken GIS 255 or 256.

WOMEN 206 Philosophy of Feminism (5) Hartsock Philosophical analysis of the concepts and assumptions central to feminism. Theoretical positions within the feminist movement; view of the ideal society, goals and strategies of the movement, its relation to racial liberation, and ethical issues. Joint with PHIL 206 and POL S 212.

WOMEN 257 Psychology of Sex Differences (5) A Kenney Major psychological theories of sex-role development; biological and environmental influences that determine and maintain sex differences in behavior; sex roles in children, sex differences in aggression, cognitive abilities, achievement motivation, affiliation, sexuality. Joint with PSYCH 257. Not open for credit to students who have taken GIS 244. Recommended: PSYCH 101 or 102.

WOMEN 283 Introduction to Women's History (5) Includes units on American, European, and Third World women that examine centers of women's activities, women's place in male-dominated spheres (politics), women's impact on culture (health, arts), and the effect of larger changes on women's lives (technology, colonization). Joint with HST 283.

WOMEN 290 Special Topics in Women Studies (2-5, max. 15) Offered occasionally by visitors or resident faculty.

WOMEN 300 Research Methods in Women Studies (5) A, W or Sp Jacobs, Kenney. Selected methods in women studies research. Use of historical documents, literary texts, interviews, and computerized data sets in research on human problems and women's roles. Computer applications in women studies research. Includes drafting proposal for senior thesis project. Prerequisites: 200, 206, or permission of instructor.

WOMEN 310 Women and the Law (5) ASpS Focus on the status of women and the law; the legal status of single and married women, the rationale of protective legislation, and the effect of the legal changes such as the Civil Rights Act of 1964 and Equal Rights Amendment. Current cases on abortion, child care, tax laws; Social Security benefits, lesbianism, prostitution, etc. Not open for credit to students who have taken GIS 355.

WOMEN 313 Women in Politics (5) Political theory, historical and contemporary, including writings of the women's liberation movement on the political role of women in society. Empirical studies of the "apolitical" woman; process of political socialization in various cultural contexts; women's participation in political decision making. Joint with POL S 313. Prerequisite: 200 or a political science course.

WOMEN 353 Anthropological Studies of Women (5) A Jacobs Cross-cultural and comparative survey of the varieties of women's cultural experiences, statuses, and roles in cultural context and the anthropological theories used to account for them. Topics include: biological factors, studies of primates, woman the gatherer, work in preindustrial and industrial societies, patriarchy and matrilineal kinship, childbirth, and women's roles in economic development. Joint with ANTH 353. Prerequisites: 200 and ANTH 202, or permission of instructor.

WOMEN 354 Lesbianism (3) Position and concerns of lesbians in our society; the biological, cross-cultural, and psychosocial evidence. Historical and current information and discussion on the nature of lesbianism. Prerequisite: 200 or 257; or ANTH 100 or 353; or PSYCH 101 or 210 or 257 or 305; or SOC 110 or 271 or 347; or permission of instructor.

WOMEN 355 Gender and Masculinity (5) Clatterbaugh Social development of masculinity in American society. Definition of masculinity at different times in history; how men are socialized today; differences in the social development of masculinity for Black men, gay men, physically disabled. Individual and collective efforts at altering masculinity (e.g., critically examines the "men's movement").

WOMEN 357 Psychobiology of Women (5) A Kenney Physiological and psychological aspects of women's lives: determinants of biological sex; physiological and psychological events of puberty, menstruation, and menopause; sexuality; pregnancy, childbirth; the role of culture in determining the psychological response to the physiological events. Joint with PSYCH 357. Not open for credit to students who have taken GIS 357. Prerequisite: 200 or 257 or PSYCH 101 or 102 or 257.

WOMEN 364 Women in the Social Structure (5) Women's current roles within social institutions, focusing on women's work roles, both in the labor force and in the home. Women in political organizations, religion, education, and law. Includes selected groups of women with compounded problems: Black women, lesbians, older women, women on welfare. Examines the structural, ideological, and historical determinants of women's position. Joint with SOC 364. Prerequisites: SOC 110 and junior or senior standing.

WOMEN 374 Methods in Life History Research (5) Jacobs Techniques and procedures for constructing life histories: use of diaries, letters, photography, and

personal interviews. Technical instruction in use of tape recorder; indexing, cataloging, and writing summaries of tapes; use of cameras for copying documents and photography. Each student completes one life history per quarter. Prerequisite: 200.

WOMEN 383 Social History of American Women (5) "Ordinary" woman, colonial times to present: work at home, charitable activities, entrance into labor force. Feminist movements—nineteenth century and post-World War II. Not open for credit if GIS 210, 383, 483, or 490 taken. Joint with HSTAA 373. Prerequisite: 200 or 283 or HSTAA 201 or permission of instructor.

WOMEN 400 Senior Seminar in Women Studies (3) Sp Part of the senior thesis requirement in Women Studies. Must be taken concurrently with G ST 493. Prerequisites: senior standing, General Studies major concentrating on Women Studies, and permission of adviser.

WOMEN 415 Sexism in American Schools (3) Implications of sex-role stereotyping in American education, kindergarten through grade 12, and development of insights into experiences as students, educators, and parents. Includes image of women and girls in curriculum materials, socialization and career counseling, teacher behavior, effects of Title IX and affirmative action on present school policy, and practical alternatives and skills useful for changing attitudes about sex roles. Prerequisite: 200 or 15 credits in education or Women Studies.

WOMEN 416 Sexist Language and Education (3) How language reflects or determines sexist attitudes, particularly in current educational institutions. Includes male and female language use, systematic lexical syntactic distinctions based on sex, derogatory references to women, influences of classroom language on sex roles, and effects of language of sex differences on learning. Prerequisite: 200 or 15 credits in education or Women Studies.

WOMEN 453 Women in Evolutionary Perspective (5) *Jacobs* Critical appraisal of major theories accounting for evolution of sex and gender roles and status differences; cross-cultural testing of sociobiological, biocultural, cultural materialist, structural, and symbolic explanations for "female power and male dominance." Joint with ANTH 483. Prerequisite: 353 or permission of instructor.

WOMEN 454 Women, Words, Music, and Change (5) Sp *Jacobs* Comparative analysis of use of myths, tales, music, and other forms of expressive culture to account for, reinforce, and change women's status and roles; cross-cultural analysis of planned change and development. Joint with ANTH 454. Prerequisite: 353 or permission of instructor.

WOMEN 455 Contemporary Feminist Theory (5) *Hartsock* Recent work on study of women, focusing on social science research that has challenged our fundamental suppositions about organization of family, nature of moral development, definition of political behavior, conceptualization of time in history, and division of labor in market place. Recommended: 200, 206, or course in social theory.

WOMEN 490 Special Topics in Women Studies (2-5, max. 15) Exploration of specific problems and issues relevant to the study of women. Offered by visiting or resident faculty members. Primarily for upper-division and graduate students.

WOMEN 497 Fieldwork in Women Studies (3-5, max. 15) AWSpS Internships in local agencies. Allows development of specific skills in area of specialization. Prerequisites: 200, junior standing, or permission of instructor.

WOMEN 499 Undergraduate Research (1-5, max. 10) AWSpS Independent study and research supervised by a faculty member with appropriate academic interest. Prerequisite: permission of instructor and adviser.

Zoology

106 Kincaid

Zoology is a natural science concerned primarily with animals: their development, structure, and function, and their relationship with their environments.

Zoology field courses are offered both at the main campus and at the Friday Harbor Laboratories. See individual course listing for location.

Undergraduate Program

Advisers
318 Hitchcock

The department offers two degree programs: Bachelor of Science, designed for students planning graduate work, and Bachelor of Arts, a program with minimal stated requirements.

Bachelor of Science Degree

Major Requirements: A total of 90 credits distributed as follows: (1) BIOL 210, 211, 212. (2) A minimum of 25 credits from the following, with at least two courses from each of the three groups (two courses must be laboratory courses from two different groups): Group I. *Cell Biology, Development, Gene Action:* ZOO 403, 455, 456, 457, BIOL 401, 402, GENET 365; Group II. *Morphology, Physiology:* ZOO 301, 432, 433, 434, 438, 439, 440, 448, 449, 453-454, 469, 478, 488, 489; Group III. *Ecology, Natural History, Evolution, Organisms:* ZOO 220, 330, 382, 409, 410, 423, 430, 435, 444, 445, 464, 465, BIOL 454, 472, 473, 474, 475, BOT 445. (3) 16 credits in electives from the above or from other biological departments, selected in consultation with the zoology adviser. (4) Additional requirements: CHEM 140, 150, 151; 231, 232 (or 231, 235, 236); two courses from PHYS 114, 115, 116; two courses from MATH 124, 125, Q SCI 291, 292, 381, 482, 483, STAT 311. One quarter of calculus is strongly recommended. Students are encouraged to exceed the college language requirement. A 2.00 grade-point average is required in all courses taken at this university in zoology, the related biological disciplines, and all supporting courses.

Bachelor of Arts Degree

Major Requirements: A minimum of 50 credits, no more than 20 in lower-division courses, to include BIOL 210, 211, 212, plus a program of upper-division courses in the major areas of biology to be selected in consultation with the zoology adviser. A 2.00 grade-point average in all courses taken at the University in zoology and in the related biological disciplines, and in all supporting courses is required. Additional requirements: CHEM 140, 150; 231, 232 (or 231, 235, 236); GENET 360, if the student has not taken BIOL 210, 211, 212; STAT 311, or Q SCI 381, or MATH 124 and 125, or Q SCI 291 and 292. PHYS 114, 115, 116 recommended.

Graduate Program

Programs of study leading to the degrees of Master of Science (both thesis and nonthesis) and Doctor of Philosophy are available in the areas of cell biology, developmental biology, developmental genetics, ecology, evolution, behavior, invertebrate and vertebrate morphology, comparative physiology, endocrinology, and neurobiology. Interdisciplinary programs are offered in developmental biology, cell and molecular biology, and neurobiology.

Research Facilities

The laboratories of the department in Kincaid Hall are equipped with modern instruments and special facilities

needed for advanced instructional and research purposes. The extensive facilities of the Friday Harbor Laboratories on San Juan Island are available for research throughout the year. Departmental graduate students often carry on an extensive part of their research there or at other field stations.

Special Requirements

Entering students should have preparation in several of the areas listed above, organic chemistry, physical chemistry in some cases, two quarters of college physics, and mathematics through calculus. All students are required to gain some teaching experience regardless of the source of support.

Financial Aid

Normally all prospective candidates for M.S. and Ph.D. degrees are supported by teaching or research assistantships or by fellowships or traineeships from national or private agencies. Some summer appointments are available both on the Seattle campus and at the Friday Harbor Laboratories on San Juan Island.

Application Date

Completed applications for entry in the Autumn Quarter must be received by January 1.

Correspondence and Information

Graduate Program Coordinator
106 Kincaid, NJ-15

Faculty

Chairperson

Charles D. Laird

Professors

Cloney, Richard A.,* 1961, M.A., 1954, Humboldt; Ph.D., 1959, Washington; invertebrate embryology, histology, morphogenetic movements, metamorphosis, biology of ascidians.

Deyrup-Olsen, Ingrid J.,* 1964, (Women Studies), Ph.D., 1944, Columbia; general physiology, cell-membrane phenomena.

Edmondson, W. Thomas,* 1949, (Emeritus), Ph.D., 1942, Yale; ecology, rotifers, limnology with emphasis on productivity of lakes.

Edwards, John S.,* 1967, (Forest Resources),† M.Sc., 1956, Auckland (New Zealand); Ph.D., 1960, Cambridge (England); arthropod neurobiology, insect physiology and development, tundra and alpine biology.

Farrer, Donald S.,* 1965, (Emeritus), M.A., 1939, Ph.D., 1941, Wisconsin; avian and comparative physiology, biochronometry, reproductive physiology, photoperiodic systems, neuroendocrinology.

Gorbman, Aubrey,* 1963, (Emeritus), M.S., 1936, Wayne State; Ph.D., 1940, California (Berkeley); endocrinology and neuroendocrinology, mechanisms of actions of hormones; evolutionary, adaptive, and behavioral aspects of endocrine systems.

Hauschka, Stephen D.,* 1967, ‡(Biochemistry), Ph.D., 1966, Johns Hopkins; developmental biology, mechanism of embryonic cellular interactions.

Huey, Raymond B.,* 1977, M.A., 1969, Texas (Austin); Ph.D., 1975, Harvard; evolutionary and physiological ecology, herpetology, behavior.

Illig, Paul L.,* 1952, (Emeritus), M.A., 1941, California (Berkeley); Ph.D., 1952, George Washington; invertebrate zoology and systematics, copepods, symbiosis of crustaceans.

Kenagy, George J.,* 1976, Ph.D., 1972, California (Los Angeles); ecology, behavior and physiology, daily and seasonal rhythms, reproductive cycles, physiological ecology, biology of mammals.

Kohn, Alan J.,* 1961, (Environmental Studies, Quaternary Research Center), Ph.D., 1957, Yale; invertebrate zoology, ecology and functional morphology of marine invertebrates, biology of mollusks.

Kozloff, Eugene N.,* 1961, (Emeritus), M.A., 1946, Ph.D., 1950, California (Berkeley); biology of lower invertebrates, ciliates, orthonectids, turbellarians and kinorhynchans.

Laird, Charles D.,* 1971, (Genetics), Ph.D., 1966, Stanford; cell and developmental biology.

Martin, Arthur W.,* 1937, (Emeritus), Ph.D., 1936, Stanford; comparative invertebrate physiology, emphasis on excretory and cephalopod physiology.

Odell, Garrett M.,* 1985, Ph.D., 1972, Johns Hopkins; mathematical biology, ecology, models in cell and developmental biology.

Orians, Gordon H.,* 1960, (Environmental Studies),† Ph.D., 1960, California (Berkeley); ecology and ethology, vertebrate social systems, community structure, plant-herbivore interactions.

Paine, Robert T.,* 1962, M.S., 1958, Ph.D., 1961, Michigan; experimental ecology, organization and structure of marine communities.

Palka, John M.,* 1969, Ph.D., 1965, California (Los Angeles); neurophysiology, sensory physiology, developmental neurobiology.

Pietsch, Theodore W.,* 1978, ‡(Fisheries), M.S., 1969, Ph.D., 1973, Southern California; systematics, biogeography, and functional anatomy of marine fishes.

Pinter, Robert B.,* 1964, ‡(Electrical Engineering), M.S., 1960, Ph.D., 1964, Northwestern; neurophysiology, physiology of the retina and visual system.

Rausch, Robert L.,* 1977, ‡(Pathobiology, Animal Medicine), D.V.M., 1945, Ohio State; M.S., 1946, Michigan State; Ph.D., 1949, Wisconsin; biology and taxonomy of helminths in their mammalian hosts with emphasis on the arctic.

Riddiford, Lynn M.,* 1973, Ph.D., 1961, Cornell; insect development and physiology, invertebrate endocrinology.

Rohwer, Sievert A.,* 1973, M.A., 1970, Ph.D., 1971, Kansas; ecology and evolution of social behavior, deception and evolution of status-signaling systems, avian biology.

Schroeder, Thomas E.,* 1974, (Research), Ph.D., 1968, Washington; fine structure and biochemistry of cellular contractile systems.

Schubiger, Gerold A.,* 1972, (Genetics), Ph.D., 1967, Zurich; developmental biology of insects, embryonic determination in *Drosophila*, pattern formation in imaginal discs.

Snyder, Richard C.,* 1949, A.M., 1941, Ph.D., 1948, Cornell; comparative and functional vertebrate anatomy, vertebrate biology.

Steiner, Robert A.,* 1977, ‡(Obstetrics and Gynecology, Physiology and Biophysics), Ph.D., 1975, Oregon; neuroendocrine control of the onset of puberty in the monkey, ultradian and circadian reproductive hormone rhythms.

Strathmann, Richard R.,* 1973, M.S., 1966, Ph.D., 1970, Washington; invertebrate development and ecology, larval ecology and developmental strategies of marine invertebrates.

Svihla, Arthur, 1938, (Emeritus), M.S., 1928, Ph.D., 1931, Michigan; zoology.

Truman, James W.,* 1973, M.A., 1969, Ph.D., 1970, Harvard; hormones and invertebrate behavior, insect physiology, circadian rhythms.

Ward, Peter D., 1985, ‡(Geological Sciences), M.S., 1973, Washington; Ph.D., 1976, McMaster; invertebrate paleontology, paleobiology.

Weintraub, Harold M.,* 1979, (Affiliate), (Pathology),† Ph.D., 1971, M.D., 1973, Pennsylvania; gene regulation and chromosome structure.

Whiteley, Arthur H.,* 1947, (Emeritus), M.A., 1939, Wisconsin; Ph.D., 1945, Princeton; comparative developmental physiology of invertebrates, gene action in normal and hybrid sea urchin development, fertilization.

Willows, A. O. Dennis,* 1969, Ph.D., 1967, Oregon; invertebrate neurophysiology, neural mechanisms underlying behavior.

Associate Professors

Bakken, Aimee H.,* 1973, Ph.D., 1970, Iowa; developmental and cell biology, chromosome structure and function in oogenesis and embryogenesis, developmental genetics.

Boersma, P. Dee,* 1974, ‡(Environmental Studies), Ph.D., 1974, Ohio State; ecology and ethology, reproductive strategies, evolution of sexual dimorphism, seabird biology.

Griffiths, Mary, 1961, (Emeritus), M.A., 1942, Ph.D., 1953, California (Berkeley); zoology.

Hille, Merrill B.,* 1976, Ph.D., 1985, Rockefeller; cell and developmental biology, RNA and protein synthesis, fertilization and embryogenesis of echinoderms.

Kareiva, Peter M.,* 1983, M.S., 1976, California (Irvine); Ph.D., 1981, Cornell; ecology of plant and animal interactions, underlying spatial and temporal factors in insect populations.

Moody, William J.,* 1982, Ph.D., 1977, Stanford; single-cell electrophysiology.

Osterud, Kenneth L., 1949, (Emeritus), Ph.D., 1941, New York; zoology.

Siegel, Andrew F.,* 1983, ‡(Finance and Business Economics, Management Science, Statistics), M.S., 1975, Ph.D., 1977, Stanford; exploratory data analysis, statistical computing and graphics, morphometrics, robust methods.

Wingfield, John C.,* 1985, Ph.D., 1973, University College of North Wales; endocrinology, reproductive physiology, ethology.

Assistant Professors

Daniel, Thomas L.,* 1984, M.S., 1978, Wisconsin; Ph.D., 1982, Duke; functional morphology, biomechanics, mechanics and energetics of animal locomotion.

Kingsolver, Joel G.,* 1986, M.S., 1978, Wisconsin; Ph.D., 1981, Stanford; role of morphological variation, functional performance, selection in the evolution of structure and function in insects.

Wakimoto, Barbara T.,* 1984, (Genetics), Ph.D., 1981, Indiana; developmental genetics, eukaryotic gene organization and regulation.

Wilson, W. Herbert, Jr.,* 1987, M.A., 1978, North Carolina; Ph.D., 1982, Johns Hopkins; marine soft-sediment ecology, marine invertebrate zoology, shorebird ecology.

Course Descriptions

Courses for Undergraduates

ZOOL 114 Evolution (2) Sp Evolutionary biology for nonmajors. Evolutionary history of the earth and various theories of evolution.

ZOOL 118 Survey of Physiology (5) AWSpS Elementary human physiology. For nonmajors. Credit is not given for 118 if credit has previously been given for 208.

ZOOL 119 Elementary Physiology Laboratory (1) ASpS Prerequisite: 118 taken concurrently.

ZOOL 220 Diversity in Animals (5) WS Morphological, functional, and ecological diversity within the major phyla of animals. Prerequisite: high school biology or permission of instructor.

ZOOL 301 Introductory Physiology (4) Deyrup-Olsen, Riddiford, Truman Fundamentals of physiology: biochemistry of cell constituents, environment of the cell, bioenergetics, membranes, control mechanisms. Laboratory project required. Prerequisites: chemistry through organic, one year of college physics, 10 credits in biological sciences.

ZOOL 330 Natural History of Marine Invertebrates (5) SpS Kohn, Paine, Wilson Field and laboratory course emphasizing the habits, habitats, adaptations, and interrelationships of marine animals. Students may be required to share a portion of the transportation costs of field trips.

ZOOL 362 Natural History of Vertebrates (5) SpS Huey, Snyder Field and laboratory course on the classification, ecology, adaptations, and natural history of fishes, amphibians, reptiles, birds, and mammals. Students may be required to share a portion of the transportation costs of field trips. Prerequisite: permission of instructor.

ZOOL 403 Comparative Vertebrate Histology (5) A Cloney Microscopic and submicroscopic anatomy of vertebrates. Emphasis on mammals. Light microscopy and interpretation of ultrastructure. Functions of basic tissue types and organs as related to structure. Prerequisite: BIOL 212.

ZOOL 409 Sociobiology (4) W Rohwer Biological bases of social behavior, emphasizing evolution as a paradigm. Topics are: individual *versus* group selection, kin selection, altruism, group *versus* individual living, mating systems, parental care of offspring, and competitive strategies. Joint with PSYCH 409. Prerequisites: BIOL 211 and 212 or PSYCH 200, or equivalent.

ZOOL 410 Ethology and Ecology Laboratory (4) Sp Boersma, Paine Field projects on foraging and social behavior, species interactions and structure of terrestrial and marine communities, including special student research problems. Students may be required to share a portion of the transportation costs of field trips. Prerequisite: permission of instructor.

ZOOL 430 Marine Zoology (9) ASp Strathmann Survey of groups of invertebrate animals represented in marine environments; natural history, ecology, distribution, habitat, adaptation, and trophic interrelationships. Offered at Friday Harbor Laboratories. Concurrent registration in BOT 445 required at Friday Harbor. Prerequisites: 20 credits in biological sciences and permission of Director of Friday Harbor Laboratories.

ZOOL 432 Marine Invertebrate Zoology (9) S Comparative morphology and biology of marine invertebrates. Laboratory study covers the structure and interrelationships among marine invertebrate animals. Representatives of all major and most minor phyla are collected, observed alive, and studied in some detail. Offered at Friday Harbor Laboratories. Not open for credit to students who have taken 433 or 434. Prerequisites: BIOL 212 or equivalent and permission of Director of Friday Harbor Laboratories.

ZOOL 433, 434 Invertebrate Zoology (5,5) A,W Kohn, Wilson Comparative morphology and biology of invertebrates. Laboratories emphasize structures and functions. Not open to students who have taken 432. Prerequisites: BIOL 212; 433 for 434.

ZOOL 435 Parasitology (5) General course covering the principles of parasitism and the major groups of animal parasites. Prerequisite: 20 credits in biological sciences or permission of instructor.

ZOOL 438 Comparative Endocrinology (3) Wingfield Hormonal integration of living processes at all levels in animals: cells, organs, organisms, populations. Prerequisite: one year of biology; recommended: a 400-level course in physiology, biochemistry, or histology.

ZOOL 439 Comparative Endocrinology Laboratory (2) *Wingfield* Appropriate experiments to accompany and enlarge on material presented in 438. Prerequisites: 438 and permission of instructor.

ZOOL 440 Biomechanics (4) *A Daniel* Physical biology emphasizing a mechanical approach to ecological, evolutionary, and physiological questions. Basic principles underlying fluid and solid mechanics to explore responses of animals to flows, loads, and motions. Recommended: some familiarity with calculus and introductory physics.

ZOOL 444 Entomology (3) *Sp Edwards* Biology of terrestrial arthropods, with emphasis on insects. Structure, classification, physiology, and ecology of insects. Interrelationships of insects and man. Prerequisite: 15 credits in biological sciences or permission of instructor.

ZOOL 445 Entomology Laboratory (2) *Sp Edwards* Structure and function of arthropods, with emphasis on insects. Field studies and taxonomy of important insect groups. Students may be required to share a portion of the transportation costs of field trips. Prerequisites: concurrent registration in 444 and permission of instructor.

ZOOL 448 Concepts of Nervous System Function (3) *Palka* Broad examination of integrative mechanisms in central nervous system function, with emphasis on sensory processing, plasticity, and control of behavior. Examples are taken from a variety of animal groups.

ZOOL 449 Concepts of Nervous System Function Laboratory (2) *Palka* Experiments to accompany material presented in 448. Prerequisites: 448 and permission of instructor.

ZOOL 453-454 Comparative Anatomy of Chordates (5-5) *A,W Snyder* Morphology and phylogeny of the chordates; structure, function, and evolution of vertebrate organ systems. Prerequisite: BIOL 212.

ZOOL 455 Developmental Biology of Animals (3) *Bakken, Schubiger, Wakimoto* Embryology and subsequent development of vertebrate and invertebrate animals, including frogs, mammals, chicks, insects, echinoderms. Morphological changes in developing animals; experimental analysis of developing systems; underlying genetic and biochemical regulation of development. Prerequisites: BIOL 210, 211, 212, or permission of instructor; recommended: some genetics, cell biology, or biochemistry.

ZOOL 456 Developmental Biology of Animals Laboratory (3) *Bakken, Schubiger, Wakimoto* Normal development of living embryos (frog, chick, insect, echinoderm). Internal anatomy of embryos on prepared slides. Comparisons between vertebrate and invertebrate animals. Prerequisites: 455 or equivalent; permission of instructor.

ZOOL 457 Methods and Problems in Development (3) *Bakken, Schubiger, Wakimoto* Special topics in development. Integrating classical and current approaches. Developmental genetics, experimental embryology, molecular mechanisms of developmental regulation, and gene function in cell determination and cell differentiation in animal systems. Prerequisites: 455 or equivalent and permission of instructor.

ZOOL 464 Natural History of Birds (5) *Sp Rohwer, Wingfield* Field, lecture, and laboratory study of birds framed in biological theory rather than taxonomy. Breeding systems, brood parasitism, appearance, molt, migration, orientation, social behavior, song, and flight are emphasized. Includes Saturday and weekend field trips for which students are required to share a portion of transportation costs. Prerequisites: BIOL 210, 211, 212 or equivalent, and permission of instructor.

ZOOL 465 Natural History of Mammals (5) *A Kenagy* Field, lecture, and laboratory course introducing mammals in a general biological context, emphasizing

ecology, evolution, behavior, morphology, and adaptation to the environment. Fieldwork focuses on rodent populations and their habitats in Washington State. Includes weekend field trips, for which students may be required to share a portion of transportation costs. Prerequisites: BIOL 210, 211, 212, and permission of instructor; recommended: 453-454 and BIOL 472.

ZOOL 469 Reproductive Endocrinology (3) *Sp Kenagy, Wingfield* Endocrine regulation of the processes of mammalian reproduction. Integration of reproduction with environmental features through behavioral and metabolic adjustments. Planned endocrine manipulation of reproduction and its demographic implications. Prerequisite: one year of college-level biology.

ZOOL 471 Models in Biology (4) *Sp Kareiva* Explores use of models in biology in a wide range of topics, including morphogenesis, nerve signals, ecological interactions, population biology, and evolutionary theory. Emphasis on the biological insights models can provide rather than mathematical techniques. Prerequisites: BIOL 210, 211; MATH 124, 125.

ZOOL 478 Environmental Physiology (5) *A Kenagy* Physiological adaptation in an ecological and evolutionary context. Adaptation to physical aspects of the environment and to daily and seasonal environmental cycles; whole-animal energetics, including thermal relations; water and solute regulation; respiration. Laboratory emphasizes the combination of field and laboratory work. Students may be required to share a portion of the transportation costs of field trips. Prerequisite: 301; recommended: course in vertebrate or invertebrate zoology.

ZOOL 488, 489 Animal Physiology (5,5) *W,S Deyrup-Olsen, Huey, Kenagy, Palka, Riddiford* Physiology at levels of organisms and behavior, organ systems, and cells—an ecological and evolutionary perspective. Energy relations, temperature effects, movement, circulation, respiration, water and solute regulation, membranes, neural and hormonal function, biological rhythms, reproduction. Experimental design and techniques; data analysis; written reports. Prerequisites: introductory biology, chemistry, and physics.

ZOOL 490 Undergraduate Seminar (3, max. 6) Supervised reading and group discussion on selected concepts of zoology. Prerequisites: 20 credits in zoology and permission of instructor.

ZOOL 491 Topics in Zoological Research (1, max. 3) Undergraduate seminar on research problems currently under investigation by department faculty members. Includes discussions and laboratory demonstrations of aims, techniques, and results of zoological research. Prerequisites: upper-division standing and permission of instructor.

ZOOL 498 Special Problems in Zoology (1-5, max. 15) *AWSps* Prerequisite: permission of instructor.

Courses for Graduates Only

ZOOL 506 Topics in Developmental Biology (1-2, max. 15) Seminars and discussions of aspects of growth of special current interest. Prerequisite: permission of instructor.

ZOOL 509 Topics in Animal Behavior (1-3, max. 9) *AWSp Orians, Rohwer* Detailed consideration of topics in behavioral integration, communication, and social organization. Prerequisite: 409 or PSYCH 409 or equivalent.

ZOOL 517 Analytical Development Physiology (9) Modern analysis of oogenesis, fertilization, embryonic organization and differentiation from an experimental and comparative point of view, and other advanced topics. Laboratory emphasizes experimental study of metabolic, biochemical, and biophysical properties, structural and mechanical features, subcellular localization, and microscopic organization of gametes and embryos of various marine invertebrates. Prerequisite: permission of instructor.

ZOOL 520, 521, 522 Seminar (1,1,1) *A,W,Sp*

ZOOL 528 Advanced Topics in Physiology (1-3, max. 15) Recent developments. Prerequisite: at least one 400-level course in physiology.

ZOOL 529 Advanced Topics in Physiology (1-3, max. 15) *Edwards, Huey, Kenagy, Palka, Riddiford, Schubiger, Truman* Recent developments. Prerequisite: one 400-level course in physiology.

ZOOL 533 Advanced Invertebrate Zoology (9) *SpS* Invertebrate fauna of the San Juan Archipelago. Topic changes from year to year. Individual research projects are emphasized. Offered at Friday Harbor Laboratories. Prerequisites: 10 credits in invertebrate zoology or equivalent and permission of Director of Friday Harbor Laboratories.

ZOOL 536 Comparative Invertebrate Embryology (9) *SpS* Morphological and experimental studies of development of selected types of marine invertebrates. Offered at Friday Harbor Laboratories. Prerequisites: 433, 434, 456, and permission of Director of Friday Harbor Laboratories.

ZOOL 538 Advanced Invertebrate Physiology (9) *Sp* General and comparative aspects of nerve and muscle physiology with particular emphasis upon neuronal control of behavior, neuronal interactions, and other advanced topics determined by visiting faculty. Extensive laboratory experience, including intracellular and extracellular stimulating and recording techniques. Offered at Friday Harbor Laboratories. Recommended: background in cellular physiology and invertebrate morphology.

ZOOL 556 Insect Development (3) *Edwards, Riddiford, Schubiger* Characterizes developmental processes and their adaptations in diverse insect groups. Emphasizes hormonal control mechanisms in metamorphosis, polymorphism and diapause, regeneration and genetic analysis of development. Prerequisites: 456 or equivalent, BIOL 212 or equivalent, or permission of instructor.

ZOOL 568 Chemical Integration (2, max. 6) *AW* Graduate seminar dealing with current problems in endocrinology and neuroendocrinology. Prerequisite: permission of instructor.

ZOOL 572 Topics in Ecology (2 or 3) *W Kareiva, Kingsolver, Kohn, Orians, Paine, Wilson* Graduate seminar on modern problems in ecology. Prerequisites: BIOL 472 or equivalent, and permission of instructor.

ZOOL 574 Ecology of Marine Communities (3) *Paine* Lecture course emphasizing the ecological structure and functioning of marine communities. Topics include population interactions and dynamics, distributional patterns, bioenergetics, stability, and species diversity. Prerequisites: BIOL 472 or equivalent, and permission of instructor.

ZOOL 578 Advanced Ecology (5) *Orians* Strategies of reproduction, habitat selection, foraging and spacing; theory of competition and predator-prey interactions; niche theory and community structure. Prerequisites: BIOL 472 or equivalent, and permission of instructor.

ZOOL 583 Advanced Techniques in Microscopy (5) *W Cloney* Theory and use of light and electron microscopes, modern techniques of specimen preparation for morphological studies, photomicrography. Methodologies are applied to analyses of special problems selected by students. Prerequisite: permission of instructor.

ZOOL 600 Independent Study or Research (*) *AWSps*

ZOOL 700 Master's Thesis (*) *AWSps*

ZOOL 800 Doctoral Dissertation (*) *AWSps*

School and Graduate School of Business Administration

Dean

Nancy L. Jacob

Associate Deans

Loyd C. Heath
Alfred N. Page

126 Mackenzie

Men and women embarking on business careers will have the opportunity to influence many of the social, political, and economic forces in today's world. The School of Business Administration prepares students to enter management and other positions and provides a foundation upon which students can build their professional careers.

The School of Business Administration offers an undergraduate program leading to the degree of Bachelor of Arts in Business Administration. The Graduate School of Business Administration offers programs leading to the degrees of Master of Business Administration, Master of Professional Accounting, and Doctor of Philosophy.

Business Administration became an independent unit within the University system in 1917. Since 1921, it has been a member of the American Assembly of Collegiate Schools of Business, with both undergraduate and graduate programs accredited.

Facilities and Services

Most business administration classes and activities are in two buildings. Balmer Hall, named for Thomas Balmer, former president of the University Board of Regents, contains classrooms, the business administration library, and the business administration computer users center. Mackenzie Hall, named in memory of Prof. Donald Mackenzie, Chairperson of the Department of Accounting from 1949 to 1955, contains the Dean's office, the Office of Graduate Programs, the Office of Undergraduate Programs, faculty offices, and other business administration program offices.

The Graduate School of Business Administration, in association with the Western Finance Association, publishes the quarterly journal, *Journal of Financial and Quantitative Analysis*. The school also publishes *The Pacific Northwest Executive*, which provides information to managers on Pacific Northwest economic, business, and public policy issues.

To serve the continuing education needs of business persons, the School and Graduate School of Business Administration offer a number of short programs, either University-initiated or cosponsored with various community and industry organizations. The eight-month management program for middle- to upper-level managers strengthens understanding and skills in all areas of management and provides an opportunity for successful managers to learn from each other. Several residential programs are offered on campus, including the engineering management program and the aerospace industry manufacturing seminar. The schools co-sponsor the Pacific Coast Banking School and the Pacific Rim Bankers Program. Short courses and

workshops are offered throughout the year in all areas of management, including marketing strategy, sales management, managing change, finance and accounting for non-financial executives, marketing research, tax clinic for small business, and the entrepreneurship symposium. In addition, the schools develop and run in-house training programs under contract with individual companies. Information on continuing education programs may be obtained from the Office of Executive Programs, 543-8560.

Minority Program

Academic Counselor
Martha Brasfield
137 Mackenzie

Special advising and support services are available for students from underrepresented minorities. Both pre-business and undergraduate business majors of Hispanic, Black, and Native American ancestry are eligible for the program.

Business Career Center

Director
James Peters
138 Mackenzie

Director, MBA Placement
Phyllis Needy
131 Mackenzie

The Business Career Center serves as a resource area for students preparing for career planning and a job search, provides career counseling, coordinates the internship and cooperative education programs, and manages the awarding of business school scholarships and fellowships. The M.B.A. placement director administers the M.B.A. placement program. Services include facilitating all aspects of the job-search process (for students and M.B.A. alumni), interacting with employers and potential employers, providing individual counseling and job-search resources, conducting job-search seminars, coordinating M.B.A. placement activities with the UW Placement Center, and coordinating publication of the *M.B.A. Résumé Composite*.

Honor Societies

Beta Gamma Sigma is the national scholastic honor society in the field of business. Election to membership is available to both undergraduate and graduate students in business. Selection is based upon outstanding scholastic achievement.

Beta Alpha Psi is the accounting honor society. Membership is based primarily on scholastic achievement, but some community service is also required. Beta Alpha Psi provides a mechanism for students, professionals, and educators to meet on both formal and informal bases.

Student Organizations

Chapters of Alpha Kappa Psi, the Association of Black Business Students, Hispanic Business Association, Pacific Northwest Personnel Management Association, International Association of Students in Economics and Business Management, American Marketing Association, and Student Advisory Council provide opportunities for undergraduate students to meet informally and to participate in a variety of projects and events.

The goals and interests of graduate students are served by the M.B.A. Association, Graduate Women in Management, and the Doctoral Association.

Undergraduate Program

Undergraduate Office

137 Mackenzie

Director
Gary Olson

The School of Business Administration, with admission at the junior level, offers a two-year program leading to the degree of Bachelor of Arts in Business Administration. The curriculum, building upon a basic foundation in the arts and sciences, provides an exposure to a wide range of functional business areas and the opportunity for study in selected areas in some depth. About forty percent of the 1,450 students in business administration study accounting, which is the only formal undergraduate concentration. Other students may choose to follow informal concentrations (e.g., finance, marketing, human resources management, international business, and operations management) based upon suggested guidelines offered by departments. The Undergraduate Program Office has handouts describing each concentration, the faculty members who specialize in the area, and potential career applications.

Academic counselors are available to help with selecting classes, adding and dropping classes, long-range planning, applying for graduation, making referrals to other campus resources and programs, and providing any needed general assistance. The Undergraduate Office publishes *Clearinghouse*, a weekly newsletter that provides information on counselor schedules, new class offerings, and changes in University and school policies.

Academic Counselors

Holly Bauman (Accounting)
Julie Finlayson
Jeffrey Hedgepeth
Patsy Wosepka

Bachelor of Arts in Business Administration Degree

Specific School Admission Requirements: A minimum of 90 credits to include the following (or equivalents): 20 credits in natural sciences, including 5 credits in calculus (MATH 157 or 124); most students need precalculus before taking college calculus (some precalculus courses qualify for natural science distribution); 30 credits in social sciences, including 10 credits in microeconomics and macroeconomics (ECON 200 and 201) and 10 credits in anthropology, psychology, and/or sociology; 10 credits in humanities; the required completed linked sets, which are usually the precalculus and calculus courses and the macro- and microeconomics courses (if precalculus is not taken, another linked set must be completed); 5 credits in English composition; ACCTG 210, 220, 230; I S 200; Q METH 201; OE 200; 5 elective credits. Students may not count credit for more than one introductory statistics course. These general education courses must be selected from the College of Arts and Sciences distribution list. Students from other four-year schools and community colleges in Washington should check the *Transfer Guide* for equivalent courses. Applicants who meet the University and School of Business Administration requirements at the time they transfer are eligible to be placed directly in the school; those with 45 credits and a minimum 2.85 GPA who meet the University entrance requirements, but not the business administration requirements, are eligible to be placed in the College of Arts and Sciences as prebusiness majors. For admission to the School of Business Administration, a supplemental application, together with all supporting materials, must be on file by the following quarterly deadlines: for Summer or Autumn quarters, April 1-15; Winter Quarter, October 1-15; Spring Quarter, January 1-15. Because eligible applicants exceed

the space available, admission is competitive. The most-qualified applicants will be admitted on grade-point average alone, but most applicants will be ranked for admission after considering their GPAs and the following factors: (1) grading practices of the college(s) at which course work was completed, (2) difficulty of courses taken, (3) GPA in business courses relative to overall GPA, (4) number of withdrawals and incompletes on their transcripts, and (5) the desired diversity of the student body. No student will be admitted with a cumulative GPA less than 2.50 for all college credits or less than 2.50 for all required business administration courses. A student who has previously attended this university also must have GPAs of at least 2.50, both UW cumulative and in UW business administration courses.

Specific Upper-Division School Requirements: B ECN 300, 301; MKTG 301; BUS 300; OPMGT 301; FIN 350; HRMOB 400; OE 302, 440; B POL 470 or 471 or 480; and a minimum of 16 credits of 300- or 400-level business administration electives (or area of concentration); minimum of 4 credits in an approved writing course, or two "W" courses. (See below for accounting requirements.)

Specific School Graduation Requirements: No more than 9 lower-division business elective credits; a minimum of 72 non-business administration credits, including those listed under Specific School Admission Requirements, and 72 business administration credits, including those listed under the preceding two requirements sections; a cumulative grade-point average of at least 2.50 in all business administration credits earned at the University; and a cumulative grade-point average of 2.50 for all University credits. Students must complete 36 of the 52 required upper-division business credits at the University of Washington. Students who have taken more than four of the ten upper-division core business courses at another school will not be admitted to the School of Business Administration.

Double Baccalaureate Degrees and Second Baccalaureate Degree

Students who wish to earn more than one baccalaureate degree should consult an academic counselor in the business administration advisory office, either during or before the junior year. Persons seeking a second baccalaureate degree should apply at the University's Office of Undergraduate Admissions. To be considered, applicants must complete by quarter of entry the same prerequisites for admission as applicants for the first baccalaureate degree. If the number of eligible applicants exceeds that for which space is available, acceptance will be competitive, based on the criteria listed above for selection of first baccalaureate degree applicants. The grade-point average for the last 90 credits earned will be used.

Graduate Program

Graduate Office

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Reza Moïnpour, Director, Ph.D. Program, Graduate Program Coordinator

Donald R. Bell, Director, M.B.A. Program, Alternate Graduate Program Coordinator

Gerhard G. Mueller, Director, M.P.Acc. Program

Janice M. Monti, Director, E.M.B.A. Program

Admission

Qualified students who are graduates of the University of Washington or of other accredited colleges or universities may be admitted Autumn Quarter to graduate degree programs. Grade-point average, Graduate Management Admission Test score, work experience, educational and professional objectives, and other factors are considered in the admission process. Inquiries concerning the details of admission should be made to

University of Washington, Graduate School of Business Administration, Mackenzie Hall, DJ-10, Seattle, Washington 98195.

Application Procedure

Applications to graduate programs are considered in the winter and spring of each year for entry in the Autumn Quarter. The formal deadlines for application are: February 15 for the Ph.D. program, March 15 for the full-time M.B.A. and M.P.Acc. programs, and May 1 for the Executive M.B.A. Program.

The Graduate School of Business Administration offers programs of study leading to the advanced degrees of Master of Business Administration, Master of Professional Accounting, and Doctor of Philosophy.

The Master of Business Administration degree program has been designed for students with varied academic backgrounds (e.g., arts and sciences, engineering, business administration) who are preparing for a professional career in management. A period of two academic years, or 72 academic credits, is required for most students to complete the M.B.A. program. The program consists of 36 credits of required first-year courses, 3 credits of required second-year business policy, and 33 elective credits. The student may take no more than 18 credits in any elective area. In addition, within the 33 elective credits the student must satisfy the research requirement by either writing an M.B.A. research report in the area of concentration or taking two electives designated by the faculty as satisfying the research requirements.

In the autumn of 1983, an additional pathway to the Master of Business Administration degree, called the Executive M.B.A. Program, was initiated. Its primary objective is to provide a special executive development experience to a select group of midcareer managers. Candidates for this two-year program should have seven or more years of increasingly successful work experience and currently hold a management-level position. They also should be identified by their sponsoring organization as having potential for continued advancement toward general management. Participants are selected to ensure diversity of industry, experience, function, and organizational size. Following an initial September session of one week in residence, classes meet for a full day on alternating Fridays and Saturdays. Course work is comparable to that of the regular M.B.A. program, with adjustments made to provide a distinctly managerial focus. Students move through the program together as a group. There are no electives. Applications are accepted throughout the year for the class beginning each autumn.

The Master of Professional Accounting degree program is aimed at preparing high-level professional accounting specialists. The M.P.Acc. degree (1) provides an opportunity for graduate study in accounting beyond the typical undergraduate accounting major and in greater depth than that offered by an accounting concentration in an M.B.A. program, and (2) fosters a professionally oriented academic environment within which professional attitudes, ethics, and a sense of personal, public, and social responsibility develop and grow.

The Doctor of Philosophy degree program has been designed for persons who wish to prepare for careers in research and teaching, business, or government. Students enrolled in this program are expected to possess the broad professional administrative competency that is the objective of the M.B.A. program, and, in addition, are expected to pursue doctoral-level competency in an area of concentration and several supporting areas. Moreover, all students must show evidence of competency in the methods and tools of research appropriate to their areas of interest. Opportunities for gaining teaching experience under supervision are available, and each student is required to obtain at least a minimum of such experience.

Special Requirements

Applicants to graduate business programs are required to submit scores on the Graduate Management Admission Test. Those admitted to the M.B.A. program must demonstrate understanding of the fundamental concepts of calculus and proficiency in the use of computers.

Financial Aid

The Graduate School of Business Administration offers a number of teaching assistantships and predoctoral teaching associate appointments each year. A limited number of scholarships and fellowships also are available.

Accounting

Accounting involves development and communication of financial and operational information for business and nonprofit economic entities. Courses provide a foundation for careers in accounting (public, industrial, private, governmental, or institutional), for a general business career, or for other professions such as law. The notation "Accounting" will be included on the permanent record, or transcript, of a student who graduates with a degree of Bachelor of Arts in Business Administration and who completes with a cumulative grade-point average of at least 2.00 the following courses: ACCTG 301, 302, 303, 311, 330, 411, 421, and 6 elective credits in 400-level accounting courses, except 401 and 499. Students who have completed ACCTG 505 may not apply to the accounting concentration. Students who have completed ACCTG 303 may not receive credit for ACCTG 375.

Faculty

Chairperson

Roland E. Dukes
231 Mackenzie

Professors

Alkire, Durwood L., 1973, (Emeritus), B.A., 1935, Washington; tax accounting.

Berg, Kenneth B., 1950, (Emeritus), M.S., 1941, Ph.D., 1952, Illinois; financial and managerial accounting.

Dukes, Roland E., 1980, M.B.A., 1970, Ph.D., 1974, Stanford; financial accounting.

Heath, Loyd C., 1962, M.B.A., 1953, Northwestern; Ph.D., 1965, California (Berkeley); financial accounting.

Jiambalvo, James, 1977, M.A.S., 1973, Illinois; Ph.D., 1977, Ohio; managerial accounting.

Mueller, Fred J., 1956, (Emeritus), M.A., 1954, Washington; Ph.D., 1956, Ohio State; auditing, not-for-profit, tax accounting.

Mueller, Gerhard G., 1960, M.B.A., 1957, Ph.D., 1961, California (Berkeley); Director, Master of Professional Accounting Program; financial accounting and reporting, international accounting.

Noreen, Eric W., 1976, M.B.A., 1974, Ph.D., 1976, Stanford; managerial accounting.

Ramanathan, Kavasserl V., 1971, M.B.A., 1962, Ph.D., 1969, Northwestern; managerial accounting.

Roller, Julius A., 1945, (Emeritus), M.A., 1960, Michigan; tax accounting.

Sundem, Gary L., 1971, M.B.A., 1969, Ph.D., 1971, Stanford; information systems, managerial accounting.

Walker, Lauren M., 1946, (Emeritus), M.B.A., 1943, Washington; financial and international accounting.

Associate Professors

Biddle, Gary C., 1984, M.B.A., 1976, Ph.D., 1980, Chicago; financial accounting.

Bowen, Robert M.,* 1978, M.B.A., 1971, Washington (St. Louis); Ph.D., 1978, Stanford; financial and managerial accounting.

Burgstahler, David C.,* 1980, Ph.D., 1981, Iowa; financial and managerial accounting.

Kelly, Lauren,* 1983, M.B.A., 1973, Bridgeport; Ph.D., 1976, Alabama; financial accounting.

Pratt, James H.,* 1977, M.B.A., 1975, D.B.A., 1977, Indiana; financial accounting.

Assistant Professors

Liberty, Susan E., 1987, (Acting), M.S., 1985, Rochester; financial accounting.

McDaniel, Linda F., 1987, (Acting), M.B.A., 1983, Florida; financial accounting.

Selcik, Stephan E., 1987, M.A.S., 1976, Ph.D., 1983, Illinois (Urbana-Champaign); financial accounting.

Seow, Gim-Seong, 1985, M.B.A., 1981, Dalhousie; Ph.D., 1985, Oregon; financial accounting.

Shevlin, Terrence J., 1985, M.Ec., 1981, Monash; Ph.D., 1986, Stanford; financial and managerial accounting.

Shores, Donna J., 1986, M.S., 1980, Wisconsin; Ph.D., 1986, Stanford; financial and managerial accounting.

Lecturers

Resler, William M., 1979, J.D., 1972, Washington; LL.M., 1973, New York; tax accounting.

Rice, Steven J., 1987, M.S., 1972, Oklahoma State; Ph.D., 1974, Texas (Austin).

Finance and Business Economics

Finance and business economics facilitate understanding the financial and economic aspects of decision making. The finance curriculum focuses on teaching sound principles of financial management and on understanding the behavior of the financial markets within which firms and individual investors operate. Business economics courses study the economic behavior of firms, examining factors that determine costs and prices. They also analyze how real and monetary factors (such as government policies) affect the national and international economic environment.

Faculty

Chairperson

Peter A. Frost
269 Mackenzie

Professors

Alberts, William W.,* 1967, M.A., 1956, Ph.D., 1961, Chicago; finance and business economics.

Bourque, Philip J.,* 1957, M.A., 1950, Ph.D., 1956, Pennsylvania; business economics.

D'Ambrosio, Charles A.,* 1960, M.S., 1958, Ph.D., 1962, Illinois; finance.

Frost, Peter A.,* 1969, M.A., 1961, Ph.D., 1966, California (Los Angeles); finance and business economics.

Haley, Charles W.,* 1966, M.B.A., 1964, Ph.D., 1968, Stanford; finance.

Hanson, Kermit O., 1948, (Emeritus), M.S., 1940, Ph.D., 1950, Iowa State; accounting and statistics.

Henning, Charles N.,* 1948, (Emeritus), M.A., 1940, Ph.D., 1952, California (Los Angeles); finance and business economics.

Hess, Alan C.,* 1967, M.S., 1967, Ph.D., 1969, Carnegie Institute of Technology; business economics.

Higgins, Robert C.,* 1967, M.B.A., 1965, Harvard; Ph.D., 1969, Stanford; finance.

Jacob, Nancy L.,* 1970, Ph.D., 1970, California (Irvine); finance.

Johnson, Dudley W.,* 1960, M.A., 1953, Ph.D., 1957, Northwestern; business economics.

Page, Alfred N.,* 1965, M.B.A., 1962, Ph.D., 1964, Chicago; business economics.

Roley, V. Vance,* 1983, A.M., 1976, Ph.D., 1977, Harvard; economics.

Schall, Lawrence D.,* 1968, M.A., 1967, Ph.D., 1969, Chicago; finance and business economics.

Associate Professors

Conrad, Douglas A.,* 1977, ‡(Community Dentistry, Health Services), M.H.A., 1973, Washington; M.B.A., 1976, Ph.D., 1978, Chicago; economic regulation in hospital industry, hospital and health administration, cost-effectiveness of dental treatment.

Malatesta, Paul H., 1980, M.S., 1976, Ph.D., 1981, Rochester; finance.

Pigott, William III, 1957, (Emeritus), M.A., 1955, Ph.D., 1957, Washington; finance and business economics.

Rice, Edward M.,* 1979, M.B.A., 1973, Rochester; Ph.D., 1978, California (Los Angeles); finance and business economics.

Siegel, Andrew F.,* 1983, (Statistics, Zoology), (Management Science), † M.S., 1975, Ph.D., 1977, Stanford; statistics.

Trivedi, Vandan M.,* 1974, ‡(Health Services), M.S.E., 1969, Ph.D., 1974, Michigan; operations research models for hospitals and health-care systems.

Assistant Professors

Bonser-Neal, Catherine A., 1987, (Acting), M.A., 1983, Chicago; international finance.

Huang, Wen-Dai Elizabeth, 1984, M.B.A., 1980, Ph.D., 1986, California (Berkeley); financial markets and institutions.

Kamara, Avraham, 1984, M.S., 1979, Hebrew University (Jerusalem); Ph.D., 1988, Columbia; financial futures and options.

Karpoff, Jonathan M., 1983, M.A., 1980, Ph.D., 1982, California (Los Angeles); economics.

Neal, Robert S., 1987, (Acting), M.A., 1985, Chicago; finance, securities markets.

Wheatley, Simon, 1984, M.A., 1979, Simon Fraser (Canada); Ph.D., 1986, Rochester; international finance.

Lecturer

Hadjimichalakis, Karma G., 1970, M.A., 1968, Ph.D., 1974, Rochester; business economics.

Marketing and International Business

Marketing provides knowledge of concepts and relationships in the areas of consumer behavior, channels of distribution, measurement and analysis of markets, pricing, physical movement of goods, product development, promotion, and sales administration. Marketing careers may involve specialization in product or brand management, advertising, sales management, marketing research, retailing, wholesaling, and international marketing for a wide spectrum of firms and industries. International business includes trade, payments, and multinational corporate systems and activities. The area prepares students for international responsibilities in domestic business firms, governmental agencies, and overseas business. Courses in business communications stress the writing dimension as it relates to business; also included are theory and techniques of effective communication in interpersonal relationships.

Faculty

Chairperson

John J. Wheatley
156 Mackenzie

Professors

Etcheson, Warren W.,* 1954, M.A., 1951, Ph.D., 1958, Iowa; marketing.

Gordon, Guy G., 1949, (Emeritus), M.B.A., 1950, Washington; Ph.D., 1957, California (Berkeley); marketing.

Harder, Virgil E.,* 1955, (Emeritus), M.A., 1950, Iowa; Ph.D., 1958, Illinois; business communications.

Ingene, Charles A.,* 1982, M.A., 1972, Ph.D., 1975, Brown; retailing and distribution.

Johansson, Johny,* 1975, M.B.A., 1967, Ph.D., 1972, California (Berkeley); quantitative models of marketing.

Kolde, Endel J.,* 1951, (Emeritus), M.A., 1951, Ph.D., 1954, Washington; international business and marketing.

MacLachlan, Douglas L.,* 1970, M.A., 1970, Ph.D., 1971, California (Berkeley); quantitative methods and marketing research.

Miller, Charles J., 1927, (Emeritus), M.B.A., 1927, Washington; marketing.

Moinpour, Reza,* 1969, M.B.A., 1966, Ph.D., 1970, Ohio State; consumer behavior and marketing research.

Murphy, Herta A., 1946, (Emeritus), M.A., 1942, Washington; international business.

Narver, John C.,* 1966, M.B.A., 1960, Ph.D., 1965, California (Berkeley); marketing.

Shocker, Allan D.,* 1986, M.S., 1962, Ph.D., 1971, Carnegie-Mellon; industrial administration.

Spratt, Thaddeus,* 1972, M.A., 1957, Ph.D., 1962, Ohio State; marketing.

Wheatley, John J.,* 1960, M.B.A., 1954, Ph.D., 1959, State University of New York (Buffalo); marketing.

Yalch, Richard F.,* 1974, M.S., 1970, Carnegie-Mellon; Ph.D., 1974, Northwestern; advertising and consumer behavior.

Yamamura, Kozo,* 1972, ‡(Economics, International Studies), Ph.D., 1964, Northwestern; economic development and economic history of Japan, comparative economic history.

Associate Professors

Erickson, Gary,* 1980, M.B.A., 1973, Ph.D., 1978, Stanford; quantitative models of marketing.

Grathwohl, Harrison L.,* 1958, (Emeritus), M.B.A., 1952, D.B.A., 1957, Indiana; marketing.

Moxon, Richard W.,* 1971, M.S., 1964, Stanford; D.B.A., 1973, Harvard; international business.

Sullivan, Jeremiah J.,* 1976, M.A., 1967, Ph.D., 1970, New York; M.B.A., 1975, Washington; business communications.

Trull, J. Frederick,* 1969, M.B.A., 1965, D.B.A., 1970, Indiana; international business.

Assistant Professors

Atwood, April, 1983, M.A., 1983, Ohio State; marketing.

Donegan, Lisa, 1984, M.A., 1978, M.Phil., 1981, Ph.D., 1985, Yale; international business.

Jacobson, Robert,* 1984, Ph.D., 1981, California (Berkeley); marketing strategies.

Obermiller, Carl,* 1981, M.A., 1973, Johns Hopkins; Ph.D., 1981, Ohio State; consumer behavior and marketing.

Roehl, Thomas W.,* 1977, M.A., 1969, Oregon; M.A., 1976, Ph.D., 1983, Washington; international business.

Lecturers

Kalitzki, Judith A., 1986, Ph.D., 1979, Washington; business communications.

Whelan, John F., 1986, M.A., 1977, Yale; international business.

Management and Organization

Management and organization provides an understanding of the processes and structures of organizations through courses in three distinct programs. The human resource management and organizational behavior courses address personnel and industrial relations topics such as selection, performance appraisal, and negotiations, as well as behavioral topics such as leadership, motivation, and group dynamics. These courses prepare students for managing an organization's human resources effectively. The organization and environment courses examine organization theory and organization design as well as the social, political, legal, and ethical environments in which organizations operate. These courses give students the knowledge, perspective, and analytical tools to deal effectively with organization-environment interactions. The business policy courses focus on organizational effectiveness from the viewpoint of top management. Emphasis is placed on strategic management and control, planning, decision making, and entrepreneurship.

Faculty

Chairperson

Gary P. Latham
155 Mackenzie

Professors

Brown, Edward G., 1948, (Emeritus), M.B.A., 1921, Harvard; business policy.

Brown, S. Darden, 1930, (Emeritus), LL.M., 1938, Stanford; business law.

Fenn, Margaret P., 1953, (Emeritus), M.B.A., 1950, D.B.A., 1963, Washington; organizational behavior and administrative theory.

Fiedler, Fred E., 1969, ‡(Psychology), A.M., 1947, Ph.D., 1949, Chicago; leadership and group effectiveness; social, industrial, and organizational psychology.

French, Wendell L., 1958, (Emeritus), M.P.S., 1949, Colorado; D.Ed., 1956, Harvard; organizational behavior, human resources management, organization development.

Goldberg, Leonard D., 1947, (Emeritus), J.D., 1945, Chicago; business responsibilities and comparative business.

Gross, Edward, 1967, ‡(Sociology), M.A., 1945, Toronto; Ph.D., 1949, Chicago; formal organizations, industrial sociology.

Henning, Dale A., 1955, M.B.A., 1949, Pennsylvania; Ph.D., 1954, Illinois; administrative theory and organizational behavior.

Jamieson, Ronald B., 1967, (Emeritus), LL.B., 1939, Harvard; business, government, and society.

Johnson, Richard A., 1955, (Emeritus), M.B.A., 1952, Minnesota; Ph.D., 1958, Washington; business policy.

Kast, Fremont E., 1952, (Emeritus), M.B.A., 1949, Stanford; Ph.D., 1956, Washington; administrative theory and organizational behavior.

Knowles, Henry P., 1957, (Emeritus), M.B.A., 1947, Harvard; Ph.D., 1961, Stanford; administrative theory and organizational behavior.

Knudson, Harry R., Jr., 1958, M.B.A., 1953, Indiana; D.B.A., 1958, Harvard; business policy.

Latham, Gary P., 1983, (Psychology), M.S., 1969, Georgia Institute of Technology; Ph.D., 1974, Akron; administrative theory and organizational behavior, human resources management.

LeBreton, Preston P., 1960, (Emeritus), M.B.A., 1949, Louisiana State; Ph.D., 1953, Illinois; business policy and administrative theory.

Mitchell, Terence R., 1969, (Psychology), † M.A., 1967, Ph.D., 1969, Illinois; organizational behavior.

Newell, William T., 1960, (Fisheries), (Management Science), † M.B.A., 1955, Denver; Ph.D., 1962, Texas; operations management and business policy.

Peterson, Richard B., 1966, M.A., 1956, Illinois; Ph.D., 1966, Wisconsin; human resources management.

Rosenzweig, James E., 1956, (Emeritus), M.B.A., 1954, Washington; Ph.D., 1956, Illinois; administrative theory and organizational behavior.

Saxberg, Borje O., 1957, M.S., 1953, Ph.D., 1958, Illinois; administrative theory and organizational behavior.

Schrieber, Albert N., 1948, (Emeritus), M.B.A., 1947, Harvard; business policy.

Scott, William G., 1966, M.S.I.R., 1952, Loyola; D.B.A., 1957, Indiana; administrative theory and organizational behavior.

Summer, Charles E., 1969, M.B.A., 1948, Pennsylvania; Ph.D., 1957, Columbia; business policy and administrative theory.

Sutermester, Robert A., 1949, (Emeritus), M.A., 1942, Washington; personnel and organizational behavior.

Vesper, Karl H., 1969, (Mechanical Engineering, Marine Studies), † M.B.A., 1960, Harvard; M.S., 1966, Ph.D., 1969, Stanford; business policy, mechanical engineering, marine studies.

Wheeler, Bayard O., 1941, (Emeritus), M.A., 1930, Washington; Ph.D., 1942, California (Berkeley); urban economics.

Associate Professors

Beard, Donald W., 1975, M.B.A., 1961, Harvard; Ph.D., 1975, Nebraska; business policy.

Bell, Cecil H., 1968, (Psychology), M.A., 1959, Ph.D., 1970, Boston; organizational behavior and administrative theory.

Buck, Vernon E., 1968, M.S., 1960, Ph.D., 1963, Cornell; organizational behavior and administrative theory.

Fry, Louis W., 1983, (Psychology), M.B.A., 1973, American; Ph.D., 1978, Ohio State; administrative theory and organizational behavior.

Jones, Thomas M., 1977, M.B.A., 1970, Washington; Ph.D., 1977, California (Berkeley); business, government, and society.

Kienast, Philip K., 1970, M.L.I.R., 1966, Ph.D., 1972, Michigan State; human resources management.

Strong, Dennis F., 1967, Ph.D., 1959, Washington; business history.

Wickman, James A., 1955, (Emeritus), M.B.A., 1954, D.B.A., 1961, Washington; risk control and insurance.

Woodworth, Robert T., 1961, M.B.A., 1956, Ph.D., 1963, Northwestern; administrative theory and organizational behavior, human resources management.

Assistant Professors

Butler, John E., 1985, M.B.A., 1980, LaSalle; M.Phil., 1982, Ph.D., 1985, New York; business policy.

Gist, Marilyn E., 1987, M.B.A., 1982, Ph.D., 1985, Maryland; organizational behavior, strategic management.

Hansen, Gary S., 1984, M.B.A., 1980, Ph.D., 1987, Michigan; business policy.

Huber, Vandra L., 1987, M.S., 1978, Utah; M.B.A., 1981, D.B.A., 1982, Indiana; human resources and social psychology.

Lee, Thomas, 1983, (Psychology), M.A., 1977, Bowling Green; Ph.D., 1984, Oregon; administrative theory and organizational behavior, human resources management.

Lecturers

Berger, Robert H., 1985, J.D., 1967, M.B.A., 1983, California (Berkeley); law.

Brucker, Thomas H., 1983, LL.B., 1960, Columbia; law.

Management Science

Management Science consists of three subareas: Information Systems, Operations Management, and Quantitative Methods. The Information Systems area is concerned with the analysis, design, and management of computer-based information/decision systems. The Operations Management area deals with the functional part of an organization that produces goods, services, or both; some topics covered include materials management, location and logistics, production scheduling, and manufacturing strategy. The Quantitative Methods area focuses on quantitative and statistical models that have been developed to assist managers to better analyze and understand business problems; courses in this area cover business statistics and operations research.

Faculty

Chairperson

Theodore D. Klastorin
370 Mackenzie

Professors

Chiu, John S. Y., 1960, M.S., 1955, Kentucky; Ph.D., 1960, Illinois; quantitative methods.

Faaland, Bruce H., 1971, (Applied Mathematics), M.S., 1968, Ph.D., 1971, Stanford; quantitative methods.

Klastorin, Theodore D., 1974, Ph.D., 1973, Texas (Austin); operations management.

Newell, William T., 1960, (Fisheries), (Management and Organization), † M.B.A., 1955, Denver; Ph.D., 1962, Texas; operations management and business policy.

Associate Professors

Diehr, George E., 1968, M.B.A., 1966, Ph.D., 1969, California (Los Angeles); quantitative methods.

Prater, George L., 1965, M.B.A., 1959, Ph.D., 1963, Stanford; quantitative methods.

Schmitt, Thomas G., 1979, M.B.A., 1974, Cincinnati; D.B.A., 1979, Indiana; operations management.

Siegel, Andrew F., 1983, (Statistics, Zoology), (Finance and Business Economics), † M.S., 1975, Ph.D., 1977, Stanford; quantitative methods, statistics.

Tamura, Hirokuni, 1967, M.S., 1961, Ph.D., 1967, Michigan; quantitative methods.

Assistant Professors

Hart, J. Pirie, Jr., 1983, M.B.A., 1977, Ph.D., 1984, California (Berkeley); operations management.

Koushik, Murlindhar V., 1986, M.B.A., 1972, Calcutta; management information system.

Moinzadeh, Kamran, 1984, M.S., 1982, Ph.D., 1984, Stanford; information systems.

Saharia, Aditya, 1984, M.S., 1969, Aligarh Muslim; Ph.D., 1978, Carnegie-Mellon; operations management.

Lecturers

Burrows, William, 1979, M.B.A., 1972, Washington; quantitative methods.

Hawkins, Michael, 1978, M.S., 1968, Ph.D., 1977, California (Berkeley); management science.

Course Descriptions

Accounting

Courses for Undergraduates

ACCTG 210 Introduction to Accounting (3) Nature and social setting of accounting; uses of accounting information; introduction to basic accounting concepts, and some accounting techniques. Prerequisite: sophomore standing or above.

ACCTG 220 Fundamentals of Financial Accounting (3) Principal procedures and concepts utilized in contemporary financial accounting and reporting. Preparation and interpretation of financial statements. Prerequisite: 210.

ACCTG 230 Fundamentals of Managerial Accounting (3) Analysis and evaluation of accounting information as part of the managerial processes of planning, decision making, and control. Concentrates on types of economic decision making in enterprises and on accounting information useful to enterprise managers. Prerequisite: 220.

ACCTG 301, 302, 303 Intermediate Accounting I, II, III, (3,3,3) Concepts and principles of financial accounting. Analysis of controversies and problems related to the measurement of enterprise income. Prerequisites: 230 and admission to accounting major for 301; 301 for 302; 302 for 303.

ACCTG 311 Cost Accounting (3) Introduction to the theory of cost accounting; job order, process, and standard cost systems; overhead accounting; problems in accumulation and allocation of costs; decision making with cost data. Prerequisite: 301.

ACCTG 330 Introduction to Accounting Information Systems (3) Concepts of accounting information systems in organizations. Processes of analyzing and designing accounting information systems, with emphasis on those using computer facilities. Internal controls and auditing considerations. Prerequisites: 301, I S 200.

ACCTG 371 Auditing or Industrial Internship (2) One quarter's internship with a certified public accounting firm, industrial organization, or government agency. Prerequisite: prior departmental approval.

ACCTG 375 Topics in Financial Reporting (4) Critical examination of the uses and limitations of general purpose financial statements that have been prepared in accordance with generally accepted accounting principles. Not open for credit to students who have completed 303. Prerequisite: 230; not open to accounting majors.

ACCTG 401 Federal Income Tax Factors in Business Decisions (3) Service course recommended for the junior year for the School of Business Administration. May also be taken by M.B.A. students for graduate credit. Prerequisite: 230; not open to accounting majors.

ACCTG 411 Auditing Standards and Principles (3) Intensive introduction to the attest function in society today. The environment, the process, and the report of the public auditor are analyzed. Potential extensions of the attest function are examined. Prerequisites: 303, 311, 330.

ACCTG 421 Tax Effects of Business Decisions (3) Issues in taxation, including tax considerations in business decision making, tax effects of business transactions, taxation of compensation, fringe benefits, capital gains, fixed asset transactions, disposition of business distribution from corporations. Prerequisite: 303 or permission of undergraduate office.

ACCTG 450 Business Taxation (3) Issues of taxation for entities other than individuals, including corporations, subchapter S corporations, partnerships, estates and trusts, corporate distributions, liquidations, and reorganizations. Prerequisite: 421.

ACCTG 451 Individual Income Taxation (3) Political, economic, and social forces influencing federal income taxation, role of taxation in personal decisions. Coverage of individual income tax matters, including business and investment income, business and personal deductions, property transactions, and tax issues of employees. Prerequisite: 421.

ACCTG 460 Advanced Cost Accounting (3) Advanced analysis of cost and management accounting problems; special applications of cost accounting techniques for management planning and control; current developments in cost accounting. Prerequisite: 311.

ACCTG 470 Case Studies in Auditing (3) Application of the theory, standards, and principles to a simulated audit engagement. Guest lecturers discuss the broad-ranging audit involvement. Prerequisite: 411.

ACCTG 471 Internal Auditing (3) Independent appraisal function established within an organization. Role and nature of internal auditing; intensive review of internal control; management effectiveness audits; and financial audits from the point of view of the internal auditor. Prerequisite: 411.

ACCTG 480 Accounting for Not-for-Profit Organizations (3) Fund and budgetary accounting as applied to public sector organizations, such as governments, foundations, hospitals, and colleges. Prerequisite: 303.

ACCTG 485 Advanced Financial Accounting (3) Accounting for partnerships, accounting for business combinations, parent-subsidiary and branch relationships, foreign exchange. Prerequisite: 303.

ACCTG 490 Special Topics in Accounting (3) Special topics of current concern to faculty and students. Offered only when faculty is available and student interest is sufficient. Class is announced in advance of scheduled offerings.

ACCTG 495 Advanced Accounting Theory (3) Theory of accounting related to income measurement, assets, and equities. Prerequisites: 303 and senior standing.

ACCTG 499 Undergraduate Research (3, max. 9) Arranged and supervised by individual members of the faculty. Prerequisite: permission of undergraduate office.

Courses for Graduates Only

Approval of graduate business program office required. Entry card required.

ACCTG 500 Financial Accounting (3) Introduction to concepts and procedures underlying determination and presentation of information for financial decisions by investors and other decision makers outside the business enterprise. Study of problems of valuation, income determination, and financial reporting.

ACCTG 501 Managerial Accounting (3) Study of the generation and the use of accounting information within the firm for purposes of planning and controlling operations. Topics covered include cost concepts, responsibility accounting systems, cost control, and the use of accounting information in short- and long-term management decision problems. Prerequisite: 500.

ACCTG 505 Intensive Analysis of Accounting Principles and Practices (15 S) Intensive covering of subjects in required core for undergraduate accounting majors: intermediate accounting, advanced accounting, cost accounting, auditing, and tax accounting. Available to M.B.A. students, but credits will not count toward M.B.A. degree. Prerequisites: 210, 220, 230 or equivalent, or permission of instructor.

ACCTG 510 Problems in Financial Reporting (3) Extension of 500 emphasizing financial reporting from user's perspective. Alternative approaches to recognition, valuation, and measurement of assets, equities, and income. Choice of accounting methods and effects on the firm of accounting policy regulation. Prerequisites: 500, 501, or permission of instructor.

ACCTG 511 Problems in Managerial and Cost Accounting (3) Discussion and analysis of costing techniques, use of accounting data in planning and evaluating managerial performance, and use of accounting data in short- and long-run decisions. Issues in human behavior involved in cost allocation, budgeting, and performance evaluation. Prerequisites: 500, 501, or permission of instructor.

ACCTG 512 Auditing (3) Introduction to auditing from the perspective of the professional manager. The environment, opinion formulation process, and reporting activities of the public auditor. Acquisition and management of auditing services as an aspect of managerial control. Prerequisites: 500, 501, or permission of instructor.

ACCTG 513 Tax Effects of Business Decisions (3) Importance of tax considerations in making business decisions. Relationship of taxable income to accounting and economic concepts of income, and the economic, political, and social background of important tax provisions. Prerequisite: 500 or 501 or permission of instructor.

ACCTG 520 Seminar in Financial Statement Analysis (3) Emphasizes use of published financial reports by decision makers external to the firm (e.g., investors, creditors). Within each decision context, traditional models and recent empirical research in accounting and finance. Project required as an application of course subject matter. Prerequisites: 500, 501, or permission of instructor.

ACCTG 521 Seminar in Financial Control Systems (3) Design and administration of formal information systems to aid the planning and control process in large organizations; formulation of divisional financial goals and control criteria; measurement of divisional performance and problems of goal congruence; administration of new investment programs. Prerequisites: 501 and O E 550 or permission of graduate office.

ACCTG 524 Seminar in International Accounting (3) Introduction to the conceptual, managerial, professional, and institutional issues of international accounting. Comparative and empirical studies. Current interest topics (e.g., standard setting and transnational financial reporting). Research paper required. Prerequisites: 500, 501, or permission of instructor.

ACCTG 550 Communications in Professional Accounting (4) Introduction to communications forms and to practices of professional accountants and accounting managers. Development of effective written and oral skills employed in accounting presentations, such as audit reports and consultants' reports. Study of results of organizational communications research applicable to accounting firms and/or units within firms. Prerequisite: undergraduate accounting concentration or permission of instructor.

ACCTG 551 Management Information Systems (4) Develops the professional accountant's responsibilities in designing and operating management information systems with an emphasis on accounting systems. Data organization and management, effects on accounting functions, responsibilities for controls and

security, and planning and acquisition of system resources. Prerequisites: 330, IS 320, 504, or equivalent.

ACCTG 552 Conceptual Framework for Financial Accounting (4) Basic premises relative to a conceptual framework for financial accounting. Historical and current research efforts. Roles of economics, government, society, and politics in setting of concepts and standards. Recent FASB, SEC, and AICPA efforts. Prerequisite: undergraduate accounting concentration or equivalent.

ACCTG 555 Statistical Methods in Professional Auditing (4) Comparative analysis of the methods of statistical inference used in auditing and incorporation of these methods in the auditor's decision processes. Prerequisite: undergraduate accounting concentration or equivalent.

ACCTG 556 Management Accounting Standards and Practices (4) Systematic coverage of advanced management accounting issues and practices. Major emphasis on analyzing complex management accounting cases and discussing research articles related to management accounting issues. Prerequisite: undergraduate accounting concentration or equivalent.

ACCTG 557 Tax Consulting, Planning, and Research (4) Decision-making processes in relation to problems of taxation. Tools of tax analysis and research and the communication of conclusions flowing from professional tax work. Role of the professional accountant in client business transactions and in negotiations with taxing authorities is highlighted and simulated on the basis of actual case histories. Prerequisite: undergraduate accounting concentration or equivalent.

ACCTG 558 Current Financial Accounting and Reporting Issues (4) Develops professional-level ability to understand, analyze, and report upon selected political, economic, social, and legal dimensions of current financial accounting and reporting issues. Issues vary each year. Prerequisite: undergraduate accounting concentration or equivalent.

ACCTG 559 Advanced Auditing Problems and Cases (4) Analysis of current developments in auditing and comprehensive case studies. Designed to extend knowledge of audit decision making and advanced techniques. Topics covered vary depending upon current issues facing professional auditors. Prerequisite: undergraduate accounting concentration or equivalent.

ACCTG 560 Special Topics in Professional Accounting (4) Sp Lectures, discussion, and case analyses dealing with special current topics relevant to professional accounting. Satisfies the professional accounting elective requirement for the M.P.A. degree program. Prerequisite: permission of instructor.

ACCTG 569 Management and Organization of Professional Accounting (4) Sp Principles of managing the accounting function in private and public sector enterprises; organization, planning, and control of the public practice of professional accounting.

ACCTG 571-572 Research Reports (3-3) Independent study in business administration; critical evaluation of business analysis and research methods. Effective communication of ideas is emphasized. Methods and content of independent research studies subjected to critical evaluation. Open only to M.B.A. nonthesis students. Prerequisites: instructor's approval of preliminary research topic outline for 571-; 571- for 572.

ACCTG 580 Seminar in Financial Accounting (3) Critical examination of conceptual and practical issues in financial accounting. Specific topics may change from quarter to quarter to include applications of behavioral and economic models to financial accounting issues. Prerequisite: 510 or permission of instructor.

ACCTG 581 Seminar in Managerial Accounting (3) Critical examination of conceptual and practical issues of cost and managerial accounting. Specific topics

may change from quarter to quarter, and they include application of behavioral, quantitative, and economic models to managerial accounting problems. Prerequisite: 511 or permission of instructor.

ACCTG 595 Introduction to Accounting Research (3) A Examination of research problems and techniques in accounting. Interdisciplinary nature of accounting research emphasized. Work in finance, economics, and psychology may be used to develop current trends in accounting research. Prerequisite: admission to doctoral program.

ACCTG 596 Seminar in Financial Accounting Research (3, max. 6) Sp Review and critical analysis of research strategies and methods applied to problems in financial reporting practice and financial accounting standard setting. May be repeated for credit with permission. Prerequisite: doctoral standing and 580 or equivalent or permission of graduate office.

ACCTG 597 Seminar in Managerial Accounting Research (3, max. 6) A Critical analysis of current managerial accounting research, both published and unpublished. May be repeated for credit with permission. Prerequisite: doctoral standing and 581 or equivalent or permission of graduate office.

ACCTG 599 Doctoral Seminar in Accounting (3) Study and research in advanced topics of accounting. The seminar is generally concerned with unpublished areas of research as well as research methodology and philosophy. It is conducted by departmental faculty and occasional distinguished visiting faculty. For doctoral students only.

ACCTG 600 Independent Study or Research (*)

Administration

Approval of graduate business program office required. Entry card required.

Course for Graduates Only

ADMIN 510 Integrative Administration (5, max. 15) AWSpS LeBreton Includes materials basic to the study and analysis of administration in organizations: organization theory and administrative behavior; human resources management; resource allocation, accounting, and financial control; systems operation and analysis; marketing; governmental-societal framework; policy formulation; and strategic planning. Faculty team-teaching approach. Not open to business administration majors. Offered on credit/no credit basis only. Prerequisite: permission of Graduate School of Business Administration.

Business Administration

Course for Undergraduates

B A 300 Foreign Study—Business Administration (3-5, max. 15) For participants in approved foreign-study programs where equivalent UW business administration courses are not available. Prerequisite: permission of undergraduate adviser.

B A 371 Cooperative Education in Business (2, max. 6) AWSpS Business practicum: one- or two-quarter internship with approved business or government agency. Open only to students who meet requirements of internship program. Internship credit may not be applied to fulfill specific course requirements or to 180 credits required for graduation. Offered on credit/no credit basis only.

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

B A 700 Master's Thesis (*) AWSp

B A 800 Doctoral Dissertation (*)

Business Administration Research Methods

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

BA RM 510 Applied Econometrics I (3) Emphasizes the application of econometric methods rather than the mathematical proofs of statistical procedures. Introduction to the linear regression model, interpretation of summary statistics, bias and precision of regression estimates, analysis of the residuals. Prerequisites: STAT 342, or 395, or 481, or permission of instructor.

BA RM 511 Applied Econometrics II (3) Continuation of 510. Hypothesis testing, distributed lags, serial correlation models, simultaneous equation models. Prerequisite: 510.

BA RM 520 Behavioral Research Methods—Theory and Design (3) Philosophy of science, development of scientific method, and meaning of behavioral research. Historical perspective of scientific investigation and the evaluation of research. The development of theory and its relationship to research. Various strategies and designs in behavioral research. Prerequisites: STAT 361, 362, or permission of instructor.

BA RM 521 Behavioral Research Methods—Approaches and Applications (3) Considers alternative research approaches, such as laboratory and field experimentation, simulation, and surveys, with data-gathering techniques appropriate for each approach. It is primarily concerned with developing alternative approaches to research problems and with discussing specific applications. It builds upon a background of specific statistical tools and techniques and an understanding of theory development and research design. Prerequisites: STAT 361, 362, or permission of instructor.

Business Communications

Courses for Undergraduates

B CMU 301 Basic Written Business Communications (4) Broad analytical approach to written communications as a management tool. Analysis of the psychology, semantics, planning, and principles of effective business writing. Practical application through messages that inform and persuade, grant and refuse; plus short business reports and applications for positions. Prerequisite: junior standing or above.

B CMU 410 Business Reports and Other Specialized Communications (5) Covers both internal and external communications that businessmen and businesswomen write on the job. Emphasis is on various types of internal reports, ranging from short informal memos to the more complex formal reports. Also covered are specialized external types of communications directed to customers. Prerequisite: junior standing or above.

B CMU 510 Business Communications for Managers (3) Sp Seeks to develop understanding of communications and related theories, to describe strategies for planning managerial communications, and to build skills in oral and written reporting and persuading. Prerequisite: approval of graduate business office. Entry card required.

Business Economics

Courses for Undergraduates

B ECN 300 Managerial Economics (3) Analysis of economic factors affecting decisions made by busi-

ness firms. Demand and cost analysis, and alternative policies from the firm's point of view. Prerequisites: ECON 200, admission to business administration or permission of undergraduate office.

B ECN 301 Money, National Income, and Prices (4) Measurement and analysis of business activity in the commodity and money markets; static and dynamic models of income and interest rate determination; problems and policies in the stabilization of business conditions. Prerequisites: ECON 200, 201, admission to business administration or permission of undergraduate office.

B ECN 420 Financial Markets (4) Analysis of the structure and functions of the money and capital markets; the saving-investment process and financial intermediaries; supply and demand for lendable funds and the level and structure of interest rates, role of Federal Reserve and Treasury in money market developments. Prerequisite: 301.

B ECN 427 International Finance (4) Asset choice and institutional operations in international finance; foreign-exchange problems; the impact of international financial problems and operations on business; short- and long-term international financing. Prerequisite: 301.

B ECN 439 Business Forecasting (4) Analysis of basic variations affecting general business conditions as a background for business and investment decisions; appraisal of proposals for controlling cycles and of forecasting techniques. Prerequisites: 301, QMETH 201.

B ECN 490 Special Topics in Business Economics (4) Special topics of current concern to faculty and students. Offered only when faculty is available and student interest is sufficient. Class is announced in advance of scheduled offerings.

B ECN 499 Undergraduate Research (3, max. 6) Research in selected areas of business economics. Prerequisites: 300, 301, permission of undergraduate office.

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

B ECN 500 Business Economics I (3) Factors underlying the determination of cost and prices for the industry and the firm, demand analysis and firm behavior. Relation of economic environment to micro-economic decisions of the firm.

B ECN 501 Business Economics II (3) Analysis of real and monetary factors affecting the national and international economic environment, supply and demand for money, interest rates, stabilization problems and policies, in relation to government and policy effects on business and individual affairs. Prerequisite: 500.

B ECN 513 Forecasting the Economic Environment of the Firm (3) Survey, evaluation, and synthesis of techniques available to forecast supply and demand conditions at the macro and industry levels. Emphasis on understanding macro forecasts and converting them to industry forecasts. Prerequisite: 501.

B ECN 520 Financial Markets (3) Analysis of the functions and the structure of money markets; the saving-investment process and financial intermediaries; supply and demand for lendable funds and the level and structure of interest rates, role of the Federal Reserve and Treasury in the money markets. Prerequisite: 501.

B ECN 521 Seminar in Financial Markets (3) Analysis of managerial and environmental financial problems of banks and nonbank financial institutions; theory of flow of funds and financial intermediation. Prerequisites: 500, 501, 520.

B ECN 527 International Finance and Investments (3) Study of selected problems in financing, international trade, investment, and foreign business operations; international aspects of money markets; problems of evaluation of foreign investments. Prerequisites: 501, FIN 502.

B ECN 528 International Financial Management (3) Analysis of financial problems facing United States businesses engaged in international activities: financing foreign investment, financial control of foreign operations and working capital management, including foreign-exchange positions, using cases and readings.

B ECN 529 Competition Policies in the Context of International Business (3) Legal and economic analysis of the competition policies of selected developed countries, including the Common Market, the Federal Republic of Germany, the United Kingdom, Japan, Canada, and the United States, with particular reference to the impact of the policies upon the multinational corporation enterprise and international business transactions.

B ECN 530 Industry Structure and Performance (3) Market structure, conduct, and performance; mergers and diversification; price and nonprice patterns of firm behavior. Prerequisite: 500.

B ECN 571-572 Research Reports (3-3) See ACCTG 571-572 for description.

B ECN 599 Doctoral Seminar in Business Economics (3) Study and research in advanced topics of business economics. The seminar is generally concerned with unpublished areas of research, and is conducted by visiting professors and departmental faculty. May be repeated for credit. For doctoral students only.

B ECN 600 Independent Study or Research (*)

Business Policy

Courses for Undergraduates

B POL 470 Business Policy (4) Policy making and administration from a general management point of view. Emphasis is on problem analysis, the decision-making process, administration and control, and continuous reappraisal of policies and objectives. This course integrates and builds upon the work of the core curriculum. Prerequisites: admission to business administration, senior standing or above, and FIN 350, MKTG 301, OPMGT 301, and HRMOB 400, or permission of undergraduate office.

B POL 471 Small Business Management (4) Policy formulation and implementation in smaller firms from the top manager's point of view. Integrates and builds upon work of the core curriculum. Includes analysis of cases and field projects related to small firms. Prerequisites: admission to business administration, senior standing or above, and FIN 350, MKTG 301, OPMGT 301, and HRMOB 400, or permission of undergraduate office.

B POL 480 Business Simulation (5) Critical analysis of integrated business policy formulation in a complex and dynamic industrial environment by means of simulation (business gaming). Prerequisites: admission to business administration, senior standing or above, and FIN 350, MKTG 301, OPMGT 301, and HRMOB 400, or permission of undergraduate office.

B POL 499 Undergraduate Research (3, max. 9) Prerequisite: permission of undergraduate office.

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

B POL 505 Business Policy and Strategy (3) Policy decisions and strategic leadership from the general management point of view. Determination of corporate product-service objectives, development of a network of internal operating policies and methods to achieve objectives at a cost satisfactory to the consumer and to society. Prerequisites: all first-year required courses in M.B.A. curriculum.

B POL 530 Entrepreneurship (3) Entrepreneurship, both in the form of (1) establishment of new independent businesses owned largely by those who manage them and (2) initiation of new enterprises having exceptional autonomy within larger organizations that finance and own them. Basic knowledge in accounting, marketing, and finance is assumed.

B POL 545 Management Strategy Simulation (3) Simulation practice to make decisions at general management level. Integrates concepts of marketing, finance, operations, administration, and control in company decisions. Uses computer simulation or other approaches. Students should check with advising office before enrolling. Prerequisites: ACCTG 500 and 501, HRMOB 501, FIN 502, MKTG 502, OPMGT 502, or permission of instructor.

B POL 570 Strategic Planning Systems (3) Formal institutional procedures for involving the entire organization in strategic planning and quantitative methods for doing such planning. These are applied to analyzing strategy and firm performance, predicting long-range industry and national environments, formulating corporate-level and business-level strategies, and integrating planning models into the planning process. Prerequisites: ACCTG 500 and 501, HRMOB 501, FIN 502, MKTG 502, OPMGT 502, or permission of graduate office.

B POL 571-572 Research Reports (3-3) See ACCTG 571-572 for description.

B POL 575 Strategic Decision Making (3) Focuses on (1) role of strategic leadership in success of organizations, (2) conceptual-logical methods for doing strategic planning, (3) organization-wide experience methods for formulating policies, and (4) decision methods for use within the strategic coalition. Prerequisites: ACCTG 500 and 501, FIN 502, MKTG 502, or permission of graduate office.

B POL 590 Special Topics in Business Policy (3) Topics of current concern to faculty and students. Offered only when allowed by faculty availability and sufficient student interest. Content announced in advance of scheduled offerings.

B POL 599 Doctoral Seminar in Business Policy (3) Study and research in advanced topics of business policy. The seminar is generally concerned with unpublished areas of research and is conducted by visiting professors and departmental faculty. May be repeated for credit.

B POL 600 Independent Study or Research (*)

Finance

Courses for Undergraduates

FIN 350 Business Finance (4) Sources, uses, cost, and control of funds in business enterprises. Internal management of working capital and income sources and cost of long-term funds; capital budgeting; financing of the growth and expansion of business enterprises; government regulation of the financial process. Prerequisites: B ECN 300 and admission to business administration or permission of undergraduate office.

FIN 423 Banking and the Financial System (4) Role of banks and nonbank financial institutions in the financial system; asset choices of banks and nonbank financial institutions; problems in the management of financial institutions with emphasis on commercial banks. Prerequisites: 350, B ECN 420.

FIN 450 Problems in Corporation Finance (4) Case problems in corporate financial management. Includes cases on management of current assets, obtaining short-term loans, raising long-term capital, capital budgeting, and dividend policy. The management point of view is stressed. Prerequisites: 350, ACCTG 375.

FIN 453 Financial Theory and Analysis (4) Determination of liquidity needs subject to firm constraints and longer-term capital budgeting problems involving cost of capital and capital rationing considerations; analytical approach. Prerequisites: 350, QMETH 201.

FIN 460 Investments (4) Introduction to the nature, problems, and process of evaluating particular securities and portfolio construction and administration. Special attention is directed to the risk and rate-of-return aspects of particular securities portfolios, and total wealth. Prerequisites: 350, senior standing.

FIN 461 Investment Analysis (4) A sequence course to 460 in which traditional investment analysis of securities is explored in more detail, and special emphasis is directed to more recent developments, especially portfolio analysis. Prerequisite: 460.

FIN 490 Special Topics in Finance (4) Special topics of current concern to faculty and students. Offered only when faculty is available and student interest is sufficient. Class is announced in advance of scheduled offerings.

FIN 499 Undergraduate Research (3, max. 6) Research in selected areas of business finance, money and banking, or investments. Prerequisites: 350, permission of undergraduate office.

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

FIN 502 Business Finance (3) Financial management of the firm, including capital budgets, working capital analysis, and financing policy. Prerequisites: ACCTG 500, B ECN 500, QMETH 500.

FIN 530 Financial Management of Banks (3) Analysis of problems in the financial management of commercial banks and other financial institutions. Loan and investment policies, liability management, capital policies, and other selected issues are discussed. Prerequisite: B ECN 520 or permission of graduate office.

FIN 550 Advanced Business Finance (3) Systematic coverage of the theory of financial management. Application of quantitative analysis to financial problems of the firm, including the investment and financial decisions, lease analysis. Prerequisite: 502.

FIN 551 Problems in Business Finance (3) The application of financial principles and techniques to problems in financial management. Topics include cash management, credit management, problems in short- and long-term financing, and capital budgeting. Prerequisite: 502.

FIN 552 Seminar in Business Finance (3) Study of the financing of the corporation, including recent theoretical and institutional developments. Extensive reading and discussion in designated areas covering problems relating to financial management and to the social and economic implications of the financial process. Prerequisite: 550.

FIN 553 Capital Investment Planning (3) Capital investment planning by a multiproduct company organized into strategic business units. Determinants of the company's value, diversification by acquisition, diversification by start-up, divestiture analysis, tests for choosing the best market share-growth policy in each strategic business unit, problems in applying these tests. Prerequisite: 502.

FIN 560 Investments (3) Introduction to the nature, problems, and process of evaluating particular securities and portfolio construction and administration. Special attention is directed to the risk and rate-of-return aspects of particular securities, securities portfolios, and total wealth. Prerequisite: 502 or permission of graduate office.

FIN 561 Seminar in Investments (3) Discussion and analysis of concepts, processes, and problems of investment media valuation, portfolio valuation, and portfolio construction, and administration for individuals and institutions. Prerequisite: 560.

FIN 571-572 Research Reports (3-3) See ACCTG 571-572 for description.

FIN 580 Doctoral Seminar in Capital Market Theory (3) Decision making under uncertainty, information and capital market efficiency, portfolio theory, capital asset pricing model, arbitrage pricing model, and options pricing model. For doctoral students or by permission. Prerequisites: ECON 500, 517.

FIN 581 Doctoral Seminar in Corporate Finance (3) Principles of intertemporal choice, alternative valuation models, theory of investment under uncertainty, impact of dividend and financing decisions on firm valuation in perfect and imperfect markets, and theory of firm organization and agency costs. For doctoral students or by permission. Prerequisite: 580.

FIN 582 Doctoral Seminar in Financial Research (3) Empirical research in finance with emphasis on methodology and scientific method. Empirical research in market efficiency, capital asset pricing model, options pricing model, and impact of firm's dividend and financing decisions on firm value. For doctoral students or by permission. Prerequisites: 580, 581, BA RM 510.

FIN 600 Independent Study or Research (*)

Human Resources Management and Organizational Behavior

Courses for Undergraduates

HRMOB 301 Personnel Systems and Industrial Relations (3) The personnel/industrial relations function from a managerial perspective. Selection, compensation, performance appraisal, and training and development. Special emphasis on union-management relations and relevant behavior science research. Prerequisite: junior standing or above. (Formerly HRMGT 301.)

HRMOB 400 The Management of Organizational Behavior (4) Behavioral aspects of management in organizations, with emphasis on leadership, motivation, communication, conflict resolution, group dynamics, and organization development. Prerequisite: admission to business administration or permission of undergraduate office. (Formerly A ORG 420.)

HRMOB 410 Staffing (4) Affirmative action, recruitment, testing, interviewing, placement, promotion, and overall human resource planning. Prerequisite: junior standing or above. (Formerly HRMGT 443.)

HRMOB 415 Performance Appraisal and Compensation (4) The various kinds of systems used by organizations to evaluate and reward employee performance. Job analysis, job evaluation, setting performance standards, giving appraisal feedback, designing incentive systems, administering a salary plan. Prerequisite: junior standing or above. (Formerly HRMGT 445.)

HRMOB 420 Collective Bargaining and Arbitration (4) Labor-management relations. The legal context, union organizing, grievance administration, collective bargaining. Individual and group simulations used. Prerequisite: junior standing or above. (Formerly HRMGT 450.)

HRMOB 450 Leadership and Decision Making (4) The manager as leader and decision maker. Various leadership theories, styles, and behaviors. Decision-making models and techniques. Prerequisite: junior standing or above.

HRMOB 460 Negotiations (4) The art and science of negotiations with the goal of making students more effective negotiators in a variety of business situations, such as budget negotiations, buying and selling, contracts, and merger negotiations. Concept and skill development. Prerequisite: junior standing or above.

HRMOB 470 Motivation and Performance (4) Various strategies for influencing employee motivation and performance. Reward systems, goal-setting procedures, and various techniques to enlarge and enrich one's job. Effects of these formal and informal strategies on job attitudes. Prerequisite: junior standing or above.

HRMOB 475 Organization Development and Change (4) Provides a conceptual understanding of organization development theory, practice, and research. Organization development is an umbrella term for a collection of behavioral science techniques for increasing individual, group, and organizational effectiveness. Prerequisite: junior standing or above.

HRMOB 490 Special Topics in Human Resources Management and Organizational Behavior (4) Topics of current interest to faculty and students. Offered when allowed by faculty availability and sufficient student interest. Content announced in advance of scheduled offerings. Prerequisite: junior standing or above.

HRMOB 499 Undergraduate Research (3, max. 9) (Formerly HRMGT 499.)

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

HRMOB 500 The Management of Organizational Behavior (3) Behavioral aspects of management with emphasis on leadership, motivation, and decision making. May include communication, conflict management, group dynamics, and organizational change. (Formerly A ORG 501.)

HRMOB 501 Human Resources Management (3) Fair employment practice, job analysis, selection, performance appraisal, and training. May include compensation and labor relations. (Formerly HRMGT 500.)

HRMOB 510 Staffing (3) Systems related to manpower planning, recruitment, interviewing, placement, and development. Advanced techniques, with emphasis on validating predictive measures of performance. Criteria development, psychological testing, validation procedures, and cost effectiveness of personnel research. (Formerly HRMGT 520.)

HRMOB 515 Performance Appraisal and Compensation (3) Strategies, procedures, and problems in evaluating and rewarding employees. Performance measurement methods, different appraisal systems, and ways of coaching employees. Ways to integrate performance appraisal into compensation systems. (Formerly HRMGT 530.)

HRMOB 520 Collective Bargaining (3) Traditional labor-management relations in private, public, and nonprofit sectors with special emphasis on grievance arbitration and collective bargaining processes. Simulations and case studies. (Formerly HRMGT 540.)

HRMOB 525 Dispute Settlement and Labor-Management Cooperation (3) Goes beyond traditional collective bargaining and grievance arbitration to examine the role of third parties and mediators, interest arbitrators, and fact finders. New forms of labor-management cooperation, such as gain sharing, quality of work life programs and labor-management commitments. (Formerly HRMGT 560.)

HRMOB 530 Managerial Behavior in Cross-Cultural Settings (3) The role of culture as it impacts managerial values and behavior in diverse national settings, including the United States, western Europe, Latin America, and Japan.

HRMOB 550 Leadership (3) Various theories of leadership. Trait theories, leader behavior theories, and situational theories. Concept of leadership within the broader framework of power—how power is gained, lost, and distributed within organizations.

HRMOB 555 Employee Attachment to the Organization (3) Theory, research, and practice on selected topics, such as employee turnover, absenteeism, organizational commitment, job involvement, socialization, career management, and organizational climate. These concepts discussed from standpoint of prediction, understanding, and control.

HRMOB 560 Negotiations (3) Strategy used in negotiations other than labor-management bargaining to develop skills necessary to devise a negotiating strategy appropriate to situation. Negotiation of contracts in simulated business settings, case studies, readings.

HRMOB 565 Decision Making (3) Individual and group decision-making strategies and techniques. Learning to match decision problems with an appropriate strategy and to understand cognitive and social processes that influence decisions. Expected value, simple rules, decision trees, delphi, nominal group, participative methods. (Formerly A ORG 580.)

HRMOB 570 Motivation (3) Approaches that emphasize people's needs, effects of reward systems, and goal setting, as well as topics that show how the social environment and the task itself influence motivation. Different motivational techniques to be used under various conditions.

HRMOB 571-572 Research Reports (3-3) (Formerly HRMGT 571-572.)

HRMOB 575 Theory and Practice in Organizational Development (3) Theory, practice, and research in organizational development—the applied discipline that seeks to improve organizational effectiveness, efficiency, and morale through causing changes in managerial practices and organizational dynamics. History of the field, intervention techniques, diagnostic methods, and client-consultant relations. Concepts and skill development. (Formerly A ORG 584.)

HRMOB 590 Special Topics in Human Resources Management and Organizational Behavior (3) In-depth study and research on topics of special interest to faculty members and students in the fields of human resources management and organizational behavior. Offered on an *ad hoc* basis. Content announced before scheduled offering. (Formerly HRMGT 590.)

HRMOB 599 Doctoral Seminar in Human Resources Management and Organizational Behavior (1-3, max. 12) Advanced topics in the fields of human resources management and organizational behavior. May be used by visiting faculty members to present topics of interest to students. For doctoral students only. May be repeated for credit. (Formerly HRMGT 599.)

HRMOB 600 Independent Study or Research (*) (Formerly HRMGT 600.)

Information Systems

Courses for Undergraduates

I S 200 Introduction to Computers and Information Systems (2) Application of computer and information systems to business problems. Introduction to computer programming. Business problem-solving software such as spreadsheet and data-base software. Introduction to computer and business data-processing concepts and use of personal computers.

I S 320 Data Structure and File Systems (4) Concepts of data and file management. Data types and data structures; organizing data on external storage devices; sequential, direct, and indexed access methods; multilist and inverted files; sorting and searching algorithms. Instruction in, and use of, a programming language using structured techniques to implement these concepts. Prerequisites: 200 and junior standing or above.

I S 409 Applications Programming for Information Systems (2) Advanced computer programming using COBOL and program development tools. Structured program design based on system documentation and specifications. Use of COBOL for transaction processing and complex file-management activities. Prerequisites: 320 and junior standing or above.

I S 460 Systems Analysis and Design I (4) First course in analysis and design of business information systems. Concentrates on analysis phase of systems development. Systems development life cycle, the feasibility study, analysis of user requirements, and the development of a logical model for the system under study. Prerequisites: 320 and junior standing or above.

I S 481 Systems Analysis and Design II (4) Second course in analysis and design of business information systems. Concentrates on design and implementation phases of systems development. Translation of logical system model into physical model, design of modules, file design, testing, implementation. Includes a project using third- and fourth-generation software development tools. Prerequisites: 409, 460, and junior standing or above.

I S 480 Data-Base Management (4) Concepts of physical and logical data-base organization. Physical file structures used in data management. Logical data models, including hierarchical, network, relational. Data-base design, data dictionaries, data manipulation languages. Exercises in design, implementation, and use of data-base systems. Survey of commercial data-base management systems. Prerequisites: 320 and junior standing or above.

I S 490 Selected Topics in Information Systems (4, max. 12) Topics of current concern to faculty and students. Potential topics include networks and distributed information-processing systems, office automation, artificial intelligence and knowledge-based systems, new approaches to systems development, fourth- and fifth-generation languages, economics of information systems. Prerequisites: 320 and junior standing or above.

I S 499 Undergraduate Research (3, max. 6) Selected problems in information systems and computer applications. Prerequisite: permission of undergraduate office.

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

I S 504 Computer-Based Information Systems for Management (3) Information systems and computer technology for students with little or no prior course work or experience in this area. Concepts for information use in decision making. Use of decision-support problem-solving tools (e.g., spread sheet, data-base software). Management's responsibility in defining, developing, using information systems is focal point.

I S 520 Data Structures and File Systems (3) Concepts of data and file management. Data types and data structures; organizing data on external storage devices; sequential, direct, and indexed access methods; list processing; multilist and inverted files, sorting and searching algorithms; search trees. Concepts are supplemented by programming languages. Prerequisites: 504 and knowledge of programming language.

I S 560 Systems Development I (3) First course in analysis and design of business information systems. Concentrates on analysis phase of systems development. Includes systems development life cycle, feasibility study, analysis of user requirements, development of logical model for the system under study. Prerequisites: 504 and introductory knowledge of programming languages.

I S 561 Systems Development II (3) Second course in analysis and design, which concentrates on the design and implementation phases of systems development. Translation of logical system model into physical model, design of modules, file design, testing, implementation, and information system administration. Prerequisite: 560.

I S 571-572 Research Reports (3-3) See ACCTG 571-572 for description.

I S 580 Data-Base Management (3) Concepts of physical, logical data-base organization. Physical file structures used in data management. Logical data models, including hierarchical, network, relational. Data-base design. Data dictionaries. Data manipulation languages. Exercise in design, implementation, use of several data-base management systems. Survey of commercial data-base management systems. Data-base administrator's role. Prerequisite: 520.

I S 590 Selected Topics in Information Systems (3, max. 9) Topics of current concern to faculty and students. Potential topics include networks and distributed information-processing systems, office automation, artificial intelligence and knowledge-based systems, new approaches to systems development, fourth- and fifth-generation languages, economics of information systems. Prerequisite: 520.

I S 599- Doctoral Seminar ((1-1-1)-, max. 12) Advanced topics of information systems. Generally concerned with unpublished areas of research and conducted by visiting professors and departmental faculty. Doctoral students only.

I S 600 Independent Study or Research (*)

International Business

Courses for Undergraduates

I BUS 300 The International Environment of Business (3) Prepares students to understand the most important aspects of the international political economy. Emphasis on the important relationships among nations and business and economic institutions that influence students' performances as managers, consumers, and citizens. Prerequisites: ECON 200, 201, admission to business administration or permission of undergraduate office.

I BUS 330 Business Environment in Developing Nations (4) The international environment for transnational trade, investment, and operations in the less-developed countries; survey of the economics of underdevelopment; analysis of foreign economic, cultural, and political environments and their impact on international business; foreign investment in the development process; case studies. Prerequisites: 300 or equivalent and junior standing or above.

I BUS 340 Business Environment in Industrial Countries (4) Factors and conditions affecting business operations and behavior in developed countries, international integration, business relations among nation states and integrated supranational systems, direct investment and multinational industrial activities, analysis of sources and causes of international change. Prerequisites: 300 or equivalent and junior standing or above.

I BUS 440 Business in Japan (4) Problems of doing business in the Japanese market. Causes of economic growth in the postwar period; Japanese busi-

ness practices and institutions. Japanese and U.S. marketing and investment strategies. Available for graduates as a part of an international business concentration. Prerequisite: 300 or 550 or permission of instructor.

I BUS 470 Management of International Trade Operations (4) Applicable for students interested in exporting and importing activities, but especially relevant to small companies. Management of import-export operations and the application of relevant functional tools. Cases and class projects are drawn from service companies as well as from manufacturers. Prerequisites: 300 and junior standing or above.

I BUS 480 Multinational Operations Management (4) Case studies in foreign operations management: planning international objectives and strategies; developing multinational company structures and executives; adapting administrative practices and operating policies to international diversities. Prerequisites: 300, 470, and junior standing or above.

I BUS 490 Special Topics in International Business (4, max. 12) Students and faculty focus on current topics of concern. Offered when faculty, student interest, and availability allow. Prerequisites: 300 or permission of instructor and junior standing or above.

I BUS 499 Undergraduate Research (3, max. 9) Prerequisite: permission of undergraduate office.

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

I BUS 550 International Business Environment (3) Understanding the underlying economic, political, and social forces in the international business environment and assessing impact of these forces on international trade and investment. Theories of international trade, foreign investment, international monetary relations and economic integration, and national policy response to international market forces. May be taken first year of M.B.A. program, preferably after student has had B ECN 500 and 501, or equivalent.

I BUS 560 Multinational Business Management (3) Managerial responses to problems of international business organizations and operations. Strategy formulation in an international context; design and control of multinational organization; adaptation of management systems and policies to different economic, sociocultural, and political environments. Prerequisite: 550 or equivalent, or course in international economics or trade or international finance, or permission of graduate office.

I BUS 570 International Business in Less-Developed Countries (3) Understanding the economic, sociocultural, and political environment in the less-developed countries. Problems of international trade and investment, north-south relations, commodities, technology transfer, foreign aid, and capital flows. Prerequisites: 550 or equivalent, a course in international economics or trade or international finance, or permission of graduate office.

I BUS 571-572 Research Reports (3-3) See ACCTG 571-572 for description.

I BUS 580 International Business in Industrialized Countries (3) Understanding the economic, sociocultural, and political environment in developed, industrialized countries. Problems of international trade and payments relations, economic integration, national policies, and supranational organizations' impact on managerial environments. Prerequisite: 550 or equivalent, or course in international economics or trade or international finance, or permission of graduate office.

I BUS 590 Seminar: Special Topics in International Business (3) Application of international business principles to the analysis of a specific issue in

trade or resource transfer, or to the business conditions in a particular country. Japan and other Pacific Rim countries are frequent topics. Prerequisite: 550 or permission of instructor.

I BUS 595 Business Studies Abroad (*, max. 18) Research and study of foreign business problems in the country or countries where the firms are located. Limited to students who have the approval of their major adviser and a faculty member who has agreed to direct their work in accordance with a definite program of studies.

I BUS 599 Doctoral Seminar in International Business (3) Study and research in advanced topics of international business. The seminar is generally concerned with unpublished areas of research and is conducted by visiting professors and departmental faculty. May be repeated for credit. For doctoral students only.

I BUS 600 Independent Study or Research (*)

Marketing

Courses for Undergraduates

MKTG 300 Marketing Concepts for Nonbusiness Majors (4) Analysis of tools, factors, and concepts used by management in planning, establishing policies, and solving marketing problems. Marketing concepts, consumer demand and behavior, location analysis, marketing functions, institutions, channels, prices, and public policy. Not open to business administration students for credit, nor to those who have taken 301.

MKTG 301 Marketing Concepts (4) Tools, factors, and concepts used by management in planning, establishing policies, and solving marketing problems. Marketing concepts, consumer demand and behavior, location analysis, marketing, functions, institutions, channels, prices, and public policy. Prerequisites: ECON 200 and admission to business administration or permission of undergraduate office.

MKTG 310 Product and Price Policies (4) Important aspects of product planning and development, product line decisions, packaging, brand policies, guarantees, and services. Price theory is considered but emphasis is placed on special pricing policies and problems and legal constraints on pricing activity. Prerequisites: 301, B ECN 300, and junior standing or above.

MKTG 320 Marketing Channels and Institutions (4) Analysis of marketing institutions and their functions, marketing channel structure, and channel alternatives available to management. Role and perspective of the channel manager in directing marketing channel systems. Prerequisites: 301 and junior standing or above.

MKTG 330 Sales Force Management (4) Sales and distribution planning; sales organization and training; management of the sales force; methods of sales, cost, and performance analysis. Prerequisites: 301 and junior standing or above.

MKTG 340 Advertising (4) Management of the advertising function and its integration with other forms of promotion. Planning the program, determining the most effective approach, evaluation of media and budget, advertising research, advertising institutions, economic and social aspects. Prerequisites: 301 and junior standing or above.

MKTG 450 Consumer Behavior (4) Theory and practice pertinent to marketing decisions of individuals and business firms; utilization of theories from behavioral sciences in marketing research; theories of fashion, characteristics of goods, shopping behavior, product differentiation, market segmentation, and opinion leadership; application of concepts to management of advertising, personal selling, pricing, and channels of distribution. Prerequisites: 301 and junior standing or above; recommended: QMETH 201.

MKTG 460 Marketing Research (4) Marketing research process; preliminary steps and research design, questionnaires, secondary and primary data, sampling, processing and interpreting data, evaluation and effective presentation of findings. A class research project provides practical application of methods studied. Prerequisites: 301, QMETH 201, or equivalent, and junior standing or above.

MKTG 465 Advanced Marketing Research (4) Application of various analytical methods in marketing research. Applied aspects of multivariate techniques (multiple regression, factor analysis, and multidimensional scaling) and their usefulness in such marketing problems as communication strategy, market segmentation, and product positioning. Prerequisites: 301, QMETH 201 or equivalent, and junior standing or above.

MKTG 470 Retailing (4) Profit planning and business control; buying, stock control, pricing, promotion; store location, layout, organization, policies, systems; coordination of store activities. Prerequisites: 301 and junior standing or above.

MKTG 480 Advanced Marketing Management (4) Introduction to advanced marketing management through the application of various decision-making models and selected computer routines to such marketing problems as advertising budgeting, media planning, sales forecasting, sales-force allocation, and pricing. Applications include market simulation, Bayesian approaches, and linear programming. Prerequisites: 301, MATH 157, or equivalent, and junior standing or above.

MKTG 485 Cases in Marketing Management (4) Analysis of managerial marketing cases involving market trends, marketing research, product planning, distribution channels, pricing, promotion, and social trends. Prerequisites: 301 and senior standing.

MKTG 490 Special Topics and Issues in Marketing (4, max. 8) Contemporary topics and issues in marketing: marketing in nonprofit organizations, marketing of services, marketing in the public sector, and marketing in an economy of scarcity. Ordinarily only one topic area is addressed in any one quarter. Course content reflects contemporary developments and the current interests of instructors and students. Prerequisites: 301 and junior standing or above.

MKTG 499 Undergraduate Research (3, max. 9) Prerequisite: permission of undergraduate office.

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

MKTG 502 Marketing Management (3) Analysis and management of customer satisfaction in goods and services markets by profit and nonprofit organizations. Buyer behavior, market segmentation and product positioning, product policy, pricing, distribution, sales force and advertising management, and market research in the contexts of strategy development, decision making, implementation, and control. (Formerly 500.)

MKTG 510 Product and Price Management (3) Identification of market opportunities, choice of which goods and services in what combinations to market, and prices at which to offer them. Considers product and price interrelationships in product-line management; product differentiation; the marketing mix; and multiple-market, oligopoly, and monopoly contexts. Includes policy considerations. Prerequisite: 502.

MKTG 520 Distribution Management (3) Location and distribution decisions for goods and services in profit and nonprofit organizations. Considers methods of optimizing the number and quality of institutions and activities employed in dealing with exchange, and space and time aspects of distribution. Relates distribution questions to the marketing mix and organizational objectives. Prerequisite: 502.

MKTG 540 Promotion Management (3) Management of advertising and personal selling and their integration with other elements of the marketing mix. The communication process, situation analysis, determining promotional mix and the budget, media selection, management of personal selling resources, stimulating reseller promotional support, measurement and evaluation of promotional effectiveness, and social and economic considerations. Prerequisite: 502.

MKTG 550 Seminar in Consumer Behavior (3) Analysis of current research in consumer behavior. Topics include consumer decision-making processes, models of buyer behavior, and contributions from the behavioral sciences. Prerequisite: 502.

MKTG 560 Research for Marketing Decisions (3) Methods and applications of marketing research incorporating analytical procedures and relevant concepts from behavioral and quantitative sciences. Deals with various aspects of research: problem definition, research design, questionnaire construction, sampling, and data analysis. Introduces promising new developments: multivariate techniques of data analysis, laboratory and field experimentation, and demand analysis in both business and public environments. Prerequisites: 502, QMETH 500.

MKTG 565 Analysis of Multivariate Marketing Data (3) Methods of analyzing multivariate data in such marketing research problems as market segmentation and product positioning. The analytical procedures include factor, cluster, and discriminant analysis, multidimensional scaling, and conjoint measurement. Prerequisites: 502, QMETH 500.

MKTG 570 International Marketing (3) Analysis of the marketing strategies and tactics of multinational corporations. Choice of entry strategies for foreign markets, analyzing international competition at home and abroad, and developing global marketing strategies. Prerequisite: 502; recommended: one international business course.

MKTG 571-572 Research Reports (3-3) See ACCTG 571-572 for description.

MKTG 580 Marketing Management Models (3) Introduction to advanced marketing management through the application of various decision-making models to such marketing problems as advertising budgeting, media planning, brand switching, sales forecasting, sales-force allocation, and pricing. The applications include computer simulation, stochastic models, Bayesian approaches, and optimization techniques. Prerequisites: 502, QMETH 501, OPMGT 502.

MKTG 590 Special Topics in Marketing (3, max. 9) Marketing topics of current concern to faculty and students. Offered only when allowed by faculty availability and sufficient student interest. Seminar content to be announced in advance of scheduled offerings. Prerequisite: 502.

MKTG 599 Doctoral Seminar in Marketing (3) Study and research in advanced topics of marketing. The seminar is generally concerned with unpublished areas of research and is conducted by visiting professors and departmental faculty. May be repeated for credit. For doctoral students only.

MKTG 600 Independent Study or Research (*)

Operations Management

Courses for Undergraduates

OPMGT 301 Principles of Operations Management (3) Introduces application of quantitative analysis to problems in planning, operating, and controlling production function. Problems of distribution and allocation, management of inventory systems, production scheduling, improvement curves, and service systems. Uses computer and quantitative models in formulating

managerial problems. Prerequisites: QMETH 201, IS 200, and admission to business administration or permission of undergraduate office.

OPMGT 401 Administration of Operations (4) Analysis of case studies in the management of operations. Uses analytical techniques to derive solutions for actual situations. Strategic resource allocation, project planning, scheduling, quality assurance and the management of quality, and international production planning. Prerequisite: 301 or equivalent.

OPMGT 443 Inventory and Materials Management (4) Production and inventory management decisions for manufacturing and distribution firms. Techniques for forecasting demand for finished product items; role of inventories and aggregate planning in production process. Integrated materials requirements planning (MRP) and capacity planning. Joint with IND E 443. Prerequisite: 301 or equivalent.

OPMGT 450 Operations Scheduling (4) Continuous flow, intermittent, and project production processes and tools for managing these processes. Assembly-line balancing, job shop scheduling, project planning and control (PERT and CPM), improvement curves, work-force scheduling, and vehicle scheduling. Joint with IND E 450. Prerequisite: 301 or equivalent.

OPMGT 485 Introduction to System Dynamics (4) Focuses on theory and concepts of system dynamics, a continuous flow simulation method of modeling. Goal is to analyze organizations as complex systems, emphasizing interactions between management decisions and information feedback theory. A general purpose simulation language, such as DYNAMO, is used. Prerequisite: 301 or permission of instructor.

OPMGT 499 Undergraduate Research (3, max. 9) Prerequisite: permission of undergraduate office.

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

OPMGT 502 Introduction to Operations Management (3) Production of goods or services in any type of organization or institution. Managerial decision making in operations problems, including application of quantitative analysis and use of computers. Inventory management, scheduling, facility location, management of service systems, and quality assurance. Prerequisites: QMETH 500, 501 or equivalent.

OPMGT 517 Materials Management and Production Scheduling (3) Managing materials and information flows in manufacturing and distribution firms. Cost analysis, quantity, quality, timing, control, and vendor selection. Demand forecasting, production scheduling, inventory management (including materials requirements planning), capacity planning, and procurement. Prerequisite: 502.

OPMGT 522 Service System Design and Control (3) Design and management of service operations in nonmanufacturing organizations. Strategic planning of service-delivery systems, establishment of desired service level and quality, measurement and assessment of service criteria, capacity planning, work-force planning, scheduling, and life cycle of service enterprises. Prerequisite: 502.

OPMGT 530 Facility Layout and Location (3) Quantitative models used to analyze problems in the layout and location of economic facilities. Location problems in both the public and private sectors, including specific applications. Current research. Prerequisite: 502.

OPMGT 535 Logistics/Physical Distribution Management (3) Management of distribution process, including all activities involved in physically moving raw materials, in-process inventory, and finished goods inventory from point of origin to point of consumption. Includes warehousing, location, order processing, materials management, and strategic planning in physical distribution organizations. Prerequisite: 502.

OPMGT 540 Manufacturing Strategy (3) Develops a general framework for creating and analyzing a strategy for domestic and international manufacturing-based companies and industries. Identifying and integrating those categories of manufacturing decisions that have a strategic impact. Work-force management, capacity planning, and organization of the manufacturing function. Course based substantially on case studies. Prerequisite: 502.

OPMGT 550 Project Management (3) Management of complex projects, and tools and techniques (e.g., CPM and PERT) developed to aid planning, scheduling, and control of projects. Includes work breakdown structures, precedence networks, Gantt charts, resource leveling and allocation, and the use of microcomputer programs. Prerequisite: 502.

OPMGT 571-572 Research Reports (3-3) See ACCTG 571-572 for description.

OPMGT 577 System Dynamics (3) Analysis of feedback structure and dynamic behavior of management decision and information systems. Dynamics of management decision making from an overall systems point of view. Interaction of separate components of an enterprise. Organizational control and growth of firms and other social, economic, and environmental systems viewed as feedback systems. Construction of continuous-flow computer simulation models using a specialized language such as DYNAMO. Prerequisite: 502.

OPMGT 590 Special Topics in Operations Management (3, max. 9) Major topics in operations management and systems analysis. Emphasis on research and, where appropriate, application of quantitative analysis and computer. Topics vary, including work-force planning, project management, research and development management, quality assurance, technology planning and forecasting, systems analysis of complex organizations, and urban systems analysis. May be repeated for credit. Prerequisite: 502.

OPMGT 599 Doctoral Seminar in Operations Management (3) Study and research in advanced topics of operations management. The seminar is generally concerned with unpublished areas of research and is conducted by visiting professors and departmental faculty. May be repeated for credit.

OPMGT 600 Independent Study or Research (*) AWSps

Organization and Environment

Courses for Undergraduates

O E 200 Introduction to Law (5) Legal institutions and processes; law as a system of social thought and behavior and a frame of order within which rival claims are resolved and compromised; legal reasoning; law as a process of protecting and facilitating voluntary arrangements in a business society. Prerequisite: sophomore standing or above. (Formerly BG&S 200.)

O E 302 Organization and Environment (4) Political, social, and legal environment of business. Critical managerial issues from historical, theoretical, ethical perspectives; their impact on organization. Corporate political power, boards of directors, capitalism, industrial policy, business ethics and social responsibility, alternative corporate roles in society. Prerequisite: admission to business administration or permission of undergraduate office. (Formerly BG&S 333.)

O E 310 Political and Regulatory Environment of Business (5) Managerial implications of restrictions imposed by government on corporations from legal point of view. Employment law, environmental law, product liability law, securities law, campaign finance law. Not a business or commercial law course. Prerequisite: junior standing or above. (Formerly BG&S 310.)

O E 314 Historical Development of the Business-Government Relationship (3) Business-government relationships in American history, with aim of defining and explaining patterns in attitudes and behavior rather than detailing events. Discussions organized in terms of policy areas (e.g., national banking, transportation, agriculture, energy, industry in wartime, trade, and research). Prerequisite: junior standing or above. (Formerly BG&S 361.)

O E 316 Business Ethics and Corporate Social Responsibility (3) Philosophical and pragmatic perspectives, including values and social/ethical premises in organizational decision making. Several issues covered in depth: investments abroad, hazardous products, bribery, industry practices, and others. Prerequisite: junior standing or above. (Formerly BG&S 362.)

O E 403 Commercial Law (5) Principles of the law of property, sales, negotiable instruments, and security transactions. Prerequisites: 200, junior standing or above. (Formerly BG&S 403.)

O E 440 Organization Structure (3) Concepts of formal organization structures, power, authority, and influence; delegation and decentralization, strategic planning, decision making; philosophy and values in management, the organization in the context of the environment and its impact on the organization's subsystems. Prerequisites: HRMOB 400 and admission to business administration or permission of undergraduate office. (Formerly A ORG 440.)

O E 441 Advanced Organization Theory (3) Current research, measuring of organizational effectiveness, planning for alternate structural relationships, developments in related disciplines, and current issues. Prerequisite: 440. (Formerly A ORG 441.)

O E 490 Special Topics and Issues in Organization and Environment (4) Topics and issues of business organization and a changing environment. Content reflects interests of faculty members and students not otherwise covered in the curriculum. Prerequisite: junior standing or above. (Formerly BG&S 490.)

O E 499 Undergraduate Research (3, max. 9) Selected problem areas or issues in consultation among faculty members and students. Prerequisite: permission of the undergraduate office. (Formerly BG&S 499.)

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

O E 502 Organization and Environment (3) Business organization's political, social and legal environments. Critical managerial issues from historical, theoretical, and social/ethical perspectives. Corporate political power, corporate boards of directors, industrial power, social responsibility, business ethics, roles of the corporation in society, themes of change. (Formerly BG&S 502.)

O E 510 Legal and Regulatory Constraints on Business (3) Managerial implications of restrictions imposed by government on corporations from legal point of view. Employment law, environmental law, product liability law, securities law, campaign finance law. Not a business or commercial law course. (Formerly BG&S 510.)

O E 512 The Politics of Business Legislation and Regulation (3) The politics of legislation and regulation affecting business. Political processes (how the rules are made) rather than substance (what the rules are). Academic and managerial perspectives. Legislative politics, regulatory politics, trade associations, lobbying, and campaign financing.

O E 516 Business Ethics and Corporate Social Responsibility (3) Business ethics and corporate social responsibility from philosophical, theoretical, and pragmatic perspectives. Ethical theories and the role of

values in business. Ethics and social responsibility put into a framework useful for practicing managers. (Formerly BG&S 562.)

O E 523 Commercial Law (3) Principles of the law of property sales, negotiable instruments, and security transactions. (Formerly BG&S 523.)

O E 550 Organization and Management (3) Integrates management as practice, theory, and research. Concepts and values, alternative theories, organizational rationality, cooperative and coordinated systems, bureaucracy and classical organization theory, executive function, accountability and legitimacy; manager's role in matching environment, culture goals, strategy, structure, technology, and control systems. (Formerly A ORG 550.)

O E 560 Seminar in Organization Design (3) Top managers can choose among alternative organizational forms. Each is dependent on the current stage in the organization's life cycle, the organization's strategy, and internal organization practices. Conditions that lead to effective organization design. (Formerly A ORG 560.)

O E 571-572 Research Reports (3-3) See ACCTG 571-572 for description. (Formerly BG&S 571-572.)

O E 587 Seminar in Advanced Organization Theory (3) Major issues and problems in the design and conduct of organization theory research. Organizational philosophy, structural congruence with environment, goals and effectiveness, culture and values, power and politics, information and control, and structure and bureaucracy. (Formerly A ORG 587.)

O E 589 Seminar in Management of Technology and Innovation (3) Critical issues relating to the management of technology and innovation. How to design innovative organizations in terms of strategy, structure, and process. The innovation process, creativity, management of professionals, technical and strategic leadership, entrepreneurship, intrapreneurship, and matrix management.

O E 590 Special Topics in Organization and Environment (3, max. 9) Topics of current concern to faculty members and students. Offered only when faculty members are available and there is sufficient student interest. (Formerly BG&S 591.)

O E 599 Doctoral Seminar in Organization and Environment (1-3, max. 12) Open only to Organization and Environment majors and minors in the doctoral program. Attendance of Organization and Environment majors is mandatory in consultation with area supervisor. (Formerly BG&S 599.)

O E 600 Independent Study or Research (*) (Formerly BG&S 600.)

Quantitative Methods

Courses for Undergraduates

Statistics

QMETH 201 Introduction to Statistical Methods (4) Survey of principles of data analysis and their applications for management problems. Elementary techniques of classification, summarization, and visual display of data. Applications of probability models for inference and decision making are illustrated through examples. Prerequisites: MATH 157 or equivalent, and sophomore standing or above.

QMETH 401 Statistical Methods for Business Research (4) Applied statistical linear models: simple and multiple regression, analysis of variance. Prerequisites: 201 and junior standing or above.

QMETH 403 Introduction to Data Analysis (4) Philosophy, methods of exploratory data analysis, robustness, statistical graphics. Structure in data sets:

groups of numbers, several groups, bivariate, time series, two-way tables. Includes plotting, transformation, outlier identification, regressions, smoothing, median polish. Joint with STAT 403. May not be taken for credit if credit received for 503. Prerequisites: 201 or STAT 220 or STAT 311 and junior standing or above.

Business Mathematics and Operations Research

QMETH 300 Quantitative Analysis for Business (4) Introduction to mathematical tools utilized for analysis of business problems; appreciation of the use of these tools in business situations; calculus; linear algebra. Prerequisites: MATH 157 and junior standing or above.

QMETH 424 Simulation (4) Discrete-event simulation methodology emphasizing model formulation and construction, statistical base for simulation modeling, and computer languages. Applications to industrial and manufacturing problems. Laboratory illustrates model architecture, inference, and optimization. Joint with IND E 424. Prerequisites: 201 or IND E 315, I S 200, or equivalents.

QMETH 450 Operations Research—Deterministic Models (4) Formulation and solution of business problems of primarily deterministic nature through use of operations research tools. Techniques of mathematical programming, dynamic programming, network algorithms. Prerequisites: 300 or equivalent and junior standing or above.

QMETH 490 Special Problems in Quantitative Analysis (4) Specialized quantitative techniques useful for solving business problems. Topics from operation research, statistics, computer methods. Emphasis on application. Prerequisites: 401, 450, depending on topic, and junior standing or above.

QMETH 499 Undergraduate Research (3, max. 9) Research in selected problems in business statistics, operations research, decision theory, and computer applications. Prerequisite: permission of undergraduate office.

Courses for Graduates Only

Approval of the graduate business program office required. Entry card required.

QMETH 500 Statistical Data Analysis for Management (3) Introduction to statistical techniques useful for aiding management decisions. Use of interactive computer methods in basic business problems. Random sequences, probability distributions, linear regression, and elementary time series analysis. Prerequisite: 300 or equivalent preparation in elementary calculus.

QMETH 501 Decision Support Models (3) Introduction to computer-based modeling techniques for management decision making. Linear programming, networks, decision analysis, and simulation. Formulation and interpretation. Prerequisite: 300 or equivalent preparation in elementary calculus.

QMETH 503 Practical Methods for Data Analysis (3) Basic exploratory data analysis with business examples. Groups of numbers, multivariate data, time series, multiway tables. Techniques include plotting, transformation, outlier identification, cluster analysis, smoothing, regression, median polish, and robustness. Joint with STAT 503. May not be taken for credit if credit received for 403. Prerequisite: 500 or STAT 342 or equivalent or permission of instructor.

QMETH 520 Statistical Applications of Linear Models (4) Exploration and inference using linear models. Advanced treatment of simple and multiple regression; use of dummy variables, analysis of covariance, and selection of variables to be included in the equation. Prerequisite: 500.

QMETH 529 Sample Survey Techniques (3) Design and implementation of selection and estimation procedures in sample surveys. Sampling of human populations, although principles apply to other sampling problems. Simple, stratified, and cluster sampling, multistage and two-phase procedures, optimal allocation of resources; estimation theory, replicated designs, variance estimation, national samples, and census materials. Joint with STAT 529 and BIOST 529. Prerequisites: 500, BIOST 511, STAT 421 or 423, or equivalent, or permission of instructor.

QMETH 530 Stochastic Series Analysis and Forecasting (4) Introduction to modern time series analysis and forecasting. Autoregressive, moving average, and mixed models. Practical methods for model identification, estimation, diagnostic checking, and adaptive forecasting. Oriented toward real data and application. Prerequisite: 500; strongly recommended: 520 or equivalent.

QMETH 540 Statistical Decision Theory (4) Application of utility theory and probability theory to decision making under conditions of uncertainty. Bayesian methods—prior-to-posterior, preposterior analysis, design of optimal experiments. Prerequisite: 500 or equivalent.

QMETH 551 Mathematical Programming (4) Advanced topics in linear programming and an introduction to nonlinear programming; the managerial significance of nonlinear models. Revised and dual simplex algorithms, decomposition of large linear programs, shortest-route problems, unconstrained optimization of nonlinear functions, steepest descent and feasible direction methods, quadratic and separable programming; Kuhn-Tucker conditions for nonlinear programming, penalty functions. Prerequisite: 501 or 450 or MATH 407.

QMETH 552 Stochastic Models in Operations Research (4) Optimal decision making in an uncertain environment; probabilistic dynamic programming, including finite horizon and unbounded horizon models,

Markov chain models, inventory models, and waiting-line models. Prerequisite: 501 or 450 or MATH 407.

QMETH 571-572 Research Reports (3-3) See ACCTG 571-572 for description.

QMETH 590 Special Topics in Quantitative Methods (4, max. 12) Operations research and applied business statistics of current concern to faculty and students. Potential topics include applications and extensions of mathematical programming, stochastic processes, discrete programming, network models, and application of statistical techniques. Topics and prerequisites vary.

QMETH 599 Doctoral Seminar in Quantitative Methods (3) Study and research in advanced topics of quantitative methods. The seminar is generally concerned with unpublished areas of research and is conducted by visiting professors and departmental faculty. May be repeated for credit. For doctoral students only.

QMETH 600 Independent Study or Research (*)



School of Dentistry

Dean

Karl-Åke Omnell
D322 Health Sciences

In the School of Dentistry, the student learns fundamental principles significant to the entire body of dental knowledge and is expected to acquire habits of reasoning and critical judgment that will enable implementation of that knowledge. Students are expected to learn fundamentals of basic health sciences, to master certain clinical skills, and to acquire a thorough understanding of professional and ethical principles. The school is accredited by the Commission on Dental Accreditation and is a member of the American Association of Dental Schools.

The following departments participate in the curriculum for the school's programs: *Dental Public Health Sciences* is concerned with the social, legal, political, economic, and psychological aspects of dental health-care delivery. *Endodontics* offers training in the diagnosis and treatment of disease of the tooth pulp. *Oral and Maxillofacial Surgery* trains students in the procedures used for all types of operations in the oral cavity and all phases of dental pain control. *Oral Biology* concerns the study of basic biological mechanisms in normal and diseased oral tissues and structures. *Oral Medicine* provides training in diagnostic techniques, so students learn to correlate information gained in various departments and to plan treatment for the patient. *Orthodontics* provides training in the prevention and correction of malocclusion of the teeth. *Pediatric Dentistry* provides students with a broad understanding of the growth and development of the child and teaches students the principles of preventive dentistry, allowing them to develop the skills necessary for maintenance of optimal oral health in children. *Periodontics* offers training relative to the periodontium in health and disease, diagnosis of periodontal disease, and treatment of diseases that affect the periodontal tissues. *Prosthodontics* provides instruction in the fabrication and maintenance of removable, complete, and partial dentures. *Restorative Dentistry* offers training in the restoration or replacement of tooth structure and study of the form and function of the masticatory structures.

The school offers courses leading to the degrees of Bachelor of Science with a major in dental hygiene, Doctor of Dental Surgery, Master of Science in Dentistry, Master of Science, and Doctor of Philosophy, as well as postgraduate certificate programs and residency training in specified areas.

Undergraduate Programs

Bachelor of Science Degree

The Department of Dental Hygiene offers a Degree Completion Program for graduates of two-year associate degree or certificate programs in dental hygiene. A Bachelor of Science degree in Dental Hygiene is granted. This advanced dental hygiene program is designed to enhance the present level of clinical skills of practicing dental hygienists and to expand their career opportunities.

Students meet with an adviser to plan a program to fit their individual needs and goals. Some of the following opportunities are available as part of a B.S. degree completion program in dental hygiene: pursuit of qualifications to teach dental auxiliary students in two-year

programs, including teaching internships; advanced qualifications for public health positions; theoretical and clinical development as dental hygiene prevention specialists; expanded dental hygiene function skills legal in the state of Washington (e.g., administration of local anesthetics and placing of amalgams and tooth-colored restorations after a dentist has cut the preparation); management skills for dental clinics or group practices; basic or behavioral sciences for admission to professional degree programs (e.g., dentistry, medicine, pharmacy, graduate studies in basic or behavioral sciences and the Master of Science degree in oral biology); or study in a field related to dental specialties.

Admission to the program is open each quarter. The student must meet the admission requirements of the University as well as the University admission deadlines for each quarter. All students awarded the B.S. degree in dental hygiene meet both the general education and proficiency requirements of the University. On admission, students must possess a certificate or an associate degree in dental hygiene from a program accredited by the Commission on Dental Accreditation of the American Dental Association and a license to practice dental hygiene in at least one state or province. Students in the dental hygiene program pay the undergraduate tuition fees.

Inquiries may be addressed to the University of Washington, Department of Dental Hygiene, SM-38, Seattle, Washington 98195.

Professional Programs

Doctor of Dental Surgery

The curriculum of the D.D.S. degree includes study in two main areas: basic sciences and clinical dental sciences. The program of instruction is designed to equip the student, as a practicing dentist, with the knowledge and qualities necessary for solving problems of oral health and disease. Emphasis is placed on the role of the dentist in the community and the professional obligation necessary to respond to the oral needs of the total population. The school is committed to improving and increasing care within dentally underserved communities. The four-year program includes a required summer quarter following the second year and the third year. The curriculum may be modified in response to the availability of current information.

A student seeking admission to the D.D.S. degree program must make application through the American Association of Dental Schools Application Service (AADSAS), 1625 Massachusetts Avenue Northwest, Washington, D.C. 20036, before November 1 of the year prior to that for which the applicant seeks entrance. Application materials and instructions should be requested from AADSAS or the School of Dentistry, Office of Academic Affairs. The school will request the following supplementary materials: (1) a nonrefundable application fee of \$35, (2) three letters of recommendation, (3) Dental Admission Test scores, (4) a supplemental application, and (5) a list of current and future courses. Firm preadmission requirements are: preparatory courses in general chemistry, organic chemistry, physics, and introductory biology or zoology. Highly recommended are courses in vertebrate zoology and embryology. Equally important is a background in the social sciences and the humanities. Although a majority of entering students have a baccalaureate degree, students with outstanding academic qualifications are considered for admissions after only two or three years of undergraduate work.

Undergraduate grade-point averages and performance on the Dental Admissions Test are given strong consideration in the selection process. The applicant's knowledge of dentistry, interest in health care, and ability to communicate orally and in writing, as well as evaluations by the recommenders, are given serious con-

sideration. The school participates in the Western Interstate Commission for Higher Education (WICHE) program, which provides access for students who reside in Western states not served by a dental school (Alaska, Arizona, Hawaii, Montana, Nevada, New Mexico, and Wyoming). Women and ethnic minorities or culturally disadvantaged persons are encouraged to apply. Information regarding AADSAS application, supplementary application materials, selection criteria, and selection process is available from the University of Washington School of Dentistry, Office of Academic Affairs, SC-62, D323 Health Sciences, Seattle, Washington 98195, or the College of Arts and Sciences Advisory Office, Padelford Hall, GN-10. Information on the Dental Admission Test is available from both the above and the American Dental Association, 211 East Chicago Avenue, Chicago, Illinois 60611.

Applicants whose primary language is not English will be asked to present TOEFL (Test of English as a Foreign Language) scores of at least 600 in order to qualify for admission.

Prior to matriculation, applicants who are foreign citizens must provide a statement verifying that full financial support is available to them throughout the program.

Students who wish to transfer may be considered only after the completion of the first year of dental school, with permission based on space availability and mitigating circumstances.

Dental student quarterly tuition for 1988: residents \$1,403, nonresidents \$3,284. In addition, each dental student is required to purchase the dental issue of equipment and materials each quarter. Current estimates of the cost and information on loans and scholarships may be obtained from the Office of Academic Affairs, D323 Health Sciences, SC-62. Also available in this office is information relating to student life, including the Student Dress Code, Academic Regulations Manual, and Student Ethics Code.

Residency Training

Residency training programs are available in oral and maxillofacial surgery and the general practice of dentistry. Programs vary in duration and are integrated, providing for rotation through several of the University-affiliated hospitals. Application, selection, and administration of the oral surgery residency is provided through the Department of Oral and Maxillofacial Surgery and the general practice residency is provided through the Division of Hospital Dentistry.

Postdoctoral Fellowships

Postdoctoral training fellowships are available in behavioral or public health research in dentistry. Programs vary in duration and many accommodate degree-seeking or research fellows pursuing an academic career. NIH-sponsored full tuition and a stipend for up to three years are provided for U.S. citizens, noncitizen nationals, and those foreign nationals with permanent residency status in the United States. Members of ethnic minorities and women are especially invited to apply. Application, selection, and administration of the program are provided through the Department of Dental Public Health Sciences.

Graduate Programs

Through their respective departments, the graduate faculty members of the school offer programs leading to the degree of Master of Science in Dentistry, Master of Science, and Doctor of Philosophy, as well as postgraduate certificate programs.

Master of Science in Dentistry Degree/Postgraduate Certificates

Fields of study for the M.S.D. programs are endodontics, oral biology (oral pathology), oral medicine, ortho-

dontics, periodontics, and prosthodontics. The programs are planned to prepare students to think independently, to evaluate their own services and the literature of the programs, and to develop their clinical operative skills to a level to permit the successful practice of their chosen specialty. Emphasis is placed on the basic principles of diagnosis and treatment that compose one of the clinician's most valuable assets. The purpose of the programs is not only to train students in the art of their respective specialties but also to encourage possible preparation for academic careers or for research. Research may be undertaken in basic or applied science. Opportunities for collaborative research are available with the cooperation of other colleges, schools, or departments of the University.

Applicants for admission to the M.S.D. and certificate programs must be graduates of a school of dentistry approved by the Commission on Dental Accreditation of the American Dental Association or a university dental school located outside the North American continent whose curriculum and admission requirements are similar to those of the UW School of Dentistry. Applications must be submitted to the appropriate department, School of Dentistry, University of Washington, Seattle, Washington 98195, on or before November 1 for consideration for entrance in the following Autumn Quarter (October 1 for orthodontics). A concurrent Application for Admission to the Graduate School also must be filed. International students must submit financial statements before the November 1 deadline and must demonstrate competency in the English language, for which TOEFL scores may be required as evidence. Requests for information or application forms may be forwarded to the department of the specialty field at the above address.

A minimum of eight consecutive full-time quarters of residence is required. A third-year option leading to a certificate in periodontal prosthodontics has been included in the prosthodontic program. It provides the student with additional training in periodontics and with experience in the prosthetic restoration of the periodontally compromised dentition. For the graduate program to be continuous, registration is required during the Summer Quarter that conforms to the University schedule. Foreign-language study is not required for graduation.

Although a student may enroll in a postgraduate certificate program only, students enrolled in the M.S.D. program also will be awarded a postgraduate certificate in the specialty. Postgraduate certificate programs are not administered by the Graduate School, and no thesis is required. The course content may vary somewhat from the M.S.D. program, although the same academic standards are applied in both programs. Tuition and fees are assessed at the graduate level for both programs.

Master of Science, Doctor of Philosophy Degrees

Curriculums for the M.S. and Ph.D. programs are offered through the Department of Oral Biology.

Oral biology is concerned with the nature of the oral and paraoral tissues and with the applicability of basic scientific knowledge to oral tissues in health and disease. The courses and research programs in the department deal with the origin, growth and development, structure, and functions of oral tissues, as well as with the etiology and pathogenesis of oral diseases and malfunctions. By its nature, oral biology overlaps the basic medical sciences and clinical dental sciences.

The department contains well-equipped laboratories actively engaged in various aspects of research involving the following approaches: biochemical, including studies on protein synthesis and secretion and the structure of salivary macromolecules; physiological, such as studies on ion fluxes in secretory tissues; microbiological, including studies on the nature of oral pathogens and the effects of salivary factors on the oral microbiota; embryological, such as studies on the for-

mation of the oral and paraoral structures, and developmental anomalies, such as palatal and lip clefting; and morphological, including various studies on oral tissues at the light and electron microscopic levels.

Several programs are available through the Department of Oral Biology to accommodate students with different educational objectives.

A program of study and research leading to the Doctor of Philosophy degree is available for those students desiring extensive research training as well as in-depth course work in oral biology. In addition to the courses offered by this department, students in the Ph.D. program are expected to gain proficiency in one of the biomedical sciences.

A separate program of study and research leading to the Master of Science degree is available for those students who want less training than the Ph.D. program affords.

A nonthesis option exists in the Master of Science program for the purpose of training dental hygiene educators to instruct in certain basic and applied sciences as well as in the clinic.

For the more clinically oriented students, the school offers a program leading to the degree of Master of Science in Dentistry with specialization in oral pathology. Students enrolled in this program receive training that includes experience in the school's extensive biopsy service, participation in the teaching of oral pathology to dental students, participation in a residency program, and enrollment in a series of advanced courses in general and oral pathology.

Clinical specialty training (e.g., oral pathology, oral medicine, periodontics) can also be obtained in conjunction with either the M.S. or Ph.D. programs.

Applicants for all programs must have either a baccalaureate or professional degree from a dental or medical school. Acceptance into the programs requires approval of both the Department of Oral Biology and the Graduate School. For information or application materials, contact the graduate program adviser, Department of Oral Biology, B224 Health Sciences, SB-22, University of Washington, Seattle, Washington 98195.

United States Public Health Service traineeships may be available to students who are United States citizens or permanent residents. These begin at \$15,996 at the postdoctoral level. An allowance for tuition and fees is normally included. Applicants may also seek support via the Dentist-Scientist Award of the School of Dentistry, which provides up to five years of stipend support for dental graduates seeking a combined clinical specialty-Ph.D. degree course of study. The M.S. and Ph.D. programs, including the nonthesis M.S. for dental hygienists, are identified as WICHE Regional Graduate Programs, making students from WICHE-participating states eligible to receive support while pursuing these degree programs.

Dental Hygiene

Faculty

Acting Chairperson

Cheryl A. Cameron

Professor

Fales, Martha H.,* 1959, (Emeritus), M.A., 1968, Ph.D., 1975, Michigan; dental hygiene.

Associate Professors

Cameron, Cheryl A., 1979, ‡(Oral Biology), M.S.Ed., 1978, Kentucky; Ph.D., 1986, Washington; dental hygiene.

Wells, Norma J., 1960, (Dental Public Health Sciences), † M.P.H., 1966, California (Los Angeles); dental hygiene.

Course Descriptions

D HYG 401 Professional Issues (3) Identification and critique of current responsibilities and behaviors with respect to professional ethics and jurisprudence.

D HYG 402 Global Perspectives in Oral Health (3) Disease patterns and their impact on oral health-care-delivery systems. Cultural, demographic, economic, and political factors affecting the efficacy of various systems.

D HYG 403 Oral Health Educational Strategies (3) Planning, preparing, and evaluating educational strategies for oral health promotion. Assessment of needs, development of objectives, creation of communication messages, review of behavioral and educational theories, mechanisms of evaluation.

D HYG 404 Field Experience in Delivery of Oral Health Care (3) Field observations of oral-health-care services. Seminars discuss field assignments within the context of professed need of service, consumer needs and demands, societal obligations, availability of care.

D HYG 456 Community Dental Health Practicum (1-6, max. 6) Application of dental health principles and practices in community settings. Specific settings to be arranged. Prerequisites: 402 or 404 and permission of instructor.

D HYG 465 Theoretical and Scientific Basis for Dental Hygiene Practice (3, max. 9) Evaluation of theories, techniques, and scientific literature related to dental hygiene patient care. Clinical techniques may be observed, assessed, or applied in a variety of settings. Offered on credit/no credit basis only. Prerequisites: graduation from an accredited dental hygiene program and being licensed to practice dental hygiene or permission of instructor.

D HYG 466 Advanced Preventive Dental Hygiene Patient Care (3, max. 9) AWSpS Continuation of 465 to enhance clinical skills in patient management, curettage, and root planing. Seminars concentrate on planning patient dental hygiene treatment and patient evaluation. Offered on credit/no credit basis only. Prerequisites: 465 and permission of instructor.

D HYG 475 Orientation to Hospital Dentistry for Dental Hygienists (4) AWSpS Operation of dental profession within hospital setting. Hospital rounds, surgical observation, participation in emergency dental treatment, clinic operations and management, and clinical dental hygiene. Prerequisite: 465.

D HYG 480 Restorative Dentistry for Dental Auxiliaries (3) First in a series of courses designed to broaden the base of knowledge in the area of restorative dentistry. Selected theoretical concepts, research findings, and laboratory application of isolation, matrices/wedges, material manipulation, cavity liners, medicaments, and bases. Prerequisite: permission of instructor.

D HYG 481 Restorative Dentistry for Dental Hygienists (3) Continuation of 480. Selected theoretical concepts, research findings, and laboratory application of temporaries, sealants, amalgams, and tooth-colored restorations. Prerequisite: 480 or permission of instructor.

D HYG 482 Local Anesthesia for Dental Hygiene Educators (3) W Develops dental hygiene faculty persons skilled in performing and teaching techniques of field and nerve-block anesthesia. Topics include head and neck anatomy, anesthetic pharmacology, pain physiology, prevention and management of an-

esthetic complications and emergencies as well as techniques administration. Clinical experience with patients is required. Prerequisite: permission of instructor.

D HYG 483 Clinical Practice of Restorative Dentistry for Dental Hygienists (3) Clinical application of 480 and 481. Seminars on patient management included. Offered on credit/no credit basis only. Prerequisite: 481.

D HYG 491 Issues in Professional Education (3) Seminar and discussions on topics influencing dental education. Academic freedom, accreditation, interdisciplinary relationships, legislation, licensure, tenure.

D HYG 492 Principles of Scientific Investigation for Oral Health Professionals (3) Introduction to principles of scientific investigation, biostatistics and their application to relevant literature.

D HYG 493 Review of Literature for Oral Health Professionals (3) Application of modern methods of library search and critical analysis of relevant literature.

D HYG 494 Principles of Teaching for Oral Health Professionals (3) Application of principles of learning to teaching methods and techniques used in education, with opportunity for course planning, demonstration, and practice teaching.

D HYG 495 Alternative Settings for Oral Health Professionals (3) Creative and innovative employment options for oral health professionals. Surveys the responsibilities involved. Considers the special talents required: personal, intellectual, clinical, and managerial.

D HYG 497 Directed Studies for Oral Health Professionals (*, max. 14) Based on student interest in special areas. Independent study and tutorial student-faculty relationships. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

D HYG 499 Dental Hygiene Extended Learning (*, S) Supplemental work in dental hygiene to correct an area of student deficiency. Offered on credit/no credit basis only.

D HYG 565 Theoretical and Scientific Basis for Dental Hygiene Practice (3) Evaluation of theories, techniques, and scientific literature related to dental hygiene patient care. Clinical techniques may be observed, assessed, or applied in a variety of settings. Offered on credit/no credit basis only. Prerequisites: graduate program admission, license to practice dental hygiene or permission of instructor.

D HYG 594 Principles of Teaching for Oral Health Professionals (3) Application of principles of learning to teaching methods and techniques used in education, with opportunity for course planning, demonstration, and practice teaching. Prerequisite: graduate program admission.

D HYG 595 Educational Internship (*, max. 12) AWSpS Clinical and/or didactic teaching experience or program administration. Teaching and administration responsibilities assigned according to student's previous experience, education needs, and interest. Seminar required. Prerequisites: 494 or 594 and permission of instructor.

Dental Public Health Sciences

Faculty

Chairperson

Timothy A. DeRouen

Professors

Conrad, Douglas A.,* 1977, (Finance and Business Economics), (Health Services),† M.H.A., 1973, Washington; M.B.A., 1976, Ph.D., 1978, Chicago; economics and finances.

DeRouen, Timothy A.,* 1975, (Biostatistics),† M.S., 1969, Ph.D., 1971, Virginia Polytechnic; applications of biostatistics to clinical epidemiology of oral and infectious diseases.

Milgrom, Peter M.,* 1974, ‡(Health Services), D.D.S., 1972, California (San Francisco); management of fearful and phobic dental patients, quality of dental care.

Weinstein, Philip,* 1972, (Pediatric Dentistry, Psychology), M.A., 1968, Ph.D., 1971, Kentucky; dental behavioral science, treatment and prevention of fear and pain.

Associate Professors

Beaton, Randal D.,* 1977, (Research), ‡(Psychosocial Nursing), Ph.D., 1972, Washington; assessment and treatment of temporomandibular joint pain and dysfunction.

Chapko, Michael K.,* 1978, (Research), (Health Services),† M.A., 1970, Hunter; Ph.D., 1972, City University of New York; diffusion of health technologies, cost-effectiveness in health care.

Domoto, Peter K., 1968, ‡(Pediatric Dentistry), D.D.S., 1964, California (San Francisco); M.P.H., 1975, Washington; pediatric dentistry.

Sharp, Lawrence J., 1962, M.A., 1959, Ph.D., 1964, Washington State; research methods, statistics.

Wells, Norma J., 1960, (Dental Hygiene),† M.P.H., 1966, California (Los Angeles); international dental health.

Assistant Professors

Fiset, Louis O., 1979, (Research), D.D.S., 1970, Washington; research and management of dental phobia.

Grembowski, David E., 1981, (Research), (Health Services, Sociology), M.A., 1975, Washington State; Ph.D., 1982, Washington; dental care demand, fluoridation, dental health services research.

Course Descriptions

DPHS 201 Planning a Career in Dentistry for the Future (2) ASp Future-oriented overview of important concepts in dental science, contemporary modes of patient treatment, and dental-care delivery systems. Provides firsthand exposure to practice of dentistry and prerequisite materials in oral anatomy, epidemiology, and other basic science subjects. Open to first-, second-, and third-year undergraduate students throughout the University.

DPHS 449 Directed Studies in Dental Public Health Sciences (*, max. 6) AWSpS Students and faculty with common academic interests pursue them together within the curriculum by means of independent study and a tutorial student-faculty relationship. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

DPHS 521P Professional Issues: Management of Patient Behavior (1) Sp Application of techniques

and principles learned in 530, involving a project of managing a patient's preventive care habits.

DPHS 530P Professional Issues: Management of Patient Behavior (1) A Designed to enhance student skill in patient management with an emphasis on strategies to alter patient oral health-care habits.

DPHS 535P Professional Issues: Scientific Literature in Clinical Decision Making (1) Sp Introduction to critical reading of individual articles in professional journals and integrating the findings of several articles. Use of the literature to assist the practicing dentist in making clinical decisions.

DPHS 541P Professional Issues: Policy Issues in Financing, Regulating, and Organizing Dental Care (2) W Provides information on private and public involvement in financing, regulating, and organizing dental care. Stresses analysis of public policy matters directly influencing professional environment of the practicing dentist.

DPHS 550P Directed Studies in Dental Public Health Sciences (*, max. 6) Students and faculty members who have common academic interests can pursue them together within the curriculum by means of independent study and a tutorial student-faculty relationship. Offered on credit/no credit basis only.

DPHS 575 Behavioral Dental Research (1) AWSpS Survey of behavioral science research and methodology in dentistry and related fields. Emphasis in various quarters varies: literature review, research design, instrumentation, data analysis. Designed for advanced students who plan a research career. Offered on credit/no credit basis only. Prerequisite: doctoral degree or permission of instructor.

DPHS 640P Professional Issues: Clinical Management of the Fearful and Phobic (1) AWSp Introduction to assessment process and treatment strategies for successful management of anxious, fearful, or phobic patient, combined with clinical observation of diagnostic and treatment appointments of active patients.

DPHS 660 Dental Fear Clinic (2) AWSpS Clinical instruction in the care of the severely anxious or phobic adult or child. Strategies from behavioral and cognitive psychology. Offered on credit/no credit basis only. Prerequisite: graduate standing in dentistry or permission of instructor.

Dentistry

Course Descriptions

DENT 511P Professional Issues: Ethics in Dental Medicine, Futurism (2) A Lectures/seminars providing awareness of ethical issues and responsibilities as student and professional; past, present, future environmental trends affecting dental profession; current information on school curriculum, academic regulations, and financial policies.

DENT 531P Professional Issues: Special Topics (1) W Lectures on epidemiology of dental disease and clinical decision making.

DENT 534P Geriatric Dentistry (1, max. 2) WSp Special needs of older persons seeking dental care: oral health, psychology of aging, socioeconomic problems, effective communications, dental management, special problems in home health care, and problems with institutional and long-term care. Offered on credit/no credit basis only.

DENT 537P Hospital Dentistry (1) Sp Introductory course presenting hospital procedures and protocol and specific patient types.

DENT 541P Ethics in Dentistry (1) Sp Designed to improve ethical reasoning, sensitivity skills; to convey ethical standards and values of the profession through small-group discussions. Standardized tests of moral reasoning and ethical sensitivity given at the beginning and end of course.

DENT 550P Special Studies in Dentistry (*, max. 12) AWSpS Series of courses offered by the various departments from which students may elect study in areas of special interest to them. These courses include subject matter applicable to all phases of dentistry. Offered on credit/no credit basis only.

DENT 551P, 552P, 553P, 554P Patient Management System (1,1,1,1) Small groups, with representation from each dental and dental hygiene class, meet together in seminar sessions to discuss patients assigned them. In this vertical group setting, the goal is to achieve acceptable levels of management of patient care. Tasks are delegated to group members to achieve this goal. Offered on credit/no credit basis only.

DENT 564 Data Entry Through SPSS (1) Introduction to entering and managing experimental or clinical alphanumeric and numeric data through the save-file capabilities of SPSS, utilizing SPSS control cards, data transformations, and documentation.

DENT 565 Dental Photography (2) Provides student with sufficient knowledge and experience to select and use correct photographic equipment for photographing patients (facial and interoral), casts, instruments, x-rays, charts, and objects.

DENT 568 Biostatistics and Research Design (2) Sp Instruction in basic biostatistics, emphasizing the integration of statistics with research design and including measures of central tendency, regression, correlation, Chi-square, and comparison of samples. Offered on credit/no credit basis only.

DENT 569 Design and Interpretation of Dental Research (3) Basic introduction to the usage, application, and interpretation of nonparametric and parametric statistical tests in dental research. Statistical package for the social sciences is used to provide examples of the statistical tests discussed. Prerequisite: permission of instructor.

DENT 640P Extramural Clinics in Geriatric Dentistry (2) AWSpS Extramural geriatric clinical experience, including choice of hospital, nursing home, community clinic, and brief didactic component.

DENT 645P Hospital Rotation (2) AWSpS Clinical experience that puts into practice the material presented in 537P. The student is involved in hospital procedures and protocol and in dental care of the hospital patient.

DENT 650P Extramurals (*, max. 12) AWSpS Extramural sites arranged to provide dental students, at varying levels of their education, with opportunities to treat a wide variety of patients in the delivery systems outside the school. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

DENT 651P Anesthesia Rotation (6) AWSpS 1½-month rotation in anesthesia at one of three local hospitals. Objectives: administration of anesthesia, management of emergency situations and airway problems, familiarization with pharmacology of anesthetic drugs; increased efficiency with venipuncture. Offered on credit/no credit basis only.

DENT 652P Clinical Medicine Clerkship (4) AWSpS One-month clinical rotation in clinical medicine at a local hospital. Objective is to increase the student's ability in physical evaluation of patients as well as to give in-depth knowledge of hospital procedures and commonly prescribed medications. Offered on credit/no credit basis only.

DENT 660 Temporomandibular Joint Diagnosis and Treatment (2, max. 8) A Seminar and clinic sequence for comprehensive examination, diagnosis, and treatment of patients with temporomandibular joint problems. Includes management of dysfunction and morphologic alterations in associated muscles and occlusion. Prerequisite: permission of instructor.

DENT 700 Master's Thesis (*)

Endodontics

Faculty

Chairperson

Robert J. Oswald

Professors

Harrington, Gerald W.,* 1969, D.D.S., 1959, St. Louis; M.S.D., 1969, Washington; endodontics.

Natkin, Eugene,* 1962, D.D.S., 1957, New York; M.S.D., 1962, Washington; endodontics.

Associate Professors

Oswald, Robert J.,* 1974, D.D.S., 1969, Medical College of Virginia; Certificate, 1974, Columbia; endodontics.

Plitts, David L.,* 1977, D.D.S., 1972, Indiana; M.S.D., 1977, Washington; endodontics.

Course Descriptions

ENDO 520P Introduction to Endodontics (2) Sp Lecture course dealing with the differential diagnosis and the treatment of pulp pathosis and associated periapical pathosis.

ENDO 531P Endodontic Technic (4) A Lecture-laboratory course in root canal therapy in terms of present-day concepts, with emphasis on a definite simplified technique. Treatment of extracted teeth as practice for clinical cases.

ENDO 534P Endodontics (1) W Lecture course dealing with diagnosis and treatment of impact injuries to teeth; treatment of endodontic emergencies; surgical management of endodontic problems.

ENDO 535P Clinical Management of Endodontic Treatment Problems (1) Sp Management of a variety of technical problems frequently encountered in the treatment of endodontic cases.

ENDO 550P Directed Studies in Endodontics (*, max. 6) AWSp See DPHS 449 for course description and prerequisite.

ENDO 560 Advanced Endodontic Diagnosis and Treatment (2) W Current concepts are presented and discussed relating to the diagnosis and treatment of pulpal and periapical pathology. Criteria for evaluation of success or failure of root canal therapy are presented.

ENDO 562 Advanced Endodontic Treatment Planning (2) Sp Diagnosis and treatment of acute symptoms of dental origin, surgical endodontic therapy, traumatic dental injuries, and the relationship between periodontal and pulpal pathology, including differential diagnosis and appropriate treatment planning, are discussed.

ENDO 563 Radiographic Interpretation (2) A Various aspects of radiographic interpretation of particular relevance to endodontics, including interpretation of normal structures, acquired and developmental abnormalities, infection, cysts, benign tumors, and diseases other than tumors.

ENDO 566 Advanced Radiographic Interpretation (2) W Various aspects of radiographic interpretation of particular relevance to endodontics, including malignant lesions, benign tumors, diseases other than tumors, temporomandibular joint disease, sialoliths and other soft-tissue calcifications, radiographic technique, and radiation safety.

ENDO 580, 581, 582, 583, 584, 585, 586, 587 Endodontic Seminar (2,2,2,2,2,2,2) A,W,Sp,S Continuous weekly seminar devoted to review of endodontic and related literature and discussion of research methods.

ENDO 590 Treatment Planning Seminar (2, max. 16) AWSpS Weekly seminar to discuss controversial treatment problems and difficult diagnostic cases.

ENDO 593 Clinical Practice Teaching (1, max. 3) AWSp Closely supervised experience in teaching clinical endodontics to the undergraduate dental student.

ENDO 597, 598 Endodontics Teaching Seminar (2,2) W,W Weekly seminars devoted to an examination of general problems of teaching and learning and specific problems of endodontics teaching.

ENDO 600 Independent Study or Research (*) AWSpS Prerequisite: permission of graduate program adviser.

ENDO 630P- Clinical Endodontics (1-, max. 7) AWSpS Student is required to complete endodontic treatment of anterior, premolar, and molar teeth. In addition to conservative treatment of several endodontic cases, the student performs periapical surgery for one case. Student must complete at least six quarters of 630P and all course requirements before any grade is awarded.

ENDO 659P Endodontics Extended Learning (*, max. 4) S Supplemental work in endodontics to correct an area of student deficiency. Offered on credit/no credit basis only.

ENDO 660 Clinical Endodontics (4, max. 32) AWSpS Clinical diagnosis and treatment of the pulpless tooth.

Oral and Maxillofacial Surgery

Faculty

Chairperson

Philip Worthington

Professors

Gehrig, John D.,* 1954, (Biological Structure), D.D.S., 1946, M.S.D., 1951, Minnesota; oral and maxillofacial surgery and biological structure.

Myall, Robert W. T.,* 1977, (Biological Structure), B.D.S., 1964, London (England); M.D., 1975, British Columbia (Canada); oral and maxillofacial surgery.

Worthington, Philip, 1976, M.B.Ch.B., 1956, B.D.S., 1959, Liverpool (England); M.D., 1980, Washington; oral and maxillofacial surgery.

Associate Professors

Beirne, O. Ross, 1985, D.M.D., 1972, Harvard; Ph.D., 1976, California (San Francisco); oral and maxillofacial surgery.

Bloomquist, Dale S.,* 1972, D.D.S., 1969, Washington; M.S., 1972, Georgetown; oral and maxillofacial surgery.

Hohl, Thomas H.,* 1971, D.D.S., 1971, Loyola; oral and maxillofacial surgery.

Kiyak, Asuman H.,* 1977, (Architecture, Psychology), M.A., 1974, Ph.D., 1977, Wayne State; clinical psychology and geriatric dentistry.

Rothwell, Bruce R., 1980, D.M.D., 1973, Oregon; M.S.D., 1977, Washington; oral medicine and hospital dentistry.

Assistant Professors

Crinzi, Richard A., 1983, D.D.S., 1972, Washington; oral and maxillofacial surgery.

Egbert, Mark A., 1986, D.D.S., 1981, Washington; oral and maxillofacial surgery.

Trimble, L. Douglas, 1979, D.M.D., 1973, M.D., 1977, Manitoba (Canada); oral and maxillofacial surgery.

Lecturer

Evans, John R., 1982, D.D.S., 1975, Washington; oral and maxillofacial surgery and oral pathology.

Course Descriptions

O S 520P Local Anesthesia and Emergencies (2) W Techniques of local anesthesia, introduction to diagnosis, and initial management of emergencies in the dental office.

O S 522P Sedation and Pain Control (2) Sp Techniques of sedation (oral, inhalational, intravenous) and pain control.

O S 530P- Oral Surgery (Didactic) (2-, max. 6) AWS Theory of major and minor oral surgery, using a medicated autotutorial approach covering extraction of teeth, impaction surgery, preprosthetic surgery, medications, surgical complications and postoperative care, biopsy, infections and principles of incision and drainage, bone cysts, maxillary sinus, salivary glands, treatment of facial trauma and deformities.

O S 550P Directed Studies in Oral Surgery (*, max.16) AWSpS See DPHS 449 for course description and prerequisite.

O S 560 Dental Sedation (2) A For graduates of the various dental specialties on the theory, application, and techniques of dental sedation. All forms of sedation, including oral, intramuscular, intravenous, and inhalation, are covered. Clinical experience is provided in the second half of the quarter.

O S 630P- Oral Surgery Clinic (1-, max. 3) AWSpS Clinical application of 530P-.

O S 651P Harborview Clerkship (2-10) AWSpS Six-week rotation at Harborview Medical Center, including intensive instruction in oral surgery procedures and observing and assisting oral and maxillofacial surgery in the operating room. Offered on credit/no credit basis only. Prerequisite: permission of department Chairperson.

O S 652P Smith Hospital, Texas, Rotation (2-12) AWSpS Six-week rotation at John Peter Smith Hospital in Fort Worth, Texas, including intensive instruction in oral surgery procedures and observing and assisting oral and maxillofacial surgery in the operating room. Offered on credit/no credit basis only. Prerequisite: permission of department Chairperson.

Oral Biology

Faculty

Chairperson

Murray R. Robinovitch

Professors

Dale, Beverly A.,* 1972, (Research), (Medicine), (Periodontics),† Ph.D., 1968, Michigan; keratin biochemistry.

Izutsu, Kenneth T.,* 1971, (Oral Medicine),† Ph.D., 1970, Washington; salivary gland physiology and pathophysiology.

Keller, Patricia J.,* 1955, (Emeritus), Ph.D., 1953, Washington (St. Louis); protein structure and function.

Robinovitch, Murray R.,* 1966, (Periodontics), D.D.S., 1961, Minnesota; Ph.D., 1967, Washington; salivary biochemistry and saliva-bacterial interactions.

Tamarin, Arnold,* 1961, (Emeritus), (Biological Structure), D.D.S., 1951, Illinois; M.S.D., 1960, Washington; oral embryology and histology, electron microscopy.

Associate Professors

Cameron, Cheryl A., 1979, ‡(Dental Hygiene), M.S.Ed., 1978, Kentucky; Ph.D., 1986, Washington; dental hygiene.

Hall, Stanton H.,* 1974, ‡(Orthodontics), D.D.S., 1967, M.S., 1967, Northwestern; Ph.D., 1974, Washington; craniofacial development.

Howard, Guy A.,* 1976, (Research), (Medicine),† M.S., 1967, Central Washington; Ph.D., 1970, Oregon; mineral metabolism.

Kashiwa, Herbert K.,* 1966, ‡(Biological Structure), M.S., 1954, Hawaii; Ph.D., 1960, George Washington; gross anatomy, cytochemistry, calcium metabolism.

Morton, Thomas H.,* 1975, (Oral Medicine),† D.D.S., 1972, Creighton; M.S.D., 1975, Washington; oral pathology.

Watson, Eileen L.,* 1972, (Research), (Pharmacology),† Ph.D., 1970, Utah; salivary gland pharmacology and regulation.

Assistant Professors

Moncla, Bernard J.,* 1984, (Research), (Periodontics),† M.S., 1976, Idaho State; Ph.D., 1983, Washington State; pathogenic, periodontal and anaerobic microbiology, host-parasite interactions.

Oda, Dolphine, 1985; M.Sc., 1981, Manitoba; oral pathology.

Course Descriptions

ORALB 449 Undergraduate Research Topics in Oral Biology (* AWSpS Individual research on topics selected in collaboration with a faculty member. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

ORALB 510P Development, Structure, and Function of Oral Tissues (4-3) W,Sp Development, microscopic and submicroscopic structure, functional aspects of hard and soft oral tissues. Embryonic development of head and neck; morphodifferentiation of face and oral structures. Structure-function relationships in descriptions of development and histology-ultrastructure of oral tissues by integration of traditional oral histology and oral physiology topics.

ORALB 520P Asepsis, Oral Microbiota, and Disease (3) A Applies students' background knowledge in basic sciences to an understanding of specific micro-

biology of various niches in oral cavity, formation and metabolic activity of dental plaque, and etiology, pathogenesis, histopathology, and clinical characteristics of dental diseases. Principles involved in prevention of cross-contamination and diagnosis of clinical infections.

ORALB 521P Oral Pathology (5) AW Survey of the diseases of the oral-facial regions in lecture and laboratory sessions. Among the conditions discussed are diseases of teeth and their supporting structures and diseases of the oral and paraoral soft tissues and bones. Correlations between clinical findings, etiologic factors, and histopathologic features are stressed. Attendance in the laboratory is required.

ORALB 540P CPC: Oral Biology (2) Sp Seminar stressing basic science aspects and clinical findings of various oral lesions through exploration of etiology, pathogenesis, histopathology, and treatment modalities for oral pathology cases drawn from files of the Division of Oral Pathology.

ORALB 550P Directed Studies in Oral Biology (*, max. 12) AWSpS Selected readings and seminars on a topic chosen by individual arrangement in collaboration with a faculty member. May be repeated for credit. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

ORALB 560 Dental Plaque and Oral Disease (3) A Series of lectures and review of current literature pertaining to the formation and microbiological and biochemical characteristics of dental plaque, and the relationship, etiologically, of dental plaque to dental caries, periodontal disease, and the sequels of these conditions.

ORALB 561 Oral Tissue Development, Structure, and Function (4-3) WSp Embryonic development of head, neck; emphasis on morphodifferentiation of face and oral structures. Development and microscopic anatomy of enamel, dentin, dental pulp, cementum, periodontal membrane, alveolar bone, oral mucous membrane, maxillary sinus, temporomandibular articulation, other oral and paraoral structures. Correlation of physiological-structural form with function. Prerequisite: permission of instructor.

ORALB 562 Supervised Teaching in Oral Biology (1-5, max. 10) AWSp Directed and guided experience in selected topics in teaching techniques, teaching philosophy, and course design of courses given by the Department of Oral Biology. Students are required to participate in lecture and laboratory teaching under the supervision of the course director. Prerequisite: permission of instructor.

ORALB 565 Clinical Oral Pathology (1-3, max. 10) AWSpS Presentation of interesting oral lesions from the dental school and the University Hospital and the correlation of the clinical findings with the underlying morphologic and biochemical changes in the tissues. The relation of these oral lesions to systemic disease is stressed. Primarily designed for students with D.D.S., M.D., or D.V.M. degrees. Prerequisite: permission of instructor.

ORALB 566 Surgical Oral Pathology (2-4, max. 16) AWSpS Students are trained to interpret microscopic slides of lesions from the oral cavity and related areas, and to correlate these with the clinical findings. Each student is responsible for the grossing of specimens and the preparation of histology reports. Primarily designed for students with D.D.S., M.D., or D.V.M. degrees. Prerequisite: permission of instructor.

ORALB 568 Biomineralization (2) A Ontogeny, microscopic, and submicroscopic organization and chemistry of bones and teeth in mammals. Mineral metabolism, crystallographic structure, mechanical properties, and experimental models of biomineralization. For graduate students and advanced students in dentistry and medicine; senior undergraduates with permission of instructor.

ORALB 569 Oral Microbiology and the Normal Periodontium (2) A Basic bacterial structure, pathogenesis; general oral microbial flora; bacteria associated with periodontal diseases, caries, endodontic abscesses; management of asepsis and means of controlling dental bacterial plaque infections; normal structural, biomechanical, and functional properties of periodontal tissues and their interaction; bacterial and host defense mechanisms. Joint with PERIO 574.

ORALB 570 Seminar in Oral Pathology (1-3, max. 9) AWSpS Consists of in-depth studies of specific oral diseases through use of seminar and discussion. Students are required to present literature reviews and to act as discussion leaders. Primarily designed for students with D.D.S., M.D., or D.V.M. degrees. Prerequisite: permission of instructor.

ORALB 572 Oral Pathology (5) AW Survey of the diseases of the oral facial regions in lecture and laboratory sessions. Diseases of teeth and their supporting structures and diseases of the oral and paroral soft tissues and bones. Correlations between clinical findings and histopathologic features. Attendance in the laboratory is required.

ORALB 574 Clinical Stomatology (3) Sp Diseases of the oral cavity and jaw are presented as the practitioner encounters them—detailed clinical pictures, laboratory tests, radiographic findings, surgical exploration for the establishment of a therapeutic diagnosis.

ORALB 575 Oral Biology Seminar (1-3, max. 10) AWSp Presentation and discussion of current research problems by members of the staff, investigators from other departments in the University, visiting scientists, and trainees. Prerequisite: permission of instructor.

ORALB 578 Research Techniques in Oral Biology (2-4, max. 15) AWSpS Introduction to biochemical, analytical, or morphological techniques employed in biochemical cytology or molecular pathology as well as *in vitro* techniques of tissue and organ culture. Prerequisite: permission of instructor.

ORALB 581-582-583 Secretory Process in Exocrine Glands (1-3)-(1-3)-(1-3) A,W,Sp Biostructural, physiological, and biochemical aspects of individual secretory systems as integrated units. Faculty members with appropriate expertise participate in discussions and presentations during each of the three quarters.

ORALB 600 Independent Study or Research (*) AWSpS Prerequisite: permission of instructor.

ORALB 700 Master's Thesis (*) AWSpS

ORALB 800 Doctoral Dissertation (*) AWSpS

Oral Medicine

Faculty

Chairperson

Edmond L. Truelove

Professors

Dworkin, Samuel F.,* 1974, (Psychiatry and Behavioral Sciences),† D.D.S., 1958, Cert., 1963, Ph.D., 1969, New York; dentistry and clinical psychology, pain, psychosomatic and illness-related behavior.

Izutsu, Kenneth T.,* 1971, (Research), (Oral Biology),† Ph.D., 1970, Washington; salivary gland function in health and disease.

Omnell, Karl-Åke,* 1981, D.D.S., 1950, Royal Dental School (Stockholm); D.Odont., 1957, Lund (Sweden); oral radiology.

Associate Professors

Morton, Thomas H.,* 1975, (Oral Biology),† D.D.S., 1972, Creighton; M.S.D., 1975, Washington; oral pathology.

Stiefel, Doris J., 1972, D.D.S., 1954, M.S., 1971, Washington; dental education, care of disabled, oral medicine.

Truelove, Edmond L.,* 1972, D.D.S., 1967, M.S.D., 1971, Indiana; oral medicine.

Assistant Professors

Chen, Andrew C. N., 1981, (Research), (Psychology), (Psychiatry and Behavioral Sciences),† M.S., 1971, Ph.D., 1980, Washington; neuropsychophysiology, brain/behavior, pain.

Middaugh, Dan G., 1967, D.D.S., 1961, Minnesota; M.P.A., 1972, Washington; oral medicine.

Schubert, Mark M., 1974, (Otolaryngology), D.D.S., 1974, M.S.D., 1981, Washington; oral medicine.

Lecturers

Menard, Thomas W., 1978, D.D.S., 1978, M.S.D., 1981, Washington; oral medicine.

Miller, Rosalie R., 1973, D.D.S., 1951, Meharry; Cert., 1957, Iowa; M.P.H., 1972, Washington; oral medicine.

Sommers, Earl E., 1972, D.D.S., 1971, Indiana; M.S.D., 1977, Washington; oral medicine.

Course Descriptions

ORALM 404 Considerations in Care of the Patient With a Disability (*, max. 6) AWSpS Stiefel Role of auxiliaries in dental treatment of the special patient, including psychosocial issues, communication techniques, wheelchair transfers; dental prevention, medical and dental management of specific disabilities; drug therapy, sedation, and anesthesia. Prerequisite: permission of instructor.

ORALM 460 Clinical Management of Patients With Disabilities (*, max. 10) AWSpS Stiefel Participation in chair/bedside dental treatment of a broad range of disabled populations, including homebound and institutionalized patients. Prerequisites: 404, permission of instructor.

ORALM 525P- Detection and Management of Human Disease ((1-13)-, max. 17) AWSpS Interviewing, history-taking, physical diagnostic techniques, use of medications, physical therapy, and clinical non-surgical management and treatment of patients in dental setting. Medical factors in treatment of dental and specific oral diseases and chronic pain. Treatment planning of oral, medical, and behavioral problems.

ORALM 531P, 532P, 533P Special Clinical Topics: Acute and Chronic Pain (1,1,2) A,W,Sp Essential clinical and technical information and skills for diagnosis and treatment of acute and chronic pain, including differential diagnosis, behavioral factors.

ORALM 540P Clinical Pathological Conference: Oral Medicine Clinical Conference (2) AW Clinical conference devoted to case presentations of patients with dental treatment needs and complicating medical problems.

ORALM 545P- Clinical Pathologic Conference (1-, max. 2) AW Clinical pathologic conference utilizing interdisciplinary approach to patient care and emphasizing basic science application.

ORALM 550P Directed Studies in Oral Diagnosis (*, max. 12) AWSpS See DPHS 449 for course description and prerequisite.

ORALM 560 Advanced Diagnostic Techniques (2) A Advanced diagnostic procedures used to identify oral and perioral diseases. Included are in-depth dis-

cussions of history analysis, methods for psychologic evaluation, soft and hard tissue diagnostic procedures, neurologic, salivary gland, and other tissue analyses requiring special procedures.

ORALM 565 Oral Medicine Clinical Conference (*, max. 16) AWSpS Clinical conference in which diagnostic data concerning patients seen in the oral medicine clinic are presented for evaluation. When possible, the patient is present with laboratory findings, radiographs, and the results of special tests.

ORALM 567 Behavioral Management of Acute and Chronic Orofacial Pain (1) AWSpS Overview of psychosomatic concepts, as related to acute and chronic pain. Behavioral management strategies for acute and chronic pain integrated into clinical care provided by primary dentist. Review biofeedbacks, relaxation, hypnosis, placebos, and related psychophysiological approaches. Open to graduate students, postdoctoral fellows, residents in dentistry, medicine, psychology.

ORALM 570- Oral Medicine and Therapy (2-, max. 6) AW Lecture directed toward the presentation and discussion of oral diseases and oral manifestations of systemic disease. Primarily the clinical manifestations' relationship to generalized disease processes and patient management with in-depth discussions of therapy.

ORALM 576 Oral Medicine Literature Review (1) AWSpS Seminar analyzes the recent literature concerning the area of oral medicine, diagnosis, and therapy for oral disease.

ORALM 600 Independent Study or Research (*) AWSpS Offered on credit/no credit basis only.

ORALM 620P Introduction to Clinical Diagnosis and Oral Medicine (1) S Clinical patient diagnosis and treatment planning, including emergency care, physical diagnosis, case planning, and use of special radiographic procedures, nonsurgical diagnostic and therapeutic protocols.

ORALM 630P- Clinical Diagnosis and Oral Medicine (1- or 2-, max. 3) AWSpS Opportunity for examining, performing x-ray survey, and planning treatment for less-involved patients. Students also participate in rendering diagnosis and emergency treatment.

ORALM 640P- Advanced Clinical Diagnosis and Oral Medicine (1- or 2-, max. 3) AWSp Advanced instruction in diagnosis and in the examination and handling of patients. Students are in block assignment and perform radiographic surveys, oral diagnosis, and treatment plans for prospective patients.

ORALM 650P Oral Medicine Clinical Elective (*, max. 12) AWSpS Opportunities for students to work in various clinical activities at local hospitals or other sites outside the school. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

ORALM 660 Rotations in Medical Disciplines (1-4, max. 24) AWSpS Clinic, oriented to the hospital practice of oral medicine, deals with examination and non-surgical therapy of hospital patients. The conditions treated include primary oral diseases, oral manifestations of systemic diseases, and oral defects resulting from medical treatment of serious systemic disease. Offered on credit/no credit basis only.

ORALM 665 Clinical Oral Medicine (*, max. 33) AWSpS Clinic involving the diagnostic evaluation of patients with difficult and unusual oral diseases. The student diagnoses and treats the patient. Types of therapy include medications and chemical agents, functional physical therapy, and counseling.

ORALM 670 Clinical Oral Medicine Teaching (1-4, max. 16) AWSpS Clinic designed to give the student experience and instruction in the teaching of clinical oral diagnosis. Treatment of emergency dental problems as well as routine and special diagnostic procedures is emphasized.

Orthodontics

Faculty

Chairperson

Peter A. Shapiro

Professors

Kokich, Vincent G.,* 1974, D.D.S., 1971, M.S.D., 1974, Washington; orthodontics.

Little, Robert M.,* 1969, D.D.S., 1966, Northwestern; M.S.D., 1970, Ph.D., 1974, Washington; orthodontics.

Moffett, Benjamin C.,* 1964, Ph.D., 1952, New York; anatomy.

Moore, Alton W., 1948, (Emeritus), D.D.S., 1941, California (San Francisco); M.S., 1948, Illinois; orthodontics.

Newell, Laura L.,* 1979, ‡(Anthropology), M.A., 1957, Northwestern; Ph.D., 1970, Washington; primatology growth and development, human biology, evolutionary aspects of dermatoglyphics.

Riedel, Richard A.,* 1949, (Emeritus), D.D.S., 1945, Marquette; M.S.D., 1948, Northwestern; orthodontics.

Shapiro, Peter A.,* 1973, D.D.S., 1970, Howard; M.S.D., 1973, Washington; orthodontics.

Associate Professors

Artun, Jon, 1988, D.D.S., 1969, D.Odont., 1987, Norway; orthodontics.

Hall, Stanton H.,* 1974, (Oral Biology), M.S., 1967, D.D.S., 1967, Northwestern; Ph.D., 1974, Washington; orthodontics.

Joondeph, Donald R.,* 1969, D.D.S., 1967, M.S., 1969, Northwestern; orthodontics.

Course Descriptions

ORTHO 449 Directed Studies in Orthodontics (*) AWSp See DPHS 449 for course description and prerequisite. Offered on credit/no credit basis only.

ORTHO 520P Craniofacial Growth and Development in Orthodontic Diagnosis and Treatment (4) Sp Basic principles of pre- and postnatal growth and development integrated with the recognition, analysis, and treatment planning of problems encountered in dental and skeletal malocclusions.

ORTHO 522P Beginning Adjunctive Orthodontics (2) S Lecture/laboratory instruction in indications for, and techniques of, simple orthodontic tipping, rotational and extrusive movements often necessary in preparation for restorative and periodontal therapy. Prerequisite: 520P.

ORTHO 550P Directed Studies in Orthodontics (*, max. 6) S See DPHS 449 for course description and prerequisite.

ORTHO 560 Orthodontics Seminar (1-5, max. 25) AWSpS Methods of diagnosis, analysis, and treatment planning of malocclusion; analysis of methods and theoretical principles used in the treatment of malocclusion. The student presents a detailed case analysis and plan of treatment for each clinical patient supervised.

ORTHO 562, 563, 564, 565, 566, 567 Orthodontic Theory (2,2,2,2,2,2) A,W,Sp,S Lecture-seminar sequence dealing with interpretation and application of orthodontic principles and concepts. Pertinent literature, research findings, and current orthodontic theory are analyzed in depth.

ORTHO 570 Roentgenographic Cephalometry (2) A Basic principles, history, and techniques of roentgenographic cephalometry.

ORTHO 575 Post-Retention Seminar (1, max. 2) AW Each student is required to locate one or more former orthodontic patient(s) with at least ten years postretention. Complete orthodontic records must be obtained, analyzed, and discussed in the seminar. The instructor critiques the presentation and offers similar or contrasting cases for comparison.

ORTHO 580 Orofacial Biology (4, max. 12) AW Comprehensive evaluation seminar of the literature relative to the growth and development of the craniofacial complex. Anthropology, embryology, morphogenesis, genetics, and anatomy are integrated to give the student an appreciation of facial development. Outside reading assignments by the student are discussed and critiqued during the seminar discussion.

ORTHO 581 Introduction to Adjunctive Orthodontics (1) Basic principles of multidisciplinary treatment planning, orthodontic diagnosis, biomechanics, and appliance therapy.

ORTHO 582 Orthodontic Diagnosis and Treatment Planning for the Adult Dental Patient (3) AWSpS Seminar and clinic for orthodontic, periodontic, and restorative dentistry graduate students in comprehensive, integrated diagnosis, treatment planning, and treatment of the dental problems of the adult patient.

ORTHO 585 Surgical Orthodontic Diagnosis and Treatment Planning (3) AWSpS Seminar and clinic for orthodontic graduate students and oral surgery residents in comprehensive, integrated diagnosis, and treatment planning for patients with major facial deformities.

ORTHO 590 Scientific Methodology in Dental Research (2) W Review of the scientific method. Evaluation of dental literature. Discussion of proposed master's degree research projects. Procedure in scientific writing. Formulation and discussion of hypothetical research projects related to orthodontics.

ORTHO 599 Preclinical Technique (4) A Techniques of construction and manipulation of the edge-wise arch mechanism.

ORTHO 600 Independent Study or Research (*) AWSpS Prerequisite: permission of instructor.

ORTHO 630P- Orthodontic Clinic (1-, max. 6) AWSpS Direct clinical application of principles of orthodontic diagnosis and treatment planning for simple orthodontic appliances to modify tooth position in preparation for definitive restorative and/or periodontal therapy. Prerequisite: 522P.

ORTHO 659P Orthodontics Extended Learning (*) AWSpS Supplemental course that may involve any area of orthodontics in which a student requires extra work to correct an area of deficiency. Offered on credit/no credit basis only.

ORTHO 660P Clinical Orthodontics (1-6, max. 24) AWSpS Clinical application of the techniques in the treatment of malocclusion.

Pediatric Dentistry

Faculty

Chairperson

Peter K. Domoto

Professor

Lewis, Thompson M.,* 1955, D.D.S., 1950, Northwestern; M.S.D., 1955, Washington; pediatric dentistry.

Associate Professors

Davis, John M.,* 1966, D.D.S., 1961, M.S.D., 1967, Washington; pediatric dentistry.

Domoto, Peter K., 1968, ‡(Dental Public Health Sciences), D.D.S., 1964, California (San Francisco); M.P.H., 1975, Washington; pediatric dentistry, dental behavioral science.

Peterson, Devereaux,* 1982, M.Ed., 1975, M.S.D., 1977, Ph.D., 1980, Pittsburgh; pediatric dentistry.

Weinstein, Philip,* 1972, ‡(Dental Public Health Sciences, Psychology), M.A., 1968, Ph.D., 1971, Kentucky; dental behavioral science, treatment and prevention of fear and pain.

Assistant Professor

Barriga, Bertha, 1966, D.M.D., 1966, Oregon; M.S.D., 1971, Washington; pediatric dentistry.

Course Descriptions

PEDO 520P Pediatric Dentistry (4) S Introduction to clinical pedodontics, including behavior management, oral diagnosis, preventive dentistry, dental anomalies, radiography, anesthesia, restorative procedures, pulpal therapy, interceptive orthodontics, and traumatic dental injuries of the child patient.

PEDO 523P Professional Issues: Communication Skills I (1) Sp Introductory communication skills with emphasis on interviewing, presented in seminar format.

PEDO 524P Professional Issues: Communication Skills II (1) A Continuation of basic communication skills.

PEDO 525P Professional Issues: Management of Pediatric Patient Behavior (1) W Introduction to selected theories of child development and application in dental setting; pediatric cognitive, affective, and social development and introduction to problematic child behaviors; use of social systems approach to overview child psychosocial development for the dentist.

PEDO 531P Professional Issues: Patient Management in Pediatric Dentistry (1) A Through observation, discussion, and problem solving, students develop their own approach to rapport building, interviewing, and management of routine problems (crying child, struggling child, etc.).

PEDO 550P Directed Studies in Pedodontics (*, max. 6) AWSpS See DPHS 449 for course description and prerequisite.

PEDO 600 Independent Study or Research (*) Prerequisite: permission of instructor.

PEDO 630P- Clinical Pedodontics (1-, max. 3) AWSpS Diagnosis and treatment planning for the child patient, including preventive dentistry procedures and primary and mixed dentition restorative procedures.

PEDO 640P Joe Whiting Clinic Rotation (1) AWSp Three-day rotation at Joe Whiting Memorial Dental Clinic.

PEDO 645P Professional Issues: CAI Patient Management (1) AWSp Utilizes computer instruction, including computer literacy, word processing, data-base management, analysis of outcomes of clinical practice, clinic scheduling, project management, and clinical simulations. Offered on credit/no credit basis only.

PEDO 650P Pedodontics Extramurals (*, max. 12) AWSpS Structured fieldwork in the comprehensive treatment of the disabled child. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

PEDO 659P Pedodontics Extended Learning (*)
AWSpS Supplemental course that may involve any area of pedodontics in which a student requires extra work to correct an area of deficiency. Offered on credit/no credit basis only.

Periodontics

Faculty

Chairperson

Robert H. Johnson

Professors

Ammons, William F.,* 1970, D.D.S., 1959, Texas; M.S.D., 1970, Washington; periodontics.

Dale, Beverly A.,* 1972, (Research), (Medicine), (Oral Biology),† Ph.D., 1968, Michigan; keratin biochemistry.

Engel, L. David,* 1974, D.D.S., 1967, Minnesota; M.S., 1969, Ph.D., 1976, Washington; cellular immunology, regulation of three lymphocyte responses.

Johnson, Robert H.,* 1981, D.D.S., 1962, McGill; M.S.D., 1964, Indiana; periodontics.

Page, Roy C.,* 1967, (Pathology),† D.D.S., 1957, Maryland; Ph.D., 1967, Washington; periodontics.

Robinson, Murray R.,* 1966, ‡(Oral Biology), D.D.S., 1961, Minnesota; Ph.D., 1967, Washington; salivary biochemistry and saliva-bacterial interactions.

Schlager, Saul, 1958, (Emeritus), D.D.S., 1931, Louisville; periodontics.

Yuodelis, Ralph A.,* 1963, ‡(Restorative Dentistry), D.D.S., 1955, Alberta; M.S., 1964, Washington; periodontics.

Associate Professors

Baah, David A.,* 1980, D.D.S., 1970, Ohio State; M.S.D., 1975, Washington; periodontics.

Persson, G. Rutger, 1985, D.D.S., 1967, Ph.D., 1978, Lund.

Selipsky, Herbert,* 1972, M.S.D., 1973, Washington; periodontics.

Assistant Professors

Moncla, Bernard J.,* 1984, (Research), (Oral Biology),† M.S., 1976, Idaho State; Ph.D., 1983, Washington State; oral biology.

Spektor, Michael D., 1979, D.D.S., 1975, Illinois; periodontics.

Instructor

Leone, Salvatore A., 1984, (Research), D.D.S., 1977, Southern California; pathology.

Course Descriptions

PERIO 449 Directed Studies in Periodontics (*)
AWSpS See DPHS 449 for course description and prerequisite.

PERIO 525P-526P Prevention/Periodontics (2-2)
W,Sp Overview of preventive dentistry, introduction to periodontal therapy.

PERIO 527P Introduction to Periodontics (1) S
 Clinical, histopathologic, and radiographic features of various periodontal diseases and principles of preventive periodontics and initial examination of periodontium.

PERIO 530P-531P- Periodontics (2-2) AW Principles of examination, consultation, instrumentation, occlusal therapy, and treatment planning of the periodontal patient.

PERIO 550P Directed Studies in Periodontics (*, max. 6) AWSp See DPHS 449 for course description and prerequisite.

PERIO 561- Periodontal Case Management (2-, max. 6) AW Didactic presentation of clinical periodontics to provide a comprehensive view of the field and a grasp of modern therapeutics.

PERIO 566 Practice Management (1) W Aspects of setting up and administering a private periodontal practice. Financing, insurance, office design, equipment, employees, professional forms, marketing strategies, and patient management. Prerequisite: 561.

PERIO 574 Oral Microbiology and the Normal Periodontium (2) A Basic bacterial structure, pathogenesis; general oral microbial flora; bacteria associated with periodontal diseases, caries, endodontic abscesses; management of assepsis and means of controlling dental bacterial plaque infections; normal structural, biomechanical, and functional properties of periodontal tissues and their interaction; bacterial and host defense mechanisms. Joint with ORALB 569.

PERIO 575 Immunologic Aspects of Oral Diseases (2) W Lecture course designed to acquaint students with basic concepts of immunology and immunopathology. Topics include cellular immunology, antibody structure and function, complement system, immunopathologic mechanisms, tumor immunology and immunologic manifestations in mucocutaneous oral lesions as well as immunology of caries and periodontal disease.

PERIO 576 The Molecular and Cellular Biology of the Periodontium (2) Sp Lecture course concerned with sequence of events in development of periodontitis. Topics include the microscopic and ultrastructural characteristics of the periodontal lesion, immunopathologic and other pathogenic mechanisms involved in the progression of the disease, and etiologic and epidemiologic aspects of human periodontitis; and historic views of the disease as well as current research findings regarding the etiology and pathogenesis.

PERIO 577 Review of Literature (2, max. 14) AWSpS Continuous weekly seminar devoted to review of periodontic and related literature and the discussion of teaching methods and philosophy of teaching and treatment.

PERIO 582- Periodontic Treatment Planning Seminar (1-, max. 8) AWSpS Weekly seminar involved with the presentation, discussion, and tentative solution of moderate to complex problems in diagnosis and treatment.

PERIO 585- Periodontal Therapy Seminar (1-, max. 8) AWSpS Weekly seminar utilizing the case review method and dealing with the treatment of moderate to advanced periodontal disease.

PERIO 586- Longitudinal Evaluation of Periodontal Therapy (1-, max. 8) AWSp Close examination of case progress from initial therapy to most recent maintenance visits to determine efficacy of method, demands upon patient, and temporal effect of therapy and survival.

PERIO 587 Periodontal Diseases Research Seminar (1, max. 12) AW Weekly seminar devoted to advances in periodontal research. Topics include research design, methodology, and data derived from recent and/or ongoing periodontal research. Offered on credit/no credit basis only.

PERIO 592 Prescription Surgery (1-1-1) AWSpS Clinical course in periodontal surgery in which surgical procedures are performed on prescription basis for patients undergoing therapy in the undergraduate dental clinic. Exposes student to a wider spectrum of patients and to stimulate an environment in which the student can encounter the problems in communication and patient management that occur in the private sector.

PERIO 600 Independent Study or Research (*)
AWSpS Prerequisite: permission of graduate program adviser.

PERIO 620P Introduction to Clinical Periodontics (1) S Clinical periodontics, with emphasis on examination and assessment.

PERIO 630P-631P-632P Clinical Periodontics (1-1-1) A,W,Sp Clinical experience in examination, preventive periodontics, instrumentation, and treatment planning of periodontal therapy in patients with mild to moderate periodontal disease.

PERIO 640P-641P-642P Advanced Clinical Periodontics (1-1-2) A,W,Sp Treatment of patient with more complex periodontal involvement. Development of skill in comprehensive treatment planning and execution by the individual student. Allowance made for surgical periodontics and experience in assisting in the treatment of advanced cases.

PERIO 659P Periodontics Extended Learning (*, max. 4) S Supplemental work in periodontics to correct an area of student deficiency. Offered on credit/no credit basis only.

PERIO 660- Clinical Periodontics ((2-6)-, max. 48) AWSpS Clinical experience in diagnosis and treatment of periodontal disease.

PERIO 663 Pre-Prosthodontics Clinical Periodontics (*) AWSpS Clinical diagnosis and treatment of periodontal disease for nonperiodontics student. Prerequisite: permission of department chairperson.

PERIO 665 Clinical Practice Teaching (*) AWSp Supervised experience in teaching clinical periodontics to undergraduate dental students.

PERIO 685 Hospital Periodontics (1) Sp Preparation in periodontics to practice in hospital situations, including experience in operation of nitrous oxide analgesia, general anesthesia, intravenous premedication, treating of out- and inpatients.

Prosthodontics

Faculty

Chairperson

Charles L. Bolender

Professors

Beder, Oscar E.,* 1952, (Emeritus), D.D.S., 1941, Columbia; maxillofacial prosthodontics.

Bolender, Charles L.,* 1959, D.D.S., 1956, M.S., 1957, Iowa; removable prosthodontics.

Brudvik, James S.,* 1979, D.D.S., 1957, Minnesota; removable prosthodontics.

Frank, Richard P.,* 1971, D.D.S., 1962, Iowa; M.S.D., 1968, Washington; removable prosthodontics.

Palmer, John M.,* 1952, (Speech and Hearing Sciences),† M.A., 1950, Washington; Ph.D., 1952, Michigan; disorders of voice and orofacial deformities.

Smith, Dale E.,* 1960, D.D.S., 1952, Pittsburgh; M.S.D., 1962, Washington; removable prosthodontics.

Associate Professors

Taylor, Thomas D., 1984, D.D.S., 1974, Iowa; M.S.D., 1980, Minnesota; prosthodontics.

Toolson, L. Brian,* 1970, D.D.S., 1967, M.S.D., 1977, Washington; removable prosthodontics.

Assistant Professors

McCreery, Ann M., 1984, M.S., 1975, Buffalo; Ph.D., 1984, Washington; education.

Nash, Brent I., 1974, D.D.S., 1958, Washington; prosthodontics.

Stern, Mitchell A., 1977, D.D.S., 1975, Washington; prosthodontics.

Course Descriptions

PROS 510P Introduction to Dental Nutrition (3) WSp Basic principles of normal human nutrition, including nutrient requirements at various ages, assessment of nutritional status, nutritive values of foods, and role of diet in development and maintenance of oral tissues.

PROS 520P Introduction to Complete Dentures—Lecture (3) A Didactic course in the treatment of completely edentulous patients. Instruction is provided in diagnostic procedures, complete denture construction, and maintenance care.

PROS 523P Removable Partial Denture Design (2) W Lectures in the basic principles of removable partial denture design; more advanced designs are discussed in seminars; certain technical aspects of design procedures are done in the classroom.

PROS 525P Removable Partial Denture Clinical Preparatory Course (4) Sp Lecture-laboratory course dealing with those procedures the dentist must perform in order to fabricate a physiologically acceptable removable partial denture. The student gains experience via clinically simulated laboratory exercises prior to beginning prosthodontic treatment of a partially edentulous patient.

PROS 530P Management of Immediate Denture Patients (1) A Lecture course describing and illustrating the clinical management of immediate denture patients (typical and overdenture).

PROS 532P Special Topics in Prosthodontics (1) Sp Lecture describing and illustrating the following topics: relining procedure, management of difficult patients, maxillofacial prosthesis, and quality-control problems in private practice.

PROS 550P Directed Studies in Prosthodontics (*, max. 6) AWSpS See DPHS 449 for course description and prerequisite.

PROS 560 Complete Dentures (2) A Lecture/seminar devoted to the diagnosis and treatment of the completely edentulous patient, with emphasis on management of patients with difficulties in treatment.

PROS 561 Immediate Dentures (2) Sp Lecture/seminar course concentrating on factors peculiar to fabrication of immediate dentures, with emphasis on the management of transition from natural to artificial dentition.

PROS 562 Removable Partial Dentures (2) W Lecture/seminar concentrating on factors peculiar to fabrication of immediate dentures, with emphasis on management of transition from natural to artificial dentition.

PROS 563 Maxillofacial Prosthetics I (2) S Introductory lecture/seminars with emphasis on pertinent literature, case reports, and the reliance of maxillofacial prosthetics on sound prosthodontic principles.

PROS 564 Maxillofacial Prosthetics II (2) A Lecture/seminar augments 563. Diagnosis and detailed treatment planning, procedures for patients with anatomic or neurologic deficits of head and neck.

PROS 571 Prosthodontics Seminar (2, max. 12) AWSp Continuous weekly seminar devoted to the review of prosthodontic and related literature.

PROS 572 Special Topics Related to Prosthodontics (1) WSp Lecture-seminar dealing with subjects having a bearing on comprehensive treatment of the maxillofacial and regular prosthodontic patient. Topics include surgery, speech, orthodontics, psychology, gerontology, and sociology.

PROS 574 Prosthodontic Visual Aids (1-1) AS Lecture/seminar covering principles of preparation and presentation of essays before dental audiences; emphasis on audiovisual aids. Practical application during Autumn Quarter.

PROS 580 Prosthodontic Dental Materials (2) A Study of common materials utilized in the fabrication of dental appliances. Emphasis on resin systems and various precious and base-metal alloys.

PROS 600 Independent Study or Research (*) AWSpS Prerequisite: permission of graduate program adviser.

PROS 620P Clinical Complete Dentures (3) A Clinical course dealing with the basic principles of complete denture fabrication as well as the diagnosis and treatment of a completely edentulous patient.

PROS 621P Complete Denture Prosthodontics (1-1) WSp Clinical course that uses the didactic material presented in 620P. The student manages a second complete-denture patient during Winter Quarter with less supervision than in 620P, and also provides follow-up care to the 620P and 621P patients during Winter Quarter and Spring Quarter.

PROS 630P Clinical Prosthodontics (1-2-1) AWSpS Clinical course involving the diagnosis and management of completely and partially edentulous patients. Removable partial dentures and immediate dentures are fabricated. Follow-up care provided for patients previously treated.

PROS 640P Clinical Prosthodontic Maintenance (1-1-1) AWSp Clinic involving the relining or rebasing of dentures previously made.

PROS 650P Extramurals in Prosthodontics (*, max. 12) AWSpS Elective clinical experiences, including Foss Nursing Home or clinical practice teaching. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

PROS 659P Prosthodontics Extended Learning (*, max. 4) S Supplemental work in prosthodontics to correct an area of student deficiency. Offered on credit/no credit basis only.

PROS 660 Clinical Prosthodontics (2, max. 6) AWSp Practical application of material covered in 560, 561, and 562.

PROS 663 Clinical Maxillofacial Prosthetics I (1-1) AS Clinical/laboratory providing exposure to treatment of maxillofacial prosthetic patients.

PROS 664 Clinical Maxillofacial Prosthetics II (1-1) WSp Clinical/laboratory expanding upon 663, including extensive patient treatment.

PROS 665- Clinical Practice Teaching (1-, max. 4) AWSp Supervised experience in teaching clinical prosthodontics to the undergraduate dental student.

PROS 670 Advanced Clinical Prosthodontics (4, max. 16) AWSpS Continuation of 660. Patients who present more difficult clinical problems are assigned.

Restorative Dentistry

Faculty

Chairperson

David J. Bales

Professors

Canfield, Robert C.,* 1951, (Neurological Surgery), D.D.S., 1951, Washington; restorative dentistry.

Hamilton, A. Ian,* 1949, (Emeritus), M.A., 1958, Washington; D.D.S., 1936, Toronto; Ph.D., 1968, London; restorative dentistry.

Hodson, Jean T.,* 1952, (Emeritus), M.S., 1958, Washington; restorative dentistry.

Morrison, Kenneth N.,* 1948, (Emeritus), D.D.S., 1943, Toronto; M.S.D., 1952, Washington; restorative dentistry.

Nicholls, Jack I.,* 1965, M.A.Sc., 1960, British Columbia; Ph.D., 1966, Purdue; structuring engineering, restorative dentistry.

Stibbs, Gerald D., 1948, (Emeritus), D.M.D., 1931, Oregon; restorative dentistry.

Warnick, Myron E.,* 1956, D.D.S., 1955, Alberta; restorative dentistry.

Yuodelis, Ralph A.,* 1963, D.D.S., 1955, Alberta; M.S.D., 1964, Washington; restorative dentistry and periodontics.

Associate Professors

Bales, David J., 1983, D.D.S., 1957, Washington; M.S.D., 1972, Indiana; restorative dentistry.

Ostlund, Lyle E., 1972, D.M.D., 1947, Oregon; restorative dentistry.

Assistant Professors

Drennon, David G., 1980, D.D.S., 1967, Temple; M.S., 1976, Iowa; restorative dentistry.

Gordon, Glenn E., 1985, D.D.S., 1962, Michigan; M.S., 1969, Texas; general dentistry/restorative dentistry.

Johnson, Glen H., 1980, M.S., 1977, D.D.S., 1978, Washington; M.S., 1983, Michigan; restorative dentistry.

Lillywhite, Jack W., 1971, D.D.S., 1965, Washington; restorative dentistry.

Powell, L. Virginia, 1986, D.M.D., 1982, Mississippi Medical Center; restorative dentistry.

Stoddard, James W., 1965, D.D.S., 1961, Washington; restorative dentistry.

Weaver, James D., 1970, D.D.S., 1965, Ohio; restorative dentistry.

Lecturer

Townsend, John D., 1977, D.D.S., 1967, McGill; M.S.D., 1973, Washington; restorative dentistry.

Course Descriptions

RES D 410 Dental Anatomy (3) W Lecture and laboratory exercises on the morphology and nomenclature of individual human adult and primary teeth. Introduction to function, internal tooth morphology, and the influence of tooth anatomy on selected clinical procedures. For dental hygiene students; others by permission of associate dean.

RES D 449 Directed Studies in Restorative Dentistry (*) See DPHS 449 for course description and prerequisite.

RES D 510P Introduction to Dental Materials (2) A Physical and chemical properties of dental materials.

RES D 511P Applied Dental Materials (4) W Lecture/laboratory in use of dental materials relative to restorative dentistry. Clinical application and student self-evaluation of laboratory work emphasized.

RES D 515P Dental Anatomy (3) A Lecture and laboratory on the morphology and nomenclature of individual teeth of the adult human dentition. Introduction to tooth histology and function and the influence of tooth anatomy on clinical dental procedures.

RES D 516P Introduction to Occlusion (3) W Lecture/laboratory in the functional determinants of occlusal morphology. Preparation and waxing techniques for developing opposing quadrants by the additive waxing technique.

RES D 517P Functional Analysis of Occlusion (3) Sp Clinical and laboratory experiences in examination and charting of patient's occlusion, record-taking for analysis of occlusion on a dental articulator, and preclinical diagnostic correction of problems of occlusion on articulated clinical casts. Provides basic background or technique information relative to laboratory and clinical experiences.

RES D 519P Operative Dentistry (1) Sp Lecture series introducing operative dentistry. Nomenclature, cavity classification, instrumentation, pulp protection, and principles of cavity preparation.

RES D 520P, 521P, 522P, 523P Introduction to Operative Dentistry Technique (3,3,3,2) Introduces processes of restoring diseased or damaged tooth structure to proper health, form, function, and esthetics. Emphasis on basic principles of cavity preparation, preparation and restoration design, proper selection and use of restorative materials, and clinical considerations for restorative treatment planning. Following demonstration of competence in didactic and practical aspects. Limited opportunity available for introduction to restorative care.

RES D 525P, 526P, 527P Fixed Prosthodontics (3,3,3) A,W,Sp Serve as introduction to area of restorative dentistry dealing with indirect restorations. Preclinical experience provided in tooth preparation and restoration, fabrication for various crown designs, singly and in conjunction with various pontic types to serve as fixed partial denture prostheses. Projects emphasize single-tooth preparation/restoration, multiple-tooth preparation/restoration, and esthetic veneer restorations.

RES D 530P, 531P, 532P Restorative Dentistry (2,2,2) A,W,Sp Lecture series related to 630P presenting restorative dentistry principles, including supportive material on clinical procedures.

RES D 540P, 541P Advanced Restorative Dentistry (2,2) A,W Broadens base of restorative procedures. Introduction of new techniques and preparation for state board examination.

RES D 542P New Developments in Dental Materials (1) Sp Dental materials recently introduced to dental profession reviewed, compared to current materials, and clinically demonstrated.

RES D 550P Directed Studies in Restorative Dentistry (*, max. 6) AWSpS See DPHS 449 for course description and prerequisite.

RES D 570 Review of Literature Seminar (1, max. 6) AWSpS Continuous weekly seminar devoted to a review of restorative and related literature, and discussion of teaching methods, philosophy of teaching and treatment.

RES D 580- Restorative Treatment Planning Seminar (1-, max. 8) AWSpS Continuous weekly seminar to discuss controversial treatment problems and difficult diagnostic cases selected for graduate students.

RES D 581- Comprehensive Treatment Planning (2-, max. 4) WSp Seminar devoted to the diagnosis and treatment of comprehensive dental cases with special emphasis given to the relationship of periodontics to restorative dentistry.

RES D 588 Masticatory Functional Analysis and Occlusal Adjustment (2) A Lecture/seminar and clinical sessions in the study of the physiology of occlusion. Pertinent literature reviewed and discussed from the multidisciplinary viewpoint. The clinical sessions include training in masticatory functional analysis and treatment of occlusally related diseases.

RES D 589 Review of Literature in Occlusion (2) W Seminar to review pertinent literature in occlusion.

RES D 590- Fundamentals of Fixed Prosthodontics (2-, max. 4) AW Lecture/laboratory/clinical sessions in the study of gnathological principles and procedures as they pertain to the treatment of comprehensive cases assigned to the students. Use and application of several fully adjustable articulators.

RES D 600 Independent Study or Research (*) AWSpS Prerequisite: permission of graduate program adviser.

RES D 620P Introduction to Clinical Restorative Dentistry (1) S Orientation to clinical operations, administrative procedures associated with restorative clinical, initial treatment plan, and limited treatment of patients.

RES D 630P- Clinical Restorative Dentistry ((1 or 2 or 3)-, max. 9) AWSp Clinical training in fundamental restorative dentistry procedures, including diagnostic, treatment planning, and therapeutic aspects of operative dentistry, fixed prosthodontics, and occlusal treatment.

RES D 640P- Advanced Clinical Restorative Dentistry ((1-3)-, max. 12) AWSp Clinical training in restorative dentistry procedures, including diagnostic, treatment planning, and therapeutic aspects of operative dentistry, fixed prosthodontics, and occlusal treatment.

RES D 645P Professional Issues: Applied Dental Practice (1- or 3) AWSp Lecture, seminar, and clinical application of material to stimulate a dental practice, including communication with staff, delegation, body mechanics, efficient work systems, practice management knowledge, and skill development.

RES D 659P Restorative Dentistry Extended Learning (*, max. 4) S Supplemental work in restorative dentistry to correct an area of student deficiency. Offered on credit/no credit basis only.

RES D 660- Oral Rehabilitation ((2-6)-, max. 32) AWSpS Clinical course to provide experience in diagnosis and treatment of patients requiring restorative procedures from single restorations to complex oral rehabilitative methods. Special emphasis is directed toward the integration of periodontics and occlusion as they relate to restorative dentistry.

RES D 665 Clinical Practice Teaching (1, max. 4) AWSp Supervised experience in teaching clinical fixed prosthodontics to undergraduate dental students.



College of Education

Dean

James I. Doi
222 Miller

Associate Deans

Jack L. Beal
James K. Morishima

The mission of the College of Education is reflected in the following goals: (1) to conduct systematic study and research on problems, concerns, and policies of education; (2) to conduct programs that will attract and prepare those who will provide excellent leadership for the schools; (3) to experiment, innovate, and develop models for improved training of school personnel; (4) to generate new ideas for the improvement of education; (5) to become intimately involved in cooperative and coordinated research and service activities with the educational enterprise; and (6) to develop systematic procedures for ensuring adequate attention to education for minority groups.

Programs

In order to achieve its mission, the College of Education has two clusters of programs: (1) the undergraduate and professional studies and (2) the graduate studies. Each one of these clusters is administered by an associate dean. The undergraduate and professional studies programs lead to a Bachelor of Arts degree or to any of a number of professional certificates in the field of education. The various graduate programs lead to the Master of Education, Doctor of Education, or Doctor of Philosophy degrees.

Special Facilities and Services

The College of Education maintains a number of special facilities to assist in the fulfillment of its goals. Among these are the Office of Teacher Education Advising and Certification, and the Experimental Education Unit. In addition, the College of Education maintains formal relationships with a number of school districts in the area to provide research and field experience opportunities for the students in the various programs. The most relevant facilities for undergraduate and professional studies students are the Office of Teacher Education Advising and Certification and the cooperating schools.

Undergraduate and Professional Studies

Associate Dean
201 Miller, DQ-12

Teacher Education Advising and Certification
211 Miller, DQ-12

Undergraduate and professional studies consist of two major programs—the Bachelor of Arts program and the programs leading to three types of professional certificates in education: administrator certificates, educational staff associate certificates, and teaching certificates.

Undergraduate, transfer, and postbaccalaureate students may be admitted to the college when they have been accepted into the Teacher Education Program or when they have received approval from a faculty committee of the Department of Education to begin a course of study leading to a noncertificate degree program.

Students must have completed a minimum of 90 approved credits and be in good academic standing, in accordance with University regulations. Admission to the college is dependent upon admissibility to the University.

Prospective applicants to the various College of Education programs should keep in mind that the University of Washington is a research-oriented institution. Consequently, students are expected to participate, within reason, in approved research projects conducted by faculty members or other authorized individuals.

Bachelor of Arts Degree

To qualify for the Bachelor of Arts degree, students in the College of Education, in addition to meeting University requirements, must complete a proficiency requirement, a writing requirement, a distribution requirement, an approved academic major, and at least 10 credits in education courses with a minimum of 2.00 grade-point average in all education courses taken following admission to the college. A minimum 2.00 cumulative grade-point average is required for the degree.

The *proficiency* requirement consists of three components: English composition—minimum of 5 credits chosen from an approved list; quantitative and symbolic reasoning—minimum of 5 credits chosen from an approved list; foreign language—through the third quarter of a single foreign language. The approved lists mentioned above are in the College of Arts and Sciences *Bachelor's Degree Planbook* or may be obtained from an adviser in Arts and Sciences or in Education. Students who began college prior to Autumn Quarter 1985 follow the proficiency requirement in effect at the time they entered.

The *writing* requirement consists of 10 credits of courses designated *W* in the *Time Schedule*. These courses emphasize the evaluation of writing in an academic discipline.

The *distribution* requirement consists of at least 20 credits in each of the broad areas of humanities, social sciences, and natural sciences. Information about the three broad distribution areas is available in the Office of Teacher Education Advising and Certification, 211 Miller. Students completing secondary-school teacher certification or those completing a degree-only program may not use courses required for the academic major to satisfy distribution requirements. However, students completing elementary-school teacher certification may include courses required for the academic major to satisfy distribution requirements.

The *academic major* may be one of those approved by the College of Education as a teaching major, or an approved individually designed interdisciplinary major consisting of a minimum of 45 approved credits. All individually designed majors must be approved in advance of the taking of course work leading to the major. This approval is given by a faculty committee of the College of Education appointed by the associate dean for Undergraduate and Professional Studies. Complete information and application materials may be obtained in the Office of Teacher Education Advising and Certification, 211 Miller.

Professional Certificates in Education

Administrator Certificates

The following three kinds of administrator certificates can be pursued in the College of Education: (1) superintendent's certificate; types: Initial, Continuing; (2) principal's certificate; types: Initial, Continuing; levels: elementary, secondary, general. (3) program administrator's certificate; types: Initial, Continuing;

specializations: curriculum, special education, personnel services, pupil personnel services, business officials.

Information concerning admission to, and requirements for, all administrator certification programs may be obtained from the Area of Policy, Governance, and Administration, M219 Miller.

Educational Staff Associate Certificates

The College of Education is authorized by the State Board of Education to issue the following educational staff associate certificates to individuals completing appropriate approved programs in various departments of the University or units of the College of Education: communication disorders specialist, occupational therapist, physical therapist, school counselor, school psychologist, and social worker.

Information concerning requirements and admission to the various educational staff associate programs may be obtained from the appropriate departments and/or units as follows: communication disorders specialist—Department of Speech and Hearing Sciences, 1417 Northeast Forty-second Street, JG-15, Seattle, Washington 98195; occupational therapist—application materials and information packets may be purchased from the University Book Store, South Campus Branch, 301 South Campus Center, WF-15, Seattle, Washington 98195; physical therapist—application materials and information packets may be purchased from the University Book Store, South Campus Branch, 301 South Campus Center, WF-15, Seattle, Washington 98195; school counselor and school psychologist—Area of Educational Psychology, College of Education, 312 Miller, DQ-12, University of Washington, Seattle, Washington 98195; social worker—School of Social Work, 4101 Fifteenth Avenue Northeast, Seattle, Washington 98195.

Teaching Certificates

The College of Education is authorized by the State Board of Education to prepare and recommend individuals for the Initial Teaching Certificate and the Continuing Teaching Certificate. The Teacher Education Program is accredited by the National Council for the Accreditation of Teacher Education and by the National Association of State Directors of Teacher Education and Certification. The college also is a member of the University Council for Educational Administration. Graduates are legally qualified for certification in all states party to the Interstate Certification Compact. Information about these states is available in the Office of Teacher Education Advising and Certification.

Initial Teaching Certificate

The Initial Teaching Certificate is the first level of certification in Washington. It is valid for four years and may be renewed for an additional three years. The initial certificate is available at both the elementary- and secondary-school levels. In some specializations, K-12 certificates are issued.

General Admission Requirements. To be considered for admission to the initial teacher certification program, all students must (1) have a minimum grade-point average greater than, or equal to, the University-wide undergraduate mean grade-point average; (2) obtain satisfactory scores (as defined by the college) on required basic skills tests; (3) remove any University admission deficiencies and complete basic proficiency and writing requirements; (4) satisfy all distribution requirements; (5) complete most of an approved major (at least ninety percent required prior to admission); (6) have a grade of at least 2.0 in each course specifically required for the certificate; (7) not have a physical, mental, or sensory handicap that would preclude ability to teach successfully; (8) provide a record of documented instructional experience at the appropriate level and in the appropriate area (EDUC 301, Introductory Practicum in Community Ser-

vice Activity, may be used). Items 3 and 4 do not apply to applicants who already hold a baccalaureate degree. Admission may depend on enrollment restrictions imposed by the University, availability of faculty, resources, and appropriate field placement.

Elementary-School Teacher Certification Admission Requirements. In addition to the general requirements, students applying for the elementary-school Teacher Education Program must complete the required prerequisite courses, which were under revision at the time of the printing of this catalog. Obtain current information on prerequisites from the Office of Teacher Education Advising and Certification, 211 Miller.

Applications are accepted during the first two weeks of the quarter preceding the desired quarter of entry. Specifically: Autumn Quarter, the first two weeks of Spring Quarter; Winter Quarter, the first two weeks of Autumn Quarter; Spring Quarter, the first two weeks of Winter Quarter. There is no Summer Quarter admission. Application forms are available in 211 Miller and must be completed and returned to an education adviser by the appropriate deadline.

Selection is based on successful completion of prerequisites and interviews with University faculty members and with public school personnel. Interviews are arranged after the application is accepted.

Secondary-School Teacher Certification Admission Requirements. Admission to the secondary-school Teacher Education Program involves a two-phase process. Completion of the first phase (field committee recommendation) establishes eligibility to proceed to the second phase (application to the Teacher Education Program). Procedures for both phases follow.

In addition to the previously specified general requirements, students applying to the secondary-school Teacher Education Program must meet specific requirements established by subject-area field committees, be recommended by their academic department, and be approved by the appropriate field committee. Although application for departmental recommendation generally is made by the first week of the quarter immediately preceding the entry quarter, deadlines vary among departments. Students are urged to verify the deadline date with their departments. After recommendation by the appropriate field committee, forms for application to the Teacher Education Program may be obtained in the Office of Teacher Education Advising and Certification. Completed applications must be submitted to an education adviser by the end of the fourth week of the quarter immediately preceding the entry quarter. There is no admission Summer Quarter. Selection is based on successful completion of prerequisites and interviews with University faculty members and public school personnel arranged after the application is received.

General Program Requirements for the Initial Certificate. With the exception of students in experimental projects, initial teacher certification at the University of Washington requires completion of a multiquarter (four quarters for elementary and three quarters for secondary), performance-based, field-oriented program. In addition to taking courses on campus, students are placed in the field and work under close supervision in various schools in Seattle or the general Seattle metropolitan area.

To qualify for an Initial Teaching Certificate, a student must hold or be eligible for a baccalaureate degree; complete an academic teaching major; complete the certification program for elementary, secondary, or K-12; and finish related requirements as explained in the following paragraphs.

Teaching certificates may be earned by students registered in colleges of the University other than Education, provided all requirements for both the teaching certificate and the degree requirements of the other college are met.

Students seeking an Initial Teaching Certificate must complete two courses (6 credits) in socioethnic studies prior to the final quarter of the teaching practicum. All students are required to take EDUC 423, a course that provides prospective teachers with background information on socioethnic/cultural diversity in the United States and its impact on decision making in such areas as school structure, school programming, and administration. The remaining 3 credits must be chosen from a list of approved courses that provide teachers with a focus on application of major concepts, theories, and research about ethnic and socioeconomic diversity in the United States in order to assist them in instruction of mainstream and minority youth. Additional information and a list of suggested courses that fulfill the requirement may be obtained from the Office of Teacher Education Advising and Certification. Students are urged to complete the socioethnic requirements prior to admission to the certification program in order to concentrate on the professional sequence after admission.

Students may earn an elementary teaching certificate with an emphasis on American Indian education, bilingual/bicultural education, or special education by completing all the requirements for the elementary teaching certificate, plus specified course work in the areas of emphasis.

Prior to the final quarter of the teaching practicum, each student must pass a performance test on the use of audiovisual equipment.

The Initial Teaching Certificate at the elementary-school level requires completion of a professional minor in elementary education.

At the secondary-school level, the Initial Teaching Certificate for science and mathematics majors requires completion of an academic minor. Although academic minors are not required, students with other majors are encouraged to broaden their teacher preparation by completing one or more minors.

Students who believe they can demonstrate competencies equivalent to any of the stipulated requirements, as indicated by previous experience or by the successful completion of advanced credit examinations, should see an education adviser for assistance. Courses in professional education completed more than ten years before admission or readmission to the Teacher Education Program are not applicable. The applicability of such courses may be reestablished by examination.

Complete details on the programs for the Initial Teaching Certificate are contained in brochures available at the Office of Teacher Education Advising and Certification.

Majors and Minors Approved for Teaching Certificates. As this catalog went to press, substantial changes in many of the majors and minors were anticipated and consequently are not listed. Please see an adviser in the Office of Teacher Education Advising and Certification, 211 Miller, for a list of approved majors and minors and the courses for each.

Continuing Teaching Certificate

As this catalog went to press, the requirements for the Continuing Teaching Certificate listed below were being reviewed by the Office of the Superintendent of Public Instruction. They are expected to be revised during 1988. Please contact the Office of Teacher Education Advising and Certification for up-to-date requirements.

Renewing the Initial Teaching Certificate. The Initial Teaching Certificate is valid for a four-year period and may be renewed once for an additional three years by meeting the following requirements: (1) Complete 15 quarter credits after the issuance of the Initial teaching certificate, unless all course work requirements for the continuing certificate have been completed. An official

transcript of renewal credits must be on file in the Office of Teacher Education Advising and Certification. (2) File an approved Continuing Teaching Certificate Study Plan in the Office of Teacher Education Advising and Certification, 211 Miller. (3) Complete the renewal application form and send it to the Educational Service District with the \$15 renewal fee (a check or money order should be made payable to the Educational Service District). Instruct that office to send the completed form to the Office of Teacher Education Advising and Certification, 211 Miller, DQ-12, University of Washington, Seattle, Washington 98195.

Teaching Experience. Candidates must have completed at least three years of professional service as a teacher, administrator, or educational staff associate in an educational setting, at least two years of which shall be as a classroom teacher in grades preschool through 12. A valid teaching certificate must be held while meeting this requirement.

Course Work. (1) A minimum of 45 quarter (30 semester) credits of course work must be completed after receiving the baccalaureate degree, distributed as follows: (a) A minimum of 3 credits is required in each of the following four generic standards—staff development and supervision, professional development and scholarship, research and evaluation, referral agencies and resource personnel. (b) A minimum of 15 credits in an area of concentration. (c) Elective credits to attain the required 45 credits. (2) 21 credits must be earned after at least one year (180 days) of teaching (candidates who hold a master's degree do not have a minimum number of credits that must be completed after teaching experience). (3) Credits must include academic and education course work. (4) On or after August 31, 1988, all Continuing Teaching Certificate candidates must have at least two endorsements. (5) At least half the course work (22½ credits) must be taken at the University of Washington. (6) A minimum grade of 2.0 is required in each course taken for the certificate (C and S grades are acceptable). (7) All course work must be upper-division (300 and 400 series) or graduate level. (8) A maximum of 5 credits of correspondence study may be approved. (9) No distinction will be made between extension and residence credits. (10) All courses are to be taken through an approved four-year institution. (11) Education courses taught in Washington by out-of-state institutions or agencies that do not have the approval of the State Board of Education are not acceptable for the Continuing Teaching Certificate.

Candidates who had completed all Continuing Teaching Certificate requirements except for one of the years of teaching experience by August 31, 1987, and had completed this teaching requirement and applied for certification before August 31, 1988, will not have continuing education requirements. Candidates who apply on or after August 31, 1988, will be required to complete 150 clock hours of continuing education and/or college credit every five years to keep the certificate valid.

Registration Status of Continuing Teaching Certificate Candidates: Students may earn credits toward the Continuing Teaching Certificate while registered as either a postbaccalaureate student or a graduate student. Persons interested in working toward a master's degree and a Continuing Teaching Certificate concurrently should contact the Education Graduate Office, 206 Miller, or the department from which they plan to obtain a graduate degree for information regarding that degree. All candidates for the Continuing Teaching Certificate, whether postbaccalaureate or graduate students, should consult an adviser in the Office of Teacher Education Advising and Certification, 211 Miller, regarding certificate requirements.

Endorsements to Four-Year Initial Teaching Certificate

Individuals preparing for or holding a four-year initial teaching certificate under the 1976 guidelines may add endorsements to their certificates indicating that they

are prepared to teach in subjects and/or at levels in addition to those in which they were originally endorsed.

Certificates for administrators under the 1978 guidelines may be endorsed for the role of principal, program administrator, or superintendent. Certificates for educational staff associates may be endorsed for the role of communication disorders specialist, counselor, psychologist, social worker, occupational therapist, or physical therapist.

For more information on available endorsements through the University of Washington and on specific requirements for each available endorsement, interested individuals should contact the Office of Teacher Education Advising and Certification, 211 Miller.

Graduate Degree Programs

James K. Morishima, Associate Dean for Graduate Studies and Research, Graduate Program Coordinator

The College of Education offers three advanced degrees: Master of Education, Doctor of Education, and Doctor of Philosophy. Graduate students may specialize their degree studies in curriculum and instruction; educational psychology; policy, governance, and administration; or special education. Questions regarding graduate study in education should be directed to the Office of Graduate Studies and Research, 206 Miller, DQ-12, College of Education, University of Washington, Seattle, Washington 98195.

Master of Education Degree

The Master of Education degree requires a minimum of 45 credits, including at least 15 credits in a special area of study in education; 9 credits related to but outside of the specialization, some work outside education; 9 thesis credits or, for the nonthesis option, 9 credits in a field study or other approved project; and a final examination.

Doctor of Education Degree

The Doctor of Education degree is designed to prepare professionals whose primary interest is to deal directly with problems of educational practice. The program of study leading to the Doctor of Education degree, as a professional degree, focuses on the utilization of research knowledge and practitioners' knowledge, rather than on the production of research knowledge. Those who aspire to positions as master teachers, curriculum designers, or learning resource specialists, for example, would appropriately seek the Doctor of Education degree.

This professional degree requires at least two years of resident study, a program of specialized study with credit in education and related fields, sufficient preparation in research methodology to interpret research findings for use in practice, an internship and leadership training, a General Examination, a dissertation on a problem of educational practice, and a Final Examination.

Doctor of Philosophy Degree

The Doctor of Philosophy degree in education is specifically a research degree. While the typical recipient of the Doctor of Education degree becomes an educational practitioner in the schools or other educative agencies, the holder of the Doctor of Philosophy degree is prepared for a career of research on issues fundamental to the conduct of education—issues that range from fairly narrow questions about human learning to macroquestions regarding the form of societies' educational institutions. Given the broad scope of the Ph.D. degree in education, it is possible, with the consent of the Supervisory Committee, to pursue special-

ized study in areas such as counseling psychology, educational policy studies, multiethnic education or exceptional children.

Degree requirements include minimally two years of resident study, a program of specialized study with credits both in education and in other academic units, preparation in research methodology adequate to design and assess research in the field of specialization, sufficient study in cognate fields inside and outside of education to ensure that the candidate can place the specialized research in a broader context, a General Examination, a research dissertation, and a Final Examination.

Admission Requirements

Admission to graduate degree programs in education is competitive, with space limited by faculty size and facilities. To be considered in the competition for admission to the Master of Education degree programs, the applicant should have earned a baccalaureate degree from an accredited institution with a 3.00 upper-division grade-point average, must have submitted a score on the Miller Analogies Test or the Graduate Record Examination general test, and must have satisfied any additional prerequisites specified by the area of specialization.

Consideration for admission to either doctoral program requires a master's degree or equivalent preparation in a field appropriate to the area of specialization, usually at least a 3.50 grade-point average in the master's program, satisfaction of special prerequisites specified by the area of specialization, and completion of the application steps outlined in the appropriate doctoral program document (available in the Office of Graduate Studies and Research, 206 Miller, DQ-12).

Financial Aid

Research and teaching assistantships in the College of Education are available on a competitive basis. To be considered for an appointment, the graduate student must show exceptional academic promise. Doctoral applicants are given priority.

Specific information on the various types of remunerative appointments for graduate students in education, amounts of stipends, application procedures, and deadlines may be obtained from the University of Washington College of Education, Office of Graduate Studies and Research, 206 Miller, DQ-12, Washington 98195.

Special Research Facilities

Within the College of Education are opportunities for students to gain research experience through four organizations. The Clinical Service and Research Center, operating under the aegis of Educational Psychology, offers research facilities ranging from observation rooms equipped with videorecorders to central computer terminals, microcomputers, and a library. The worldrenowned Experimental Education Unit offers an interdisciplinary approach to research, training, and service provision for handicapped children and their families. The Institute for the Study of Educational Policy, which promotes interdisciplinary research that bears on education policy, provides a point of contact between the University and the educational policy researchers and analysts throughout the state. The Teacher Education Research Center assists faculty members and graduate students in conducting research and evaluation on teacher education.

Faculty

Professors

Abbott, Robert D.,* 1975, M.S., 1968, Ph.D., 1970, Washington; measurement, statistics and research design.

Affleck, James Q.,* 1967, M.A., 1963, San Francisco State; Ed.D., 1968, Columbia; special education (severely handicapped).

Anderson, Robert A.,* 1965, Ph.D., 1964, Minnesota; educational administration.

Andrews, Richard L.,* 1968, M.S., 1965, Ph.D., 1968, Purdue; policy, governance, and administration.

Banks, James A.,* 1969, M.A., 1967, Ph.D., 1969, Michigan State; social studies and multiethnic education.

Billingsley, Felix F.,* 1978, M.A., 1966, Western Washington; Ph.D., 1974, Washington; special education (severely handicapped).

Bolton, Dale L.,* 1962, M.S., 1953, Oklahoma State; Ph.D., 1958, Wisconsin; educational administration.

Borgatta, Edgar F.,* 1981, ‡(Sociology), M.A., 1949, Ph.D., 1952, New York; Director, Institute on Aging; methodology, social psychology, demography-ecology.

Boroughs, Homer, Jr., 1948, (Emeritus), M.A., 1947, Ph.D., 1949, Washington; history and philosophy of education.

Brammer, Lawrence M.,* 1964, M.A., 1948, Ph.D., 1950, Stanford; counseling, adult development.

Briggs, J. Robert,* 1952, (Emeritus), M.A., 1950, Ed.D., 1954, Washington; business education.

Brown, Frances A., 1953, (Emeritus), M.A., 1950, Columbia; business education.

Burgess, Charles O.,* 1964, (History), M.S., 1958, Ph.D., 1962, Wisconsin; history of education.

Butterfield, Earl C.,* 1981, (Engineering, Psychology), Ph.D., 1963, George Peabody; human development and cognition.

Dohner, Charles W.,* 1967, (Medical Education), ‡ M.S., 1957, Kansas State (Pittsburgh); Ph.D., 1966, Ohio State; educational psychology/research in medical education.

Doi, James I.,* 1979, M.A., 1950, Ph.D., 1952, Chicago; finance and management of colleges and universities.

Driscoll, John P.,* 1967, (Emeritus), M.S., 1950, California (Los Angeles); Ph.D., 1957, Pennsylvania State; educational communications.

Edgar, Eugene B.,* 1972, M.A., 1968, Ph.D., 1972, George Peabody; special education (early childhood).

Evans, Ellis D.,* 1964, M.S.Ed., 1962, Ed.D., 1964, Indiana; human development and cognition.

Fea, Henry R.,* 1954, (Emeritus), M.Ed., 1948, Saskatchewan; Ph.D., 1950, California (Berkeley); educational psychology.

Fewell, Rebecca R.,* 1979, M.A., 1969, Ph.D., 1972, George Peabody; special education (early childhood).

Foster, Clifford D.,* 1959, (Emeritus), M.A., 1952, Ph.D., 1957, Washington; elementary education (curriculum).

Freehill, Maurice F.,* 1962, (Emeritus), M.A., 1947, Ed.D., 1948, Stanford; school psychology/human development and cognition.

Giles, Frederic T.,* 1961, (Emeritus), M.A., 1946, Ed.D., 1961, Washington State; higher education.

Goodlad, John I.,* 1985, M.A., 1946, British Columbia; Ph.D., 1949, Chicago; higher education.

Haring, Norris G.,* 1965, M.A., 1950, Nebraska; Ed.D., 1956, Syracuse; special education (early childhood).

Hayden, Alice H.,* 1942, (Emeritus), M.S., 1929, Oregon State; Ph.D., 1932, Purdue; special education.

Hunkins, Francis P.,* 1966, M.Ed., 1963, Boston; Ph.D., 1966, Kent State; curriculum.

Jarolimek, John,* 1962, (Emeritus), M.A., 1949, Ph.D., 1955, Minnesota; social studies.

Jenkins, Joseph R.,* 1978, Ph.D., 1967, Minnesota; special education (mildly handicapped).

Kaltsounis, Theodore,* 1968, M.A., 1959, Wichita; Ph.D., 1961, Illinois; social studies.

Kerr, Donna H.,* 1973, Ph.D., 1973, Columbia; philosophy and education.

Kerr, Stephen T.,* 1985, M.A., 1969, Columbia; Ph.D., 1975, Washington; educational communications and technology.

Klockars, Alan J.,* 1967, M.A., 1963, Oregon State; Ph.D., 1967, Washington; measurement, statistics and research design.

Legters, Lyman H.,* 1966, ‡(International Studies), M.A., 1956, Boston; Ph.D., 1958, Free University (Berlin); educational policy studies and Russian and East European studies.

Lieberman, Ann,* 1986, M.A., 1966, California State (Northridge); Ed.D., 1969, California (Los Angeles); policy, governance, and administration.

Lovitt, Thomas C.,* 1966, M.M.E., 1960, Ed.D., 1966, Kansas; special education (mildly handicapped).

Lowenbraun, Sheila,* 1968, M.A., 1962, Ph.D., 1969, Columbia; special education (hearing impaired).

Lumsdaine, Arthur A.,* 1965, (Emeritus), (Psychology), † Ph.D., 1949, Stanford; educational psychology, psychology.

Madsen, David L.,* 1962, A.M., 1954, Ph.D., 1961, Chicago; history of education.

McCartin, Rosemarie E.,* 1965, M.A., 1960, Immaculate Heart; Ph.D., 1964, Southern California; school psychology/human development and cognition.

Meacham, Merle L.,* 1966, (Emeritus), M.S., 1956, Washington; Ed.D., 1965, Washington State; school psychology.

Morishima, James K.,* 1972, Ph.D., 1967, Washington; human development and cognition.

Morris, Arval A.,* 1955, ‡(Law), M.A., 1953, J.D., 1955, Colorado; LL.M., 1958, Yale; LL.D., 1972, Colorado College; educational policy studies, law.

Neel, Richard S.,* 1972, M.S., 1971, Ph.D., 1972, Southern California; special education.

Odegaard, Charles E.,* 1974, (Emeritus), A.M., 1933, Ph.D., 1937, Harvard; higher education.

Olstad, Roger G.,* 1964, (Environmental Studies), M.A., 1959, Ph.D., 1963, Minnesota; science education, teacher education.

Peckham, Percy D.,* 1968, M.A., 1955, Denver; Ph.D., 1968, Colorado; measurement, statistics and research design.

Powers, Francis F.,* 1928, (Emeritus), M.A., 1927, Oregon; Ph.D., 1928, Washington; educational psychology.

Reitan, Henry M.,* 1967, (Emeritus), Ph.D., 1950, North Dakota; higher education.

Ryckman, David B.,* 1969, A.M., 1961, Chicago; Ed.D., 1966, Illinois; special education (mildly handicapped).

Sax, Gilbert,* 1966, (Psychology), † M.A., 1956, California (Los Angeles); Ph.D., 1958, Southern California; measurement, statistics and research design.

Schill, William J.,* 1967, M.A., 1952, Minnesota; Ed.D., 1962, California (Los Angeles); higher education.

Sebesta, Sam L.,* 1963, M.A., 1960, Northwestern; Ed.D., 1963, Stanford; reading/language arts.

Sirotnik, Kenneth A.,* 1985, (Research), M.A., 1966, M.A., 1967, Ph.D., 1969, California (Los Angeles); measurement, statistics, research design and evaluation, educational change and school renewal.

Stowitschek, Joseph J.,* 1986, (Research), M.S., 1969, Oregon College of Education (Monmouth); Ed.D., 1973, Utah State; vocational and social development, service program policies regarding disabled youth.

Strayer, George D., Jr.,* 1949, (Emeritus), M.A., 1928, Ph.D., 1934, Columbia; educational administration.

Thompson, Marie D.,* 1979, M.A., 1968, Ph.D., 1970, Washington; special education (hearing impaired).

Torkelson, Gerald M.,* 1965, (Emeritus), Ph.M., 1945, Wisconsin; Ed.D., 1953, Pennsylvania State; educational communications.

Tostberg, Robert E.,* 1962, M.A., 1958, Ph.D., 1960, Wisconsin; philosophy of education.

Winn, William D.,* 1985, M.A., 1970, Indiana; M.A., 1972, Oxford (England); Ph.D., 1972, Indiana; educational technology.

Associate Professors

Armstrong, Hubert E., Jr., 1966, ‡(Psychiatry and Behavioral Sciences, Psychology), Ph.D., 1963, Syracuse; clinical psychology.

Beal, Jack L.,* 1973, M.S., 1962, Kansas; Ph.D., 1972, Nebraska; secondary mathematics education.

Broedel, John W.,* 1967, (Psychology), † M.S., 1956, Indiana State; Ed.D., 1958, Illinois; school psychology, psychology.

Brown, Robert L.,* 1965, M.Ed., 1956, Trinity; Ed.D., 1961, Arkansas; school psychology.

Cope, Robert G.,* 1969, A.M., 1961, Ph.D., 1967, Michigan; higher education.

Dimmitt, Norma M.,* 1969, (Emeritus), M.Ed., 1963, Washington; Ed.D., 1970, Stanford; teacher education/curriculum.

Forster, Jerald R.,* 1966, Ph.D., 1966, Minnesota; counseling.

Frerichs, Alberta J., 1955, (Emeritus), M.Ed., 1951, Nebraska; business education.

Gehrke, Nathalie J.,* 1979, M.A., 1972, Northwestern; Ph.D., 1976, Arizona State; curriculum.

Goldblatt, Steven M., 1982, ‡(Architecture, Building Construction, Civil Engineering), J.D., 1977, Golden Gate; educational facilities.

Gray, Carol Ann,* 1971, (Parent and Child Nursing), M.Ed., 1968, Western Washington; Ph.D., 1971, Washington; school psychology/human development and cognition.

Hansen-Krening, Nancy M.,* 1974, M.Ed., 1973, Ph.D., 1974, Oregon; reading/language arts.

Kelly, Samuel E.,* 1973, (Emeritus), M.A., 1960, Marshall; Ph.D., 1971, Washington; higher education.

Kersh, Mildred E.,* 1969, M.A., 1965, Louisiana State; Ph.D., 1971, Chicago; mathematics education, gifted education.

Lawrence, George L.,* 1968, M.Ed., 1961, Maine; Ed.D., 1968, George Peabody; counseling.

Mizokawa, Donald T.,* 1973, M.Ed., 1969, Hawaii; Ph.D., 1974, Indiana; human development and cognition.

Nolen, Patricia A.,* 1971, M.S., 1968, Ph.D., 1970, Washington; school psychology/human development and cognition.

Olswang, Steven G.,* 1977, J.D., 1971, Illinois; Ph.D., 1977, Washington; higher education administration and policy, law, faculty governance, collective bargaining.

Ostrander, Kenneth H.,* 1968, M.S., 1959, Purdue; M.P.A., 1965, Kansas; Ed.D., 1968, Tennessee; educational administration.

Smith, John P.,* 1969, M.Ed., 1963, Missouri; Ed.D., 1969, Stanford; science education.

Standal, Timothy C.,* 1976, M.Ed., 1974, Western Washington; Ph.D., 1976, Minnesota; reading/language arts.

Sulzbacher, Stephen I., 1972, ‡(Psychiatry and Behavioral Sciences, Pediatrics), A.M., 1964, Hollins; Ph.D., 1971, Washington; special education.

Thalberg, Stanton P.,* 1965, M.A., 1959, Ph.D., 1964, Iowa; school psychology.

Vasquez, James A.,* 1975, M.Div., 1961, Fuller Theological Seminary; M.A., 1971, Ph.D., 1973, California (Los Angeles); learning (minority youth)/bilingual education.

White, Owen R.,* 1981, M.A., 1970, Ph.D., 1971, Oregon; special education (severely handicapped).

Williams, Donald T., Jr.,* 1969, M.A., 1957, Ph.D., 1963, Stanford; higher education.

Zumeta, William M.,* 1985, ‡(Public Affairs), M.P.P., 1973, Ph.D., 1978, California (Berkeley); public management, policy analysis, education and manpower policies, regulation.

Assistant Professors

Bashey, Husain I., 1969, M.A., 1955, Bombay (India); M.A., 1960, MacMurray College; Ph.D., 1975, Oregon; counseling.

Berninger, Virginia W.,* 1986, M.Ed., 1970, Pittsburgh; Ph.D., 1981, Johns Hopkins; reading acquisition, reading and writing disabilities, developmental neuropsychology, school psychology.

Camarena, Margaret M., 1986, M.S., 1977, California State (Hayward); Ph.D., 1987, Stanford; sociology of education (organizations), evaluation of social and educational programs.

Fenner, Robert H., 1968, (Psychology), M.A., 1962, Ph.D., 1965, Colorado; counseling.

Liberty, Kathleen A.,* 1986, (Research), M.A., 1971, Oregon; Ph.D., 1977, Washington; special education.

McCutchen, Deborah E.,* 1986, M.A., 1978, Youngstown State; M.S., 1981, Ph.D., 1985, Pittsburgh; study of cognitive processes underlying reading and writing skills.

Parker, Walter C.,* 1985, M.A., 1978, Colorado; Ph.D., 1982, Washington; social studies.

Weisenstein, Gregory R.,* 1986, (Research), M.A., 1972, Washington; Ed.D., 1975, Kansas; special education.

West, Margaret A.,* 1987, (Research), M.S.W., 1968, Ph.D., 1984, Washington; special education.

Principal Research Associate

Meyer, Bonnie J.,* 1986, M.S., 1971, Ph.D., 1974, Cornell; learning.

Course Descriptions

Policy, Governance, and Administration

EDPGA 441 Educational Administration (3) For persons not majoring in policy, governance, and administration. Theories and practices of administering educational systems. Structuring educational organizations, supervising personnel, planning problems, interpreting educational programs, forming policies, decision making, administering instructional program, finance and business management, housing, appraising educational systems, and leadership in democratizing educational administration.

EDPGA 444 Constitutional Freedom and American Education (3-6, max. 6) *Morris* Emphasis on the principles, processes, and content of constitutional law in an effort to provide new insights and new tools with which school administrators and teachers may examine questions involving political and civil rights in the United States, especially as these affect the conduct of education. Specific topics on constitutional freedom include the obligation to go to school; legal controls over curriculum, teachers, and students; and racial integration and equal financing of public schools. Open to law students and to nonlaw students enrolled as graduate students or as upper-division undergraduates. Joint with LAW 444. Satisfactory/not satisfactory option available to nonlaw students only.

EDPGA 458 History of American Education to 1865 (3) *Burgess* Development of American education in cultural context; colonial period, influence of Enlightenment, and common school movement. Joint with HSTAA 458.

EDPGA 459 History of American Education Since 1865 (3) *Burgess* Development of American education in cultural context: progressive education, recent criticism, continuing issues and trends. Joint with HSTAA 459.

EDPGA 479 Crucial Issues in Education (3) *AWSpS* Selected educational issues, policies, and contexts. Evolution of the American education enterprise, legal issues, professionalism, finance, and other vital educational concerns. Prerequisite: admission to the Teacher Certification Program or permission of instructor.

EDPGA 492 History of European Education Through the Reformation (3) Development of European education in cultural context: Greece, Rome, Middle Ages, Renaissance, and Reformation.

EDPGA 493 History of European Education Since the Reformation (3) Development of European education in cultural context: pedagogical reformers, national systems, and recent trends.

EDPGA 494 Comparative Education (3) International efforts in education, including the role of the United States in overseas programs. Analysis of the relation of education and society in foreign areas, stressing social change and conflict.

EDPGA 495 Supervision for Teachers (3) S Provides practicing teachers with the knowledge and skill to initiate, develop, and present instructional and informational programs to staff, board members, and parents, and to supervise and evaluate personnel reporting directly to them. Can be used for continuing teacher certification.

EDPGA 496 Workshop: Educational Programs and Problems (1-6, max. 12) Study of such topics as planning, development, supervision, organization, operation, or evaluation of current or emerging programs or problems in education.

EDPGA 498 Educational History and Utopian Thought (3) Selected studies of education as a key to the good society.

EDPGA 499 Undergraduate Research (*) Students developing studies under this rubric should be advised that a report or a paper setting forth the results of their investigations should be regarded as a basic part of the program. Prerequisite: permission of instructor.

EDPGA 501 The Study of Educational Policies (3) *Kerr* Systematic consideration of the structure and function of educational policies and problems of research and evaluation of those policies. Includes survey of resources for description of particular types of policies.

EDPGA 502 Sociology of Education (3) *Camarena* Examination of education and educational institutions by using the major conceptual tools of sociology. Emphasis on sociological thought and findings that have particular bearing on the understandings and judgments of educators.

EDPGA 503 History of Educational Thought (3) *Burgess, Madsen* Study of educational theory and practice in Western culture.

EDPGA 504 Philosophy of Education (3) *Kerr, Tostberg* Philosophy of education considered as a study of the conceptual basis for educational policy and practice. Emphasis on relationships between enduring educational problems and fundamental philosophical issues; concepts that feature centrally in educational discourse; and conceptual analysis as a means for clarifying decisions regarding educational policy and practice.

EDPGA 505 The American College and University (3) *Cope, Williams* Introduction to contemporary United States higher education, with special emphasis

on emerging trends, roles of the several kinds of institutions, the composition and character of student bodies and faculty, and the state coordination of colleges and universities.

EDPGA 506 History of American Higher Education (3) *Williams* Examination of the historical development of the American higher education enterprise.

EDPGA 508 Principles and Practices of Adult and Continuing Education (3) History and development of adult and continuing education in the United States: component parts of the field; issues, theory, and research; program planning for adults; professionalization of the field.

EDPGA 510 Introduction to School Law (3) *Julnes* Impact of school law on administrative roles and processes, including due process in a school setting. Prerequisite: graduate standing.

EDPGA 511 Environmental Setting for Educational Administration (3) *Andrews* Theoretical bases and practical integration of educational organizations within the social/environmental context. Topics include educational organizations as complex organizations, and as open systems interacting with other open systems, power, and consensus mechanism. Prerequisite: graduate standing.

EDPGA 512 Training Programs in Business and Industry (3) Investigations of the organization, content, methods, and funding of training programs in business and industry. Emphasis on variables that affect the decisions to establish and continue training programs versus sending employees elsewhere for training.

EDPGA 519 Laboratory in Educational Administration (1-3, max. 3) *AWSpS* Series of extended class sessions that engages students in building skills related to concepts taught in the regular courses. Skill building activities parallel the tasks facing building-level and central office administrators in the public and private schools. Prerequisites: completion of all other requirements for principal or program administrator certificate and permission of instructor.

EDPGA 521 Administration of School Programs (3) Information and management techniques useful for setting priorities and goals for educational organizations, for providing procedures for allocation of human resources, and for evaluating educational programs. Topics include bases for educational programs, needs assessment, goal setting, administering the curriculum and school programs, staff utilization and development, staff morale, and program evaluation. Prerequisite: graduate standing.

EDPGA 522 Leadership in Personnel Systems in Schools (3) Emphasizes the human elements of educational administration, including such topics as adult motivation and learning, leadership, change strategies, managerial styles, selection and evaluation of personnel, and personnel systems. Prerequisite: graduate standing.

EDPGA 527 School Finance (3) Objective is to aid students to acquire knowledge and understanding of the technical aspects of educational administration. Financial practices and problems, including state and federal support plans, school plant planning, school business management, resource allocation, and budgeting and educational accountability. Prerequisite: graduate standing.

EDPGA 528 Educational Planning and Evaluation (3) *Cope* Application of planning and evaluation methods to educational institutions. Course scheduling; collaborative planning; information systems; program planning and evaluation and budgeting; cost analysis; student attribute progress and enrollment projections. Prerequisite: graduate standing.

EDPGA 529 Policy, Problems, and Issues in Adult Learning and Instruction (3) For students planning leadership careers in postsecondary, adult, and continuing education. Policy problems and issues in adult learning and instruction. Development of theory, nature, and conditions on adult learning, description sociology of lifelong education. Social and policy implications of present trends. Prevalent instructional models analyzed.

EDPGA 530 Seminar in Educational Sociology (3) *Camarena* Application of sociological principles to school problems; individual problems and investigations. For teachers, administrators, and those using educational sociology as a field for advanced degrees.

EDPGA 531 Seminar: American Education in the Twentieth Century (3, max. 6) *Burgess* Selected problems in American education over the last century, with special emphasis on contemporary issues and trends.

EDPGA 532 Seminar in the History and Organization of Higher Education (3) *Williams* Advanced seminar on special problems in the history and the organization of higher education. May be repeated for credit at the discretion of the student and the instructor. Open to advanced doctoral students in higher education and to others at the discretion of the instructor.

EDPGA 535 Seminar in Educational Classics (3) *Burgess* Analysis in depth and in the context of the relevant history of several major works in educational thought from Plato to Dewey.

EDPGA 536 Contemporary Philosophies of Education (3) *Kerr, Tostberg* Intensive study of the writings of selected contemporary philosophers of education. Prerequisite: graduate standing.

EDPGA 537 Analysis of Educational Concepts (3) *Kerr, Tostberg* Selected concepts central to conduct and understanding of education. Prerequisite: permission of instructor.

EDPGA 538 History of the Modern University (3) *Madsen, Williams* Growth of the modern university with attention to intellectual trends as well as organizational and curricular changes. Special attention is given to nine American universities in the twentieth century.

EDPGA 539 Seminar in Occupational Programs in Higher Education (3) Analysis of current critical social and educational issues that affect occupational preparation programs in post-high-school institutions. Prerequisite: permission of instructor.

EDPGA 540 School-Community Relations (3) *Ostrander* Examines the dynamics of the interface between the public schools and the community. Special attention is given to the findings of research in relation to school-community power, types, and organizational influences. Offered on credit/no credit basis only. Prerequisite: master's degree or permission of instructor.

EDPGA 541 Education and the Law (3) *Olswang* Examination of court cases associated with the rights of individuals and groups in educational organizations. Attention is given to the understanding of administrative due process requirements and to the growing body of administrative law affecting student and personnel management. Prerequisite: master's degree or permission of instructor.

EDPGA 542 Higher Education and the Law (3) *Olswang* Legal implications of university operations and an explanation of the legal and constitutional rights of students, faculty, and staff within the university. Special attention given to faculty employment and termination decisions; student protections, including due process; and university liabilities.

EDPGA 543 Management of Labor Relations in Education (3) *Julnes* Examination of procedures and techniques pertinent to the management of organi-

zational conflict. Among the areas covered are collective bargaining, grievance procedures, mediation, fact finding, and arbitration. Prerequisite: master's degree or permission of instructor.

EDPGA 544 Academic Governance and Collective Bargaining in Higher Education (3) *Olswang* Explores the concept and operation of collective bargaining in higher education: its origin; the reasons for its growing popularity as a governance mechanism; the legal framework within which it operates; the rights, powers, and duties subsumed under its operation; and its relationship to the traditional form of faculty governance mechanisms.

EDPGA 545 Decision Making in Educational Organizations (3) Examination of decision making in modern organizations, characterized by problematic goals, complex decision-making processes, and fluid participation. Impact of information, power, beliefs, resources, organizational structure, and environment. Alternative models of choice and their implications for leadership and change.

EDPGA 546 Organizational Change in Education (3) Change and innovation in educational organizations. Theoretical approaches include sociopsychological, rational planning, political perspectives, and those associated with notion of organized anarchies. Specific topics related to change and innovation (e.g., roles of beliefs, symbols and norms, diffusion of innovations, and research issues). Prerequisite: 545 or permission of instructor.

EDPGA 547 Resource Allocation in Higher Education (3) After attention to the basic tools of economic analysis, focus is on application of those tools to specific topics in higher education (e.g., access, budgeting, finance and policies, and funding alternatives).

EDPGA 551 Seminar in School Supervision (3) *Bolton* Theory of the process of supervising school personnel, including an analysis of the techniques of supervision, theory of leadership and group process, interpersonal relations, and evaluation of teacher effectiveness. Prerequisite: master's degree or permission of instructor.

EDPGA 552 Seminar in School Personnel Administration (3) *Bolton* Major emphasis on the analysis of factors to be considered in the selection and evaluation of teachers, including determination of relevant criteria, acquisition and analysis of data, planning and decision processes. Less emphasis is given to other school personnel topics. Prerequisite: master's degree or permission of instructor.

EDPGA 553 Public and Educational Policy Issues in the Development of Human Talent (3, max. 9) Three (noncumulative) courses on policy issues involving education, training, the economy, and the development of the nation's human resources. Relationship between education, training, and work; underutilized workers; race and gender discrimination issues; and the role of education/training in economic development. Joint with PB AF 571, 572, 573.

EDPGA 555 Seminar in the Administration of Colleges and Universities (3) *Cope* Study of the internal administration and organization of four-year colleges and universities with emphases on practice and theory. Instruction largely by the case or problem method.

EDPGA 556 Seminar in Teaching and Learning in Higher Education (3, max. 9) *Madsen* Consideration of theory and practice in the area of instruction and learning with focus on staff development. May be repeated with permission. Prerequisite: open to advanced doctoral students in higher education and to others at the discretion of the instructor.

EDPGA 557 Seminar in Economics of Education (3) Current problems in school finance, including costs, ability to support schools, and financial implica-

tions of educational principles. The economics of public education. Problems of federal, state, and local school support. Financing capital outlay, research, and public relations. Prerequisite: master's degree or permission of instructor.

EDPGA 558 Seminar in Administration: Facilities (3) *Goldblatt* Contemporary issues, problems, and techniques of educational facility administration. Emphasis placed on such factors as planning, financing, development, design, construction, operation, liabilities, property management, state regulation. Prerequisite: master's degree or permission of instructor.

EDPGA 559 Seminar in Administration of Community Colleges (3) For students preparing for administrative positions in community colleges. Principles and practices in organization and administration of community colleges.

EDPGA 560 Workshop in Educational Administration (2-6) Workshop focuses on current problems facing educational administration. Topics may include personnel management, supervision of personnel, professional negotiations, selection and planning procedures, power relationships, school-community relationships. Prerequisite: master's degree or permission of instructor.

EDPGA 561 Special Problems in Policy, Governance, and Administration (3, max. 9) Readings, lectures, and discussions of topics of special and current interest to educators. Reports on new developments in research. Topics vary each year. Prerequisite: master's degree or permission of instructor.

EDPGA 571 Seminar in Human Relations in Educational Administration (3) *Bolton* Analysis of factors involved in human relations problems related to operation of public schools. Motivation, perception, communication, role analysis, and dynamics of groups are studied through use of cases and simulated situations. Offered on credit/no credit basis only. Prerequisite: master's degree or permission of instructor.

EDPGA 577 Seminar in Education: Planning and Organization (3) Application of principles utilized in planning and organizing educational institutions. Formation of policy and procedures; formal and informal organization; power, authority, and responsibility; utilization of people, time, and space. Offered on credit/no credit basis only. Prerequisite: master's degree or permission of instructor.

EDPGA 578 Seminar in Educational Decision Making (3) *Andrews* Analysis of nature of decisions in educational setting. Consideration of theory of decisions, social and psychological constraints, and application in simulated situations. Offered on credit/no credit basis only. Prerequisite: master's degree or permission of instructor.

EDPGA 579 Internship in Educational Administration: Superintendent (1-6, max. 6) *AWSpS* Recommended for candidates preparing for superintendent positions other than those having sufficient experience in central offices of school districts. Half-time work in a school district or districts for one, two, or three quarters, depending upon the student's previous experience. Supervision by staff members of the College of Education and the superintendent of schools in the selected school district. Prerequisites: completion of all other requirements for superintendent's credential and permission of instructor.

EDPGA 580 Seminar: Research in History of Education (3, max. 6) *Madsen* Study of the literature, bibliography, sources, and critiques of history of education. Research methods analyzed and demonstrated in seminar papers. Prerequisite: graduate standing.

EDPGA 582 Seminar in Philosophy of Education: Modes of Inquiry (3, max. 6) *Tostberg* Philosophical examination of ways in which education might be studied. Uses and limits of conventional scientific approaches in education inquiry. Consideration of alternatives. Prerequisite: permission of instructor.

EDPGA 583 Seminar: Research in Educational Sociology (3) *Camarena* Theory, concept, and method of sociological inquiry as applied to problems in education. Prerequisite: permission of instructor.

EDPGA 600 Independent Study or Research (*) Registration must be accompanied by a study prospectus endorsed by the appropriate faculty adviser for the work proposed, and which with permission of the instructor, must be filed with the Office of Policy, Governance, and Administration in the College of Education. Prerequisite: permission of instructor.

EDPGA 601 Internship (3-9, max. 9) Name of faculty member responsible for supervising the student should be indicated on program of studies. Offered on credit/no credit basis only. Prerequisite: permission of Supervisory Committee chairperson or graduate program adviser.

Education Curriculum and Instruction

EDC&I 317 Art in Childhood Education (3) *Koenig, Solberg* Provides the general elementary student with a theoretical and practical background for teaching art to children. Prerequisites: ART 105 or 109, and admission to the Teacher Certification Program.

EDC&I 318 Drama in Childhood Education (3) Provides the student with a theoretical and practical introductory background of fundamentals for teaching drama to children as a creative process and mode of learning. Prerequisites: DRAMA 200 and admission to the Teacher Certification Program.

EDC&I 319 Music in Childhood Education (3) *Cooper* Provides the student with a theoretical and practical introductory background to the fundamentals of music and for teaching music to children as a creative process and mode of learning. Prerequisites: MUSIC 200 and admission to the Teacher Certification Program.

EDC&I 329 Teaching Foreign Language in the Secondary School (2) Basic course in the methods of teaching foreign languages in the secondary school. Prerequisite: EDPSY 304.

EDC&I 330, 331, 332 The Teaching of French (3,3,3) Elementary, junior high, and senior high emphases. Prerequisites: EDPSY 304 and demonstration of language proficiency.

EDC&I 333, 334, 335 The Teaching of Spanish: Secondary Emphasis, Elementary and Junior High School Emphasis, Elementary Emphasis (3,3,3) Prerequisite to teaching practicum. Elementary, junior high, and secondary emphases. Prerequisites: EDPSY 304 and demonstration of language proficiency.

EDC&I 336 The Teaching of German in Secondary Schools (3) Taught concurrently with GERM 576. Prerequisites: EDPSY 304, GERM 303, or permission of instructor.

EDC&I 337 The Teaching of German in Elementary Schools (3) Objectives and methods of the Foreign Languages in Elementary Schools program. Taught concurrently with GERM 576. Prerequisites: EDPSY 304, GERM 303, or permission of instructor.

EDC&I 338 The Teaching of Russian (2) Special methods in the teaching of Russian to acquaint prospective teachers with materials, methods, and problems. Prerequisites: EDPSY 304 and permission of instructor.

EDC&I 339 The Teaching of Scandinavian (Norwegian, Swedish) (2) Special methods in the teaching of Norwegian and Swedish to acquaint prospective teachers with materials, methods, and problems. Prerequisites: EDPSY 304 and permission of instructor.

EDC&I 340 Elementary Art Education (3) Study of the stages of development in the art of the young child as expressed through the child's creative and mental growth.

EDC&I 341 The Teaching of Art in the Secondary School (3) For majors in secondary art education planning to teach on the junior or senior high school level. Prerequisite: EDPSY 304.

EDC&I 343 Music in the Elementary School: Intermediate Grades (3) For students majoring in elementary education (not open to music specialists). A study of music in the development of children, with attention to musical activity and the growth of related concepts and skills. Prerequisites: EDPSY 304 and MUSIC 119.

EDC&I 344 Materials and Methods of Teaching Asian Languages (3) Methods specifically pertaining to the teaching of Asian languages are discussed. Existing textbooks reviewed. Each student is required to write a lesson, draw up a teaching plan, and teach a class before the end of the quarter. Prerequisites: EDPSY 304, and three years of target language, or equivalent.

EDC&I 353 Teaching in the Elementary School (3) Emphasizes selected teaching modes; lesson planning; classroom management procedures; grouping to accommodate pupils with special needs; utilization of learning resources; evaluation of teaching. Attention also given to school culture.

EDC&I 354 Teaching in the Secondary School (3) Development of basic skills in instructional methods, lesson planning, classroom management procedures, evaluation of teaching.

EDC&I 355 Language Arts in the Elementary School (3) *Hansen-Krening* Basic course in planning and teaching elementary language arts: listening and speaking, written composition, handwriting, spelling, creative and practical writing. Prerequisite: EDPSY 304.

EDC&I 356 The Teaching of English (3) Combines theoretical understanding of teaching with specific techniques and materials for literature, language, composition, and mass media at the secondary level; coordinated with concurrent experience in schools. Prerequisite: EDPSY 304.

EDC&I 357 The Teaching of Speech (3) *Staton-Spicer* Special methods course in the teaching of speech communication at the secondary level. Prerequisites for majors in speech communication: EDPSY 304, at least 20 credits in speech communication; for nonmajors: permission of instructor.

EDC&I 360 Reading in the Elementary School (3) *Sebesta, Standal* Basic course in methods, techniques, and materials used in the teaching of reading from the readiness period through decoding and comprehension skills teaching in primary and intermediate grades. Prerequisite: EDPSY 304.

EDC&I 361 Basic Skills in Reading (3) *Standal* Developmental readiness for reading; diagnostic teaching of reading in the classroom; reading instruction for bilingual learners; reading for special learners; developing the least restrictive environment; teaching functional reading and study skills; and materials and approaches for teaching reading. Prerequisites: 360 and EDPSY 304.

EDC&I 365 Social Studies in the Elementary School (3) *Banks, Kaitounis, Parker* Basic course in the planning and teaching of social studies in the elementary school. Prerequisites: EDPSY 304 and GEOG 100.

EDC&I 366 The Teaching of Social Studies in Secondary Schools (3) *Banks, Kaitounis, Parker* Application of educational principles and methods to the teaching of social studies on the junior and senior high school levels. Prerequisite: EDPSY 304. (Offered alternate years by the Department of History.)

EDC&I 370 Science in the Elementary School (3) *Olstad, Smith* Basic course in the teaching of science in the elementary school with special emphasis on the nature of science as a process of inquiry. Prerequisites: EDPSY 304 and 5 credits in an approved laboratory natural science course (biology, chemistry, or physics).

EDC&I 371 Teaching Science in the Secondary School (3) *Olstad* Basic course in the teaching of science in the secondary school with special emphasis on the nature of science as a process of inquiry. Prerequisite: EDPSY 304.

EDC&I 372 The Teaching of Biology (2) *Deyrup-Olsen* Prerequisites: 371, EDPSY 304, and 25 credits in biology.

EDC&I 373 The Teaching of Chemistry (3) Prerequisites: 371, EDPSY 304, and at least 20 credits in college chemistry.

EDC&I 375 Mathematics in the Elementary School (3) *Beal, Kersh* Examination of the learning and teaching of elementary mathematics, in light of recent theoretical and pedagogical developments. Prerequisites: EDPSY 304, MATH 170.

EDC&I 378 Teaching Mathematics in the Secondary School (3) *Beal, Kersh* Basic course in the teaching of mathematics in the secondary school for preservice teachers. Prerequisite: EDPSY 304 or permission of instructor.

EDC&I 424 Multicultural Curriculum and Instruction (3) *Banks* Primarily for preservice and in-service teachers who have little or no previous exposure to issues related to ethnicity and schooling. Designed to help teachers better understand the school's role in the ethnic education of students and acquire the insights, understandings, and skills needed to design and implement curricular and instructional strategies that reflect ethnic diversity. Prerequisite: admission to Teacher Education Program, teaching experience, or permission of instructor.

EDC&I 432 Educational Soundtrack Production (3) Theory and operation of soundtrack production equipment, including microphones, mixers, tape recorders, and signal-processing equipment. Practice in narration, field and studio recording, mixing, and final soundtrack mix-down. Covers soundtracking for sound-slide and filmstrip, audiotape, motion picture, and television. Offered on credit/no credit basis only.

EDC&I 433 Educational Sound-Slide Production (3) Theory and techniques of sound-slide production, including planning, scripting, slide photography, titling, macrophotography, story-line posing, soundtrack production, and slide-tape synchronization. Introduction of multi-image production. Offered on credit/no credit basis only.

EDC&I 434 Introduction to Computers in the Classroom (3) Overview of the uses of computers in education. Uses of computers in instruction, classroom management (gradebooks, utilities), evaluation of software, overview of programming, and word processing. Prior experience not required.

EDC&I 435 Uses of LOGO in the Classroom (3) Logo programming in the classroom. Uses of Logo as an environment for exploring problem-solving, programming, and mathematical concepts. Topics and applications developed for elementary and secondary settings, based on students' needs and desires. Prerequisite: 434 or equivalent.

EDC&I 438 Issues in Programming and Instructional Design of CAI (3) Instructional design issues related to development of computer-assisted instruction. Motivation; computer-human interaction; screen design strategies; documentation, and help; planning an interactive lesson; branching. Future developments. Students required to use programming abilities to pro-

duce selected portions of computer lesson. Prerequisites: 434, knowledge of programming or authoring language.

EDC&I 438 Improvement of Teaching: Latin (3) Examination and evaluation of the various methods of teaching Latin; audiovisual aids; testing materials; textbooks; relation of Latin to other languages. Latin derivatives in English vocabulary. Joint with LAT 475.

EDC&I 439 Caesar and Vergil for High School Teachers (3) *S. Pascal* Interpretation of the works of Caesar and Vergil with special reference to the problems of high school teaching. Joint with LAT 476.

EDC&I 443 Improvement of Teaching: Elementary School Music (3) Advanced studies in the teaching of music in the elementary school. Prerequisite: teaching experience.

EDC&I 445 Theory and Practice of Kindergarten and Primary Teaching (3) Systematic treatment of the content, teaching processes, and learning resources appropriate to kindergarten and primary education with particular emphasis on current research and developments. Prerequisite: EDPSY 304 or permission.

EDC&I 453 Teaching the Bilingual-Bicultural Student (3) *W* Educational needs of bilingual students: research findings, special programs, materials, and methodologies that bilingual-bicultural education can provide to meet those needs. Cultural combinations of bilingual populations to American culture; historical, social, and linguistic factors affecting their K-12 education.

EDC&I 455 The Language Arts: Instructional Problems and Practices in the Elementary School (3) *Hansen-Krening* Study of important and recent research in elementary school language arts and consideration of its practical implications for teaching. Prerequisite: teaching experience.

EDC&I 456 Workshop in Instructional Improvement: Language Arts (1-6, max. 15) Individual or group study projects on the improvement of instruction in language arts.

EDC&I 457 Methods in Teaching English as a Second Language (3) Prepares preservice and in-service teachers to teach English as a second language and to meet the educational and linguistic needs of students who have little or no English language skills. Emphasis on a survey of first- and second-language acquisition research and its educational implications, as well as instructional strategies consistent with the audiolingual, cognitive, and creative construction approaches to second-language learning. Includes diagnostic-prescriptive strategies for classroom application.

EDC&I 459 Workshop in Instructional Improvement: Reading (1-6, max. 15) Projects on the improvement of instruction in reading. Prerequisite: minimum of one course in methods of teaching reading.

EDC&I 460 The Teaching of Reading (3) *Hansen-Krening, Sebesta* Improvement of teaching reading in the elementary school, including comprehension and decoding, reading in the content fields, motivation of voluntary reading. Prerequisite: teaching experience or prior course work in the teaching of reading.

EDC&I 461 Materials for Teaching Reading (3) *Hansen-Krening, Sebesta* Designed to provide acquaintance with materials used in the teaching of reading. Basal readers, materials from content areas, children's trade books, and supplementary practice materials are examined, as are the organization of learning centers and other schemes for teaching reading. Prerequisite: one prior course in the teaching of reading.

EDC&I 462 Reading in the Secondary School (3) *Standal* Teaching of reading in the secondary schools, including vocabulary development, compre-

hension, reading in the content fields, and organization of reading programs at the secondary level. Prerequisite: teaching experience or concurrent internship.

EDC&I 464 Educating Native American Youth (3) Assists students in understanding the North American Indian child from cultural, socioeconomic, and psychological points of view. Provides opportunities for the student to apply knowledge and skills gained in other courses to prepare programs and learning aids relevant to the educational situation of the Indian child.

EDC&I 465 Social Studies Education: Elementary School Programs and Practices (3) *Banks, Kallsounis, Parker* Stresses curriculum patterns, instructional procedures, resource materials, and the selection of content in social studies. For elementary and junior high school teachers. Prerequisite: teaching experience.

EDC&I 466 Social Studies Education: Secondary School Programs and Practices (3) *Banks, Kallsounis, Parker* Stresses curriculum patterns, instructional procedures, resource materials, and a selection of content in social studies for junior and senior high school teachers. Prerequisite: teaching experience.

EDC&I 467 Geography in the Social Studies Curriculum (3) Discussion of the concepts and content of geography essential to effective social studies curricula. Joint with GEOG 467.

EDC&I 468 Workshop in Instructional Improvement: Social Studies (1-6, max. 15) Individual or group study projects on the improvement of instruction in social studies.

EDC&I 469 Educating the Black Inner-City Child (3) *Banks* Intensive analysis and review of the research and literature, both theoretical and empirical, relevant to curriculum patterns and programs designed especially for Black inner-city children. Special attention is given to the implications of the research reviewed for devising effective teaching strategies for Black inner-city children.

EDC&I 470 Science Education: Elementary School Programs and Practices (3) *Olstad, Smith* Designed for classroom teachers with reference to the teaching and learning of science from kindergarten through grade 6. Emphasis is placed on objectives, methods, and materials as related to the concepts and processes of science. Prerequisite: teaching experience.

EDC&I 471 Science Education: Secondary School Programs and Practices (3) *Olstad, Smith* Survey of the status and potential role of science in education; trends and their implications for the teaching of both biological and physical sciences in the junior and senior high schools; representative curricula and related teaching procedures; the psychology of concept formation and problem solving; and organization of science programs. Prerequisite: teaching experience.

EDC&I 473 Workshop in Instructional Improvement: Science (1-6, max. 15) Individual or group study projects on the improvement of instruction in science.

EDC&I 474 Multi-Ethnic Studies: Methods, Content, and Materials (3) *Banks* Designed to help preservice and in-service teachers identify content and materials and devise methods for implementing ethnic studies programs and for incorporating ethnic content into regular K-12 social studies, language arts, and humanities curricula. Special attention is given to teaching about American Indians, Mexican-Americans, Black Americans, Asian-Americans, Puerto Rican-Americans, and White ethnic groups. Prerequisite: admission to Teacher Education Program or teaching experience.

EDC&I 475 Improvement of Teaching: Elementary School Mathematics (3) *Beal, Kersh* Designed for elementary teachers. Emphasis is placed on the contri-

butions of research to the improvement of the teaching of mathematics in the elementary school. Prerequisite: teaching experience.

EDC&I 476 Improvement of Teaching: Junior High School Mathematics (5) Exploration of some modern mathematical concepts for the purpose of improving the teaching of junior high school mathematics. Prerequisite: 1½ years of high school algebra or equivalent.

EDC&I 477 Improvement of Teaching: Secondary School Mathematics (5) Exploration of some modern mathematical concepts for the purpose of improving the teaching of secondary-school mathematics. Prerequisite: teaching experience.

EDC&I 478 Special Topics in Mathematics for Teachers (2-9) Study of selected areas of mathematics. Designed for the improvement of teachers of mathematics. Joint with MATH 497.

EDC&I 479 Workshop in Instructional Improvement: Mathematics (1-6, max. 15) Individual or group study projects for the improvement of instruction in mathematics.

EDC&I 480 Introduction to Educational Communication and Technology (3) Potential benefits of the newer media and technologies (videodisc, teleconferencing, computers, videotex, CD-ROM) for instruction. Implications of these innovations for the theory, practice, and organization of education.

EDC&I 481 Introduction to Instructional Design (3) Students design a unit of instruction that relies upon a technology for its delivery. Steps in the design process discussed and practiced, and principles that guide selection of methods and materials applied. (Formerly 582.)

EDC&I 482 Still Photography in Education (3) Theory and practice in producing still photographs and slides for teaching purposes; camera and darkroom techniques. Producing photographic materials to meet specific learning problems.

EDC&I 483 Basic Motion Picture Production (4) Basic motion-picture techniques, emphasizing cinematography and editing.

EDC&I 485 Workshop in Instructional Improvement: Educational Communication and Technology (2-6) Individual or group study projects on the improvement of instruction through use of educational communication and technology. Prerequisite: 480, 481, 488, or permission of instructor.

EDC&I 488 Educational Technology and Learning in Alternative Settings (3) How educational technology can be used to encourage learning in nonschool environments, such as museums, radio and television broadcasts, parks and recreation centers, and distance education programs. Students investigate one of these areas and prepare a project.

EDC&I 490 Single Camera System School Television Production (3) Techniques of TV production utilizing a single camera. Includes TV hardware theory and vocabulary, experience in connecting and handling equipment, planning, scripting, production, and editing techniques. Offered on credit/no credit basis only.

EDC&I 491 Small Studio Television Production (3) Techniques of TV production utilizing a two-camera simple studio. Includes TV equipment theory and vocabulary, experience in planning, scripting, equipment operation, lighting, final production. Emphasis on utilization of nonbroadcast standard facilities. Offered on credit/no credit basis only.

EDC&I 494 Workshop in Improvement of Curriculum (1-6, max. 15) Stresses the application of procedures for curriculum development, maintenance, and evaluation. Opportunities furnished to develop and

perfect strategies for program development with occasions given to utilize the strategies in master plan and materials preparation for simulated or real school situations. Specific focus of workshop is determined by instructor or by arrangement with district. Prerequisite: permission of instructor.

EDC&I 495 Workshop in Improvement of Teaching: Selected Topics, Issues, or Problems (1-6, max. 15) Individual or group projects to help teachers adapt instruction to selected topics, issues, or problems and to identify the approaches and instructional resources that will provide the soundest learning experiences.

EDC&I 498 Workshop in Instructional Improvement (2-6, max. 6) Individual or group study projects on the improvement of instruction with attention to designing instructional plans.

EDC&I 499 Undergraduate Research (2-5, max. 5) Students developing studies under this rubric should be advised that a report or a paper setting forth the results of their investigations should be regarded as a basic part of the program.

EDC&I 500 Field Study (3 or 6, max. 9) Individual study of an educational problem in the field under the direction of a faculty member. Prerequisites: approved plan of study and permission of the instructor must be filed in the Office of Curriculum and Instruction in the College of Education.

EDC&I 501 Curriculum for the Gifted (3) A *Kersh* Investigation of curriculum and instruction appropriate for gifted students of the elementary- or secondary-school level. Prerequisite: teaching experience.

EDC&I 502 Seminar in Gifted Curriculum (3, max. 6) SpS *Kersh* Study and development of curriculum materials differentiated to accommodate the special needs of gifted learners. Prerequisites: 501 or equivalent and experience in teaching gifted learners.

EDC&I 520 Current Models in Early Childhood Education (3) *Hansen-Krening* In-depth analysis of current program models for the education of young children, with an emphasis on specification of objectives, practices, and evaluation of model effectiveness. Models emphasized are those developed in this country, but the course also includes a study of models developed in other countries as they have influenced practice here.

EDC&I 521 Problems and Issues in Early Childhood Education (3) *Hansen-Krening* Study of issues currently facing the field of early childhood education, emphasizing the rationale, impact, and management of child-care programs. Relationship of local child-care programs to state and federal agencies is included. Prerequisite: 520 or permission of instructor.

EDC&I 522 Practicum in the Training of Early Childhood Instructional Personnel (3) *Hansen-Krening* Directed experience in educational training conducted in the field. Design and implementation of a training program for early childhood education instructional personnel. Prerequisites: graduate standing and permission of instructor.

EDC&I 524 Seminar in Teacher Education (3) W Focus on recent trends, issues, and proposals for future development in teacher education and certification. Prerequisite: permission of instructor.

EDC&I 530 Seminar in Analysis of Approaches for Teaching Reading (3) *Sebesta, Standal* Designed to aid experienced teachers who possess background in the teaching of reading, this course presents a variety of approaches with implications of research for analyzing the effectiveness of individualized reading, individually guided instruction, computer-assisted instruction, eclectic methodology, and others. Prerequisites: teaching experience and a basic course in the teaching of reading.

EDC&I 531 Seminar: Analysis of Reading Materials (3) WS *Sebesta, Standal* Students formulate and apply criteria for assessing materials, with emphasis on linguistic, cultural, and psychological factors; instruction effectiveness, interest level; and educational objectives. Prerequisites: teaching experience and one basic course in the teaching of reading.

EDC&I 532 Seminar in Research in Reading (3) Sebesta, Standal Primary focus on those aspects of the reading process that are of concern in a developmental reading program. Emphasis is on research design, evaluation of research, and research findings dealing with factors influencing reading ability, problems in skill development, and recreational reading. Course work includes group and individual analysis of studies with attention to research design and measurement. Prerequisite: permission of instructor.

EDC&I 533 Seminar: Conducting Research in Reading (3, max. 6) SpS *Sebesta, Standal* Students design and conduct original research studies in the field of reading. Emphasis on research rationale, choice of productive research types, and reporting of research results and implications. Prerequisite: 532.

EDC&I 534 Seminar in the Reading of Literature (3) Hansen-Krening, Sebesta Reading of literature and its effect on reading skills, language development, social values, and literary judgment of children and adolescents. Emphasis on analysis of research in these areas and on the development of action research designed to study response to literature. Prerequisite: one 400- or 500-level education curriculum and instruction course in reading or language arts or one graduate course in literature for children or young adults.

EDC&I 535 Seminar: Conducting Research in Response to Literature (3, max. 6) SpS *Hansen-Krening, Sebesta* Students design, conduct, and interpret original research studies in the field of reading literature within the context of the school curriculum. Emphasis on the analysis of literary content and structure and the relationship of those qualities to the literary experience. Prerequisite: 534.

EDC&I 541 Seminar in Bilingual Education: Organization and Structure (4) A Study of the structure and organization of bilingual programs. Includes study of the developmental and organizational factors affecting bilingual education. Assists graduate students in reviewing the historical antecedents in bilingual education and in developing a personal philosophy about bilingual education.

EDC&I 542 Seminar in Bilingual Education: Instructional Foundations and Issues (4) W *Vasquez* Study of the theoretical foundations and instructional implications of psychology and linguistics as they apply to bilingual education. Assists graduate students in exploring learning styles of bilingual children and in becoming familiar with the crucial issues in bilingual education.

EDC&I 543 Seminar in Bilingual Education: Instructional Strategies (4) Sp *Vasquez* Study of instructional factors affecting bilingual education. Particular emphasis is given to research related to the variables involved in teaching in a bilingual environment. Assists graduate students in exploring instructional methodologies and formats as they apply to bilingual education and in becoming familiar with the current issues in bilingual education.

EDC&I 550 Educational Technology Research (3) Sp *Kerr, Winn* Analysis, critique, and practical experience with research studies of all types (experimental, ethnographic, evaluation) concerning questions of interest to educational technologists. Prerequisite: 480, a research methods course, or permission of instructor.

EDC&I 555 Educational Futures (3) Hunkins Concept of alternative futures stressing manageability of the future. Current and future events that can and

could impact education. Acquaintance with basic future studies methods and opportunity to apply such methods within educational arena. Prerequisite: prior graduate course work or experience in education.

EDC&I 556 Elementary School Curriculum (3) Hunkins Study of elementary school curriculum, its design, rationale, and delivery. Current trends and issues affecting elementary school curriculum analyzed.

EDC&I 558 Secondary School Curriculum (3) Gehrke Systematic description and analysis of the current curriculum practices, with particular emphasis on the factors and forces affecting secondary-school curriculum.

EDC&I 559 Principles and Procedures of Curriculum Development (3) Gehrke, Hunkins Intensive study of basic principles and procedures utilized in development of curricula. Participants have opportunities to apply such procedures in class activities. Some attention given to curriculum foundations.

EDC&I 561 Seminar in Language Arts (3) Hansen-Krening Study of recent research in language structure with special attention to research pertaining to the teaching of language skills: auding, speech, and written composition. Course work includes group and individual analysis of language arts studies with attention to research design and measurement. Prerequisite: permission of instructor.

EDC&I 562 Seminar in Reading and Language Arts: Secondary Emphasis (3) Standal Study of recent research in listening, oral language, reading, and written language, emphasizing psychological and interrelated aspects. Prerequisite: permission of instructor.

EDC&I 563 Current Issues in Language Arts Education (1-3, max. 6) Hansen-Krening Discussion of problems and issues of current interest and importance in language arts education.

EDC&I 564 Seminar: Issues in American Indian/Alaskan Native Education (3) Current social and political issues as they relate to American Indian/Alaskan native education. Educational implications of state and federal legislation, judicial decisions, and politically controversial issues. Prerequisite: 464 or permission of instructor.

EDC&I 565 Seminar in Social Studies Education: Elementary Emphasis (3) Banks, Kaltsounis, Parker Intensive study of the social studies curriculum, with particular emphasis on current literature and research. Prerequisite: 465 or equivalent.

EDC&I 566 Seminar in Social Studies Education: Secondary Emphasis (3) Banks, Kaltsounis, Parker Intensive study of the social studies curriculum, with particular emphasis on current literature and research. Prerequisite: 466 or equivalent.

EDC&I 567 Current Issues in Social Studies Education (1-3, max. 6) Banks, Kaltsounis, Parker Discussion of problems and issues of current interest and importance in social studies education.

EDC&I 568 Seminar on Instruction and Curriculum for Minority Youth (3) Vasquez Examines research related to curriculum and instruction for minority youth for purpose of preparing teachers, administrators, and other educators working with students who differ from mainstream students in value and motivational systems, learning styles, and socialization practices. Prerequisite: EDPSY 513, 591, or permission of instructor.

EDC&I 569 Educating Ethnic Minority Youths (4) Banks Intensive analysis and review of the research and curricular programs related to the social, psychological, and political factors that influence the school experiences of ethnic minority youths. Special attention given to instructional and curricular programs for Afro-American, American Indian, Mexican-American,

Puerto Rican-American, and Asian-American students. Prerequisite: successful completion of 464, 469, or 474, or permission of instructor.

EDC&I 570 Seminar in Science Education: Elementary Emphasis (3) Olstad, Smith Investigation of curriculum and instruction in science at elementary-school levels, with particular emphasis on current literature and research. Prerequisite: 470 or equivalent.

EDC&I 571 Seminar in Science Education: Secondary Emphasis (3) Olstad, Smith Investigation of curriculum and instruction in science at secondary-school levels, with particular emphasis on current literature and research. Prerequisite: 471 or equivalent.

EDC&I 572 Current Issues in Science Education (1, max. 6) Olstad, Smith Discussion of topics and problems of current interest and importance in science education. Prerequisite: graduate standing.

EDC&I 575 Seminar in Mathematics Education: Elementary Emphasis (3) Kersh Investigation of curriculum and instruction in mathematics at the elementary-school level; review of research and preparation of proposals. Prerequisite: graduate standing.

EDC&I 576 Seminar in Mathematics Education: Secondary Emphasis (3) Kersh Investigation of curriculum and instruction in mathematics at the secondary-school level; review of research and preparation of proposals. Prerequisite: graduate standing.

EDC&I 577 Current Issues in Mathematics Education (1, max. 6) Beal, Kersh Discussion of problems and issues of current interest and importance in mathematics education. Prerequisite: graduate standing.

EDC&I 580 Seminar in Educational Communication and Technology (3) History, basic assumptions, and current controversies of the field. Discussion of appropriate research, theory, and practice for educational technologists. Prerequisite: 480 or permission of instructor.

EDC&I 581 Management of Educational Technology Programs (3) Factors contributing to effective management of programs incorporating educational technology and microcomputers. Manager's role as agent of instructional change and processes leading to successful adoption and long-term implementation of a new instructional system. Prerequisite: 480 or permission of instructor.

EDC&I 582 Seminar on Instructional Systems Development (3) Critical analysis of processes involved in the development of instructional systems. Prerequisites: 481 or permission of instructor, and concurrent registration in 601.

EDC&I 583 Message Design (3) W Research and theory on design of instructional messages in various modalities (visual, auditory), and in various formats (pictorial, verbal, graphic). Prerequisite: 480 or permission of instructor.

EDC&I 585 Technology and the Culture of Education (3) Social impact of technology on education in the United States and elsewhere: social, political, and cultural factors affecting educational communication and technology; roles and relationships among instructors and learners; appropriate technology in developing countries; technology's long-term influence on thought and values. Prerequisite: 480 or permission of instructor.

EDC&I 586 Current Issues for Computers in the Classroom (1, max. 6) Addresses many of the current topics in computer-related education. Issues and research related to computer uses in curriculum, instruction, and management of instruction.

EDC&I 587 Design of Interactive Instructional Systems (3) Theoretical and empirical questions involved in design of interactive instructional systems us-

ing such technologies as videodisc, videotex, and CAI. Specific problems inherent in design of complex learning environments: control, branching, structure and sequence of material, way-finding, help systems. Prerequisites: 481 or 582, and 436; or permission of instructor.

EDC&I 588 Seminar: Computers in Education (3) Provides opportunity for graduate students to analyze, discuss, and design research in areas of computers in education. Includes historical development of research in this area as well as a platform for the development of research proposals and refinement of ongoing research. Prerequisites: 434, 436, EDPSY 490; recommended: 435.

EDC&I 589 Current Issues in Educational Communications (1, max. 9) Discussion of problems and issues of current interest and importance in the field of educational communications. Serves also as a forum for discussion of doctoral research. Designed for master's and doctoral candidates in educational communications. Offered on credit/no credit basis only. Prerequisite: graduate standing.

EDC&I 590 Seminar in Elementary Education (3) *Hunkins* Exploration of the philosophy, history, purposes, curriculum, methods, and school organization of elementary education, with emphasis on individual research. Prerequisites: elementary-school teaching experience, 556.

EDC&I 591 Seminar in Curriculum Research (3) *Gehrke, Hunkins* Analysis of past and current empirical, historical, ethnographic research, and philosophical analysis of the curriculum field. Studies considered include research in curriculum development, the curriculum plan, contextual characteristics, and factors related to curriculum participants. Group and individual analyses focus on theory generation and practical applications of research. Prerequisite: 559 or permission of instructor.

EDC&I 592 Seminar in Secondary Education (3) *Gehrke* Research and study of secondary education. Primary focus on factors involving change in secondary-school curriculum and organization. Prerequisite: 558.

EDC&I 593 Seminar in Curriculum: Theory and Practice (3) *Hunkins* Investigation of curriculum theory and practice. Consideration is given to models that explain the relationships between various curricular variables. These theoretical models are related to curricular practices and innovations. Prerequisite: 559.

EDC&I 594 Seminar in Curriculum: Issues, Systems, Models (3) *Gehrke, Hunkins* Emphasis, from a systems and futuristic view, on the current approaches to curriculum, curriculum innovation, and major educational issues as they affect curricular activity. Prerequisite: 559.

EDC&I 595 Seminar in Analysis of Teaching (3) Analyzing the teaching act. Psychological, sociological, and philosophical factors impacting teaching. Emphasis given to research dealing specifically with teaching. Prerequisite: teaching experience.

EDC&I 596 Seminar in Strategies of Instruction (3) *Hunkins* Various instructional models applicable to all levels of schooling. Theoretical and philosophical bases for these instructional models are considered. Participants have opportunities to practice particular models.

EDC&I 597 Curriculum Evaluation Seminar (3, max. 6) *WSP Kersh, Smith* Offered as a two-quarter sequence. The first quarter focuses on the evaluators' roles, evaluation theory and models, and selected curricular evaluations. Examples are drawn from the several disciplines commonly offered in the elementary and secondary schools. In the second quarter, students are expected to identify an evaluation problem and to develop an evaluation design that can be implemented as a practical solution to the problem. Prerequisites: 559 and permission of instructor.

EDC&I 599 Independent Studies in Education (*) Independent studies or readings of specialized aspects of education. Prerequisite: permission of instructor.

EDC&I 600 Independent Study or Research (*) Prerequisite: permission of instructor.

EDC&I 601 Internship (3-9, max. 9) Offered on credit/no credit basis only. Prerequisites: graduate standing and permission based on approval of proposal submitted during quarter preceding the internship.

Educational Psychology

EDPSY 304 Educational Psychology (5) Human learning in the educational setting. Cognition, development, learning, motivation, affective processes, and socialization. Emphasis on skills in influencing classroom learning and discipline. Prerequisites: admission to Teacher Certification Program and concurrent enrollment in EDUC 302. Entry card required.

EDPSY 308 Evaluation in Education (3) Fundamentals of measurement, construction of achievement tests, selection and administration of standardized tests and scales, and evaluation and application of test results. Prerequisite: admission to Teacher Certification Program. Entry card required.

EDPSY 407 Teaching the Gifted Child (3) The role of the teacher and the school in the identification and development of the special abilities and talents of gifted children. Prerequisite: teaching experience.

EDPSY 408 Stress Management for Teachers and Administrators (3) Principles and methods of stress management for school personnel and students. Designed to help teachers handle the stress associated with teaching. The principles also apply to management of students' stress.

EDPSY 421 Remedial Education (3) Experience in, and study of, analysis of difficulties in school subjects with special reference to language arts and mathematics. Experience in, and study of, appropriate remedial instruction. Analysis and instruction that is considered both feasible and practical for the teacher working with individuals or with a group.

EDPSY 425 Reading Disability: Remedial Techniques (3) Evaluation of methods for diagnosing and minimizing reading retardation. Descriptions of in-class and clinical procedures. Prerequisite: EDC&I 360 or equivalent.

EDPSY 431 Strategies for Classroom Research and Evaluation (5) *S* Techniques and strategies for the design and implementation of studies of classroom instruction. Directed toward classroom teachers as consumers of instructional research and as evaluators in their own classrooms. Prerequisite: 308 or equivalent.

EDPSY 447 Principles of Guidance (3) Study of guidance programs in elementary and secondary schools. Attention is given the roles of specialists with emphasis on the role of the classroom teacher in school guidance programs. This course is designed for teachers, administrators, and prospective teachers.

EDPSY 449 Laboratory in Educational Psychology (2-6, max. 6) Special studies for counselors, teachers, administrators, and others concerned with student personnel and psychological services in schools and colleges. The course focuses on special topics that have either local or contemporary significance. (Not offered every year; check quarterly *Time Schedule*.)

EDPSY 471 Evaluation of Neuropsychological Research on Reading and Learning Disorders (5) Research on the neuropsychology of reading and learning disorders read, discussed, and critically evalu-

ated. Topics include hemispheric functions and integration, soft neurological signs, attentional deficit, hyperactivity, language disability, congenital disorders, head injury, and other conditions. Recommended: PSYCH 421, 429, SPHSC 401.

EDPSY 490 Basic Educational Statistics (3) Measures of central tendency and variability, point and interval estimation, linear correlation, hypothesis testing.

EDPSY 499 Undergraduate Research (*) Students developing studies under this rubric should be advised that a report or a paper setting forth the results of their investigations should be regarded as a basic part of the program. Entry card required.

EDPSY 500 Field Study (*) Individual study of an educational problem in the field under the direction of a faculty member. Prerequisites: approved plan of study and permission of the instructor must be filed in the Office of Educational Psychology in the College of Education. Entry card required.

EDPSY 501 Seminar in Concepts and Problem Solving (3) The psychology of children's thinking. Course emphasizes study of research results in concept development and problem solving with application to classroom learning situations. Entry card required.

EDPSY 502 Seminar in Critical and Creative Thinking (3) The psychology of children's thinking. Course emphasizes study of research results in critical thinking and creative thinking with application to classroom learning situations. Entry card required.

EDPSY 503 Psychology of Reading (3) Reading and perception, word recognition, concept development and meaning in reading, psychology of reading interests and skills. Entry card required.

EDPSY 504 Verbal Instruction (3) Study of linguistics and the psychological implications of classroom verbal learning. Entry card required.

EDPSY 505 Psychology of Writing (3) Examines writing as a cognitive process and reviews current empirical research on writing, emphasizing primarily studies from a psychological perspective. Both developmental differences and individual differences in writing skills, together with instructional implications, explored. Prerequisite: 520 or equivalent.

EDPSY 506 Instructional Theory (3) Sources, current state, and utility of prescriptive instructional theories with emphasis upon theories having a potential for guiding the design of instruction.

EDPSY 507 Reading Disability: Etiology and Diagnosis—Practicum (5) Theory and basic concepts underlying appraisal techniques and causality. Lectures and clinical practicum in administering, scoring, and evaluating each technique, and in interpreting and communicating results. Prerequisite: 425. Entry card required.

EDPSY 508 Clinical Supervision—Practicum (2-6, max. 12) Practicum in supervising counseling, group counseling, diagnostic activities, and remedial reading therapy. Prerequisites: advanced graduate standing. Entry card required.

EDPSY 509 Educational Issues in Human Development (5) Human development theories. Educational implications of theory, methodology, and application. Current research complements the historical antecedents of current practice. Age range covered varies as function of current issues in professional literature. Prerequisites: 15 credits in educational psychology or psychology.

EDPSY 510 Seminar in Educational Psychology (1-3, max. 15) Seminar on advanced topics in educational psychology. A critical appraisal of current research. Prerequisites: advanced degree candidacy in educational psychology and permission. (Check quarterly *Time Schedule* for subject listings, which vary from quarter to quarter.)

EDPSY 511 Seminar In Applied Educational Psychology (1, max. 6) Designed for graduate students in educational psychology. Applications of theoretical constructs to particular problems encountered in school psychology and counseling, practice. Entry card required.

EDPSY 513 Learning Variables of Minority Children: Instructional Implications (4) Provides students with data base regarding (1) four variables (language/dialect, cognitive style, locus of control, and motivational systems) that affect learning among minority students, and (2) teaching strategies appropriate for these cultural socioeconomic variables.

EDPSY 514 Seminar In Quantitative Methods (3, max. 15) Seminar on such topics as measurement techniques, research design, psychometrics, and statistics. Prerequisite: permission of instructor.

EDPSY 515 Seminar In Development and Socialization (3, max. 15) Advanced seminar on selected topics concerned with human development and socialization processes. Emphasis placed upon empirical research and its theoretical underpinnings in such areas as cognitive development, moral development and education, self-concept development, and related concerns. Prerequisite: permission of instructor.

EDPSY 516 Seminar In Learning and Thinking (3, max. 15) Seminar in the psychology of learning language and language learning. Each seminar is offered with predesignated emphasis in one of the following topics: linguistics, phonology, pragmatics, psycholinguistics, semantics. Entry card required.

EDPSY 519 Language In Early Childhood Education (3) Review and critical examination of theories of language acquisition and their psychological implications for developing cognition. Prerequisite: 304 or equivalent; recommended: 523, 532, and PSYCH 414. Entry card required.

EDPSY 520 Human Learning and Educational Practice (3) Systematic examination of current research about human learning and instructional psychology, including the study of motivation, human abilities, and learning, the learning process, and performance assessment. Prerequisite: 304 or equivalent.

EDPSY 521 Educational Issues In Human Learning (3) Contemporary issues and trends in human learning from the perspective of major psychological theories of learning. Both classic and emerging viewpoints on issues about learning theory for educational practice, including counseling and special programs. Prerequisite: 520 or equivalent.

EDPSY 522 Reading Disability Clinic (3-5) Supervised practicum in diagnosis and remediation of reading disabilities. Prerequisites: 425 and 507. Entry card required.

EDPSY 523 Developmental Foundations of Early Learning (3) Perceptual-motor, language, and overall cognitive development in children from birth through primary-school age. Emphasis on basic learning processes and guidelines for assessment of developmental status and their implications for parents and professionals. Field-based course projects may be required. Prerequisites: background in child development and 520 or equivalent.

EDPSY 531 Socialization of School-Age Children (3) Study of personal social development and behavior from preschool age through preadolescence. Socialization theory and research are reviewed to include such topics as aggression, achievement, motivation, moral development, social cognition, and applicable socialization influences. Prerequisites: 523 and permission of instructor.

EDPSY 532 Adolescence and Youth (3) Includes middle school, senior high, and early college years, with implications for helping professions. Developmental

processes and patterns examined with major theoretical and current research themes from behavioral sciences. Educational issues, social problems associated with adolescence in Western culture. Prerequisites: 6 credits in psychology, permission of instructor, and 520 or equivalent.

EDPSY 540 Individual Testing (5) Study of assessment of human intelligence with supervised training in the administration, scoring, and interpretation of individual intelligence tests with emphasis on Stanford-Binet and Wechsler scales. Prerequisite: 490. Entry card required.

EDPSY 541 Group Tests In Counseling (5) Emphasis on the utilization of objective measures in counseling. Prerequisite: 490 or equivalent. Entry card required.

EDPSY 542 Career Development (3) Emphasis on vocational development theory and research. Psychological, social, and economic determinants of vocational development and choice are examined as a basis for vocational counseling. Prerequisite: graduate standing or permission of instructor.

EDPSY 543 Seminar In Vocational Psychology (3) Theory and practice in exploring, clarifying, and articulating individual goals and career plans. Entry card required.

EDPSY 544 Counseling (5) Emphasis on the theory and practice of counseling.

EDPSY 545 Practicum In Counseling (3-6, max. 6) Supervised practice in counseling. Prerequisite: 544. Entry card required.

EDPSY 547 Organization and Administration of Student Personnel Programs (3) Basic considerations in planning, organizing, and operating school student personnel programs; analysis of issues and problems encountered in formulating policy; supervising and evaluating services. Prerequisite: permission of instructor.

EDPSY 548 Educational Implications of Personality Theory (5) Study of personality development and personality theories with continuous attention to the meaning of these in educational practice, testing, and counseling. Prerequisites: 15 credits of psychology and educational psychology.

EDPSY 549 Seminar In Consultation Methods (3) Theory and practice of process consultation in educational settings. Field practice in teams with clients. Prerequisite: permission of instructor.

EDPSY 550 Family Counseling (3) Introduction to family counseling theory and practice, emphasizing family dynamics and communication analysis. Prerequisite: 544 or permission of instructor.

EDPSY 553 Student Development Services In Higher Education (3) Survey and critical study of the philosophy and practice of student personnel work in American colleges and universities.

EDPSY 555 Seminar In Counseling Specialty (1-2, max. 6) Oriented toward the role of a counselor as a professional worker. Entry card required.

EDPSY 561 Group Process Laboratory (3) Experience in small-group process. Collateral discussions of process and independent study. Entry card required.

EDPSY 564 Practicum In School Psychology (1-6, max. 6) Practicum in appraisal and counseling, emphasizing diagnosis and counseling with behavior and learning disabilities, and focusing on techniques acquired in 540, 545, and 565. Entry card required.

EDPSY 565 Personality Appraisal (5) Study of personality evaluation with a supervised laboratory emphasizing work with children and their families. Prerequisites: 540, 548. Entry card required.

EDPSY 566 Case Study Seminar (1, max. 4) Integrating theoretical concepts with practice/service issues. Cases selected for discussion represent a wide range of problems and agency settings, including school and child problems. Entry card required.

EDPSY 568 Seminar In Professional Issues and Ethics (2) A Professional ethics codes and cases, history of counseling psychology, legal problems, credentialing issues, conditions of practice, continuing education, publishing, and presenting research papers.

EDPSY 569 Seminar In Counseling Psychology Research (2) Methodological and professional issues related to research in counseling and psychological services. Counseling psychology research literature with focus on content and methods. Prerequisite: 591 or equivalent.

EDPSY 570 Seminar In School and Community Psychology (2, max. 4) Current issues in professional psychology practice and research. Limited to graduate students in school psychological services. Entry card required.

EDPSY 571 Educational Applications of Neuropsychology: Assessment and Intervention (5) A Students observe and administer neuropsychological tests and plan and carry out educational interventions for children with neuropsychological disorders. Content focuses on various neuropsychological disorders for which school psychologists can provide assessment and consultation. Prerequisites: 540 or equivalent course in individual testing, and 471 or permission of the instructor.

EDPSY 580 Seminar: The Emergence of Educational Psychology (3) Examination of documents by selected contributors to the field of educational psychology. Special focus on period from mid-nineteenth century to early twentieth century. Prerequisite: graduate standing.

EDPSY 588 Survey Research Methodology and Theory (3) Survey research, research, theory, and methodology. Probability theory, sampling, human subjects considerations, instrumentation, and analysis techniques. Review and critique by students of theoretical issues in survey research and development of a survey instrument. Prerequisite: 490 or equivalent.

EDPSY 590 Computer Utilization In Educational Research (3) Computer utilization in solution of research problems, data reduction to forms amenable to computer solution, appropriate framing of problems for solutions by computer. Using an interactive system, editors, and program packages. Prerequisite: 490.

EDPSY 591 Methods of Educational Research (3) Introduction to educational research. Primary focus on hypothesis development, experimental design, use of controls, data analysis and interpretation. Prerequisite: 490. Entry card required.

EDPSY 592 Advanced Educational Measurements (3) Theory of measurement; an examination of assumptions involved in test theory, errors of measurement, factors affecting reliability and validity, and item analysis. Joint with PSYCH 516. Prerequisite: 490.

EDPSY 593 Experimental Design and Analysis (5) Experimental design with emphasis on the analysis of variance. Prerequisites: 490 or equivalent, and 591 or permission of instructor.

EDPSY 594 Advanced Correlational Techniques (5) Multivariate analysis, including regression and multiple correlation; matrix algebra; factor analysis. Prerequisite: 490 or equivalent.

EDPSY 595 Measurement and Evaluation In Human Development and Education (3) Measurement strategies and evaluation research in developmental psychology and education. Overview of major studies and procedures for childhood intervention research, established and experimental measurement

techniques, and problems of measurement and evaluation. Skill in evaluating measurement and evaluation design. Prerequisite: 308 or 490.

EDPSY 596 Program Evaluation (3) Advanced course in evaluation research emphasizing nontraditional designs, especially those that impose severe ecological constraints on the evaluators. Prerequisites: 593, 594, EDC&I 597, or permission of instructor.

EDPSY 597 Test Development (3) Principles of test construction, including criterion and norm-referenced tests, item writing and sampling, test administration, preparation, scoring, and item evaluation techniques; problems of scaling and norming of cognitive and affective measures. Prerequisites: 592 and 594, or permission of instructor.

EDPSY 599 Independent Studies in Education (*) Independent studies or readings of specialized aspects of education. Entry card required.

EDPSY 600 Independent Study or Research (*) Prerequisite: permission of instructor. Entry card required.

EDPSY 601 Internship (3-9, max. 9) Entry card required.

Special Education

EDSPE 404 Exceptional Children (3) Atypical children studied from the point of view of the classroom teacher.

EDSPE 414 Integrating Handicapped With Non-Handicapped Preschool Children in the Inner City (3) Upper-division course designed for teachers and aides planning to work in inner-city preschool classrooms where handicapped children are integrated with nonhandicapped children.

EDSPE 418 Vocational Development of Handicapped Children and Youth (3) Curricular aspects of vocational training relevant to each age level in the education of handicapped children. Application of programmed instructional techniques to breaking down of the occupational task. Emphasis on familiarizing school personnel with interdisciplinary services and community resources available to assist them in facilitating the maximal vocational development of handicapped children and youth.

EDSPE 419 Interventions for Families of Handicapped Children (3) Upper-division course for professionals and paraprofessionals working with families of handicapped children enrolled in special education or integrated programs.

EDSPE 420 Classroom Management of the Physical Problems of Individuals With Severe or Profound Handicaps (3) Overview of physical management of pupils with severe or profound handicaps in educational settings. Principles of normal motor development, positioning, and handling are applied to the development of classroom strategies. Effects of abnormal motor development on educational programming.

EDSPE 421 Introduction to Vocational Assessment (3) Theoretical concepts and fundamental techniques of vocational assessment of handicapped and disadvantaged persons. Clinical process, including vocational counseling, test administration and interpretation, behavioral analysis. Significant issues related to legislation, research, methods of implementation of curriculum-based school assessment models. Prerequisite: 418 or equivalent preparation.

EDSPE 423 Work Sample Development (3) Work sample development through labor market survey and job analysis techniques. Advanced level vocational assessment instruments based on content and construct validity. Reliability measures and analysis of developmental data used to evaluate technical soundness and integrity of instruments. Prerequisite: 421 or equivalent preparation.

EDSPE 424 Introduction to Vocational Education for Special Educators (3) Vocational education: funding, governance, service areas, delivery systems, and major issues. Vocational education and its value in the education of disadvantaged and handicapped youth. Prerequisite: 418 or equivalent preparation.

EDSPE 425 Vocational Education for Special Needs Youth and Adults (3) Provides instructional strategies for teaching handicapped, disadvantaged, and/or limited-English proficient students in vocational education classes. Population identification and documentation, legislative issues, funding, transition methods, post-secondary options, advisory committees' roles, civil rights implications. Prerequisite: 418 or equivalent preparation.

EDSPE 435 Principles and Practice of Manual English (3) Nature of manual communication is introduced with an identification of its specific modes: American sign language, signed English, total communication, finger spelling, and manual English. Discussions center on the linguistic structure of signs, the psycholinguistic effects of signs on young children, and a review of the pertinent literature. Laboratory sessions emphasize manual English.

EDSPE 436 Manual Communication for the Hearing Impaired (3) Intermediate course in manual conversation stressing fluency in both receptive and expressive manual English. Grammatical system of Ameslan introduced and practiced. Prerequisite: 435 or equivalent preparation.

EDSPE 475 Recreation and Leisure Activities for the Handicapped (3) Acquaints the student with the philosophy of specialized recreation and leisure activities for the handicapped: community, state, and national organizations providing leisure activities; adaptive devices and how to organize various activities; and the need to integrate and coordinate recreation, education, and service organizations working with the handicapped. Observation, practical experience, guest speakers, films, and lectures.

EDSPE 496 Workshop in Special Education (1-9, max. 15) Demonstration, observation, and/or participation with groups of handicapped children in laboratory or controlled classroom settings. Prerequisite: permission of instructor. Entry card required.

EDSPE 499 Undergraduate Research (2-5, max. 5) Students developing studies under this rubric should be advised that a report or a paper setting forth the results of their investigations should be regarded as a basic part of the program. Prerequisite: permission of instructor. Entry card required.

EDSPE 500 Field Study (1-6, max. 6) Individual study of an educational problem in the field under the direction of a faculty member. Prerequisites: approved plan of study and permission of the instructor. Entry card required.

EDSPE 505 Educating the Mentally Retarded (3) Basic course for students preparing to teach severely mentally retarded students; organization of programs, curriculum planning, and instructional procedures and materials.

EDSPE 507 Education of Severely Retarded Individuals With Multiple Handicaps (3) Basic course for students preparing to teach the moderately to severely retarded individual and the multiple-handicapped individual. Includes community resources, implementation of instructional techniques, and modification of materials for these students.

EDSPE 508 Administration of Special Education (3) Research and trends in administrative organization, programs, personnel assignments, and instructional groupings for the education of exceptional students as these relate to the total school program, pupil personnel services, community agency services, and state and federal legislation.

EDSPE 509 Seminar in Mental Retardation (3, max. 9) Research, theory, and/or contemporary practice in the education and habilitation of mentally retarded individuals. The synthesis of findings and their application to the educational environment. Prerequisites: 505, 507, 542.

EDSPE 510 Behavioral Measurement and Management in the Classroom (3) Response measurement in the classroom; use of data analysis for instructional decisions and behavior management; instructional programming for handicapped children.

EDSPE 511 Methods of Applied Behavior Analysis Research (3) Characteristics of applied behavior analysis are presented: direct, daily measurement, and the systematic investigation of important variables. Representative studies from various applied situations are discussed in terms of dependent and independent variables, research design, reliability, validity, and data analysis. Prerequisite: 510 or equivalent preparation.

EDSPE 512 Evaluation of Instructional Materials for Exceptional Children (3) Introduction to techniques of determining the quality of instructional materials in terms of (1) the systems of specific matter organization and (2) specified instructional outcomes.

EDSPE 513 Clinical Appraisal of Exceptional Children (3) Diagnostic instruments used in the clinical appraisal of exceptional children. Theoretical and measurement considerations are used to buttress practical experiences in appraisal related to intervention.

EDSPE 514 Fundamentals of Reading for Handicapped Children (3) Emphasis on basic prereading and reading skills, such as phonics and structural analysis, specifically for the handicapped child. Acquisition of comprehension skills by the handicapped. Diagnosis of reading problems, published materials appropriate for handicapped, material modification.

EDSPE 515 Problems and Issues in Special Education (3, max. 9) Intensive examination of the issues pertinent to special education, such as legislation, interdisciplinary functions, and the role of special education in general education and placement practices.

EDSPE 516 Developing Instructional Materials for Exceptional Children (3) Theory and basic concepts underlying the writing of instructional materials for exceptional children. Basic review of the literature in programming research and methodology. Students write, field test, and rewrite a unit of instructional materials for a specific population of exceptional children.

EDSPE 517 Practicum in Research Design and Analysis in Special Education (3) Critical analysis of current research practices in special education serves as background to a student carrying out a small independent research project. Projects are evaluated in seminar discussion. Prerequisites: EDPSY 490 and 591 or equivalent preparation.

EDPSE 518 Seminar in Special Education Research (1, max. 3) Designed for doctoral students in special education during their first year of residency. Each candidate selects a dissertation problem and submits a proposal. Topics such as the procurement of research subjects, the reporting and communication of research findings, and the evaluation of research are stressed. The seminar leads to the evolution of a viable dissertation proposal.

EDSPE 520 Seminar in Applied Special Education (1-12, max. 12) Designed for graduate students in special education. Focus on contemporary topics relating to the application of the theoretical constructs to special education.

EDSPE 521 Classroom Strategies for Developing Communication in Exceptional Children (3) Normal and deviant language/communication development. Assessment of receptive and expressive lan-

guage and formulation of communication intervention strategies. Various sections focus on children with specific handicapping conditions.

EDSPE 522 Seminar on the Education of the Severely/Profoundly Handicapped (3) Advanced graduate seminar arranged to study and discuss the essential components of providing a comprehensive approach to the identification and education of the severely/profoundly handicapped infant, child, adolescent, or young adult.

EDSPE 525 Educating Autistic and Severely Behavior Disordered Children (3) Consideration of the diagnoses, etiology, education, and prognoses of autistic and severely behavior-disordered children.

EDSPE 530 The Hearing Impaired (3) Consideration of problems of deaf individuals from social, economic, and educational points of view; history of education of the hearing-impaired learner.

EDSPE 531 Aural-Oral Communication for the Hearing Impaired: Part I (3) Develops competencies in teaching receptive language skills through children's use of residual hearing, utilization of appropriate amplification, and speech reading. Emphasis on acquisition of related knowledge and demonstration of knowledge with children in individual or group settings.

EDSPE 532 Aural-Oral Communication for the Hearing Impaired: Part II (3) Techniques of teaching speech to hearing-impaired children at the phonologic and phonetic levels. Emphasis on speech development using residual hearing. Prerequisite: 531 or equivalent preparation.

EDSPE 533 Teaching Language to the Hearing Impaired (3) Methods for instructing hearing-impaired students with language acquisition problems. Analysis of currently available curriculum and instructional materials. Skills in diagnosis, evaluation, and program development. Prerequisite: 521.

EDSPE 534 Teaching the Hearing Impaired (3) Methods for instructing hearing-impaired students in regular school subjects. Skills in educational diagnosis, construction of instructional materials, and program development.

EDSPE 541 Education of the Emotionally Disturbed (3) Analysis of major theoretical approaches to the education of emotionally disturbed children. Adaptation of various approaches to various educational settings.

EDSPE 542 Mental Retardation (3) Introductory course on mental retardation and the challenges it presents to parents, the mentally retarded individual, the community, the schools, and society.

EDSPE 543 Learning Disabilities (3) Analysis of major theoretical approaches to the study of children with learning disabilities. Adaptation of various approaches to educational settings.

EDSPE 545 Instructional Modifications for the Education of the Mildly Handicapped (3) In-depth analysis and application of several modifications of instructional techniques necessary for the education of mildly handicapped students.

EDSPE 546 Seminar in Educating the Socially and Emotionally Disturbed (3) Advanced-level seminar that analyzes the classical and contemporary research in the intervention of behavior disorders and reviews intervention procedures applied in a variety of classroom administrative organizations. Students prepare a scholarly manuscript for dissemination.

EDSPE 548 Special Topics in the Education of the Learning Disabled (3, max. 12) In-depth analysis of empirical findings in the specialty of learning disabilities with focus on the synthesis of research findings and their application to the educational environment. A

paper suitable for publication required. Prerequisite: course in learning theory, introductory course in learning disabilities, or equivalent preparation.

EDSPE 561 Assessment of Preschool Handicapped Children (3) Students taught to select, administer, interpret, and prepare written reports on appropriate classroom tests for preschool-age handicapped children.

EDSPE 562 Curricula for Preschool Handicapped Children (3) Basic theoretical models and approaches to curricula for handicapped preschoolers. Promote specific preschool curricula and develop skills to assist students in critiquing and evaluating curricula. How to adapt materials for specific populations and to plan a program for exceptional preschoolers.

EDSPE 563 Parent-Handicapped Infant Transactions (3) Adjustment of parents to the birth of a handicapped infant, transactions that occur between parents and their infant, procedures that facilitate the infant's development through these interactions.

EDSPE 565 Seminar: Early Childhood Education for the Handicapped (3) Advanced seminar on early childhood education for the handicapped. Historical and current research from appropriate specialties in special education reviewed; research from related fields is reviewed in terms of its application to the education of young handicapped children.

EDSPE 566 Seminar: Research on Intervention With Handicapped Infants (2, max. 6) Examination and analysis of research on intervention with at-risk, developmentally delayed, and disabled children (birth to thirty-six months). Focuses on design and content of investigations. Prerequisites: permission of instructor or courses in child development and EDPSY 490 or its equivalent. Entry card required.

EDSPE 599 Independent Studies in Education (*) Independent studies or readings of specialized aspects of education. Prerequisite: permission of instructor.

EDSPE 600 Independent Study or Research (*) Registration must be accompanied by a study prospectus endorsed by the appropriate faculty adviser for the work proposed.

EDSPE 601 Internship (3-9, max. 9) Prerequisites: graduate standing and permission based on prearrangement of internship placement and approval by adviser. Entry card required.

Independent Study, Research, and Field Experiences

(Teaching Practicum)

EDUC 301 Introductory Practicum in Community Service Activity (3) Opportunity is provided for initial tutoring and teaching experiences in a specific community service organization, placement made according to participant interests and needs. Approximately sixty hours of participation on a prearranged schedule plus scheduled seminars are required. Prerequisites: application during quarter prior to participation and permission of instructor.

EDUC 302 Introductory Practicum in Classroom Teaching and Management (3-6, max. 9) Opportunity is provided for initial participation experience in classroom teaching and management. Assignment is for twenty hours per credit in a specific school situation, level as requested. Scheduled seminars required. Prerequisite: admission to Teacher Education Program.

EDUC 401 Practicum in Community Service Activity (3-18) Opportunity is provided for tutoring and teaching experiences in a specific community service

organization, placement made according to participant interests and needs. Approximately twenty hours of participation on a predetermined schedule plus scheduled seminars are required for each credit earned. Participants wishing to utilize community service experience to satisfy, in part, certification requirements should make arrangements prior to enrollment with the Director of Certification. Prerequisites: application during quarter prior to participation and permission of instructor.

EDUC 402 Practicum in Classroom Teaching and Management: Early Childhood, Kindergarten, Primary (Through Grade 3) (5-36) Teaching practicum is completed in an assigned school. Approximately twenty hours of participation on a predetermined schedule plus scheduled seminars are required for each credit earned. Placement is approved through the Office of Teacher Education. Prerequisites: permission of instructor.

EDUC 403 Practicum in Classroom Teaching and Management: Intermediate Grades, Middle School (5-36) Teaching practicum is completed in an assigned school. Approximately twenty hours of participation on a predetermined schedule plus scheduled seminars are required for each credit earned. Placement is approved through the Office of Teacher Education. Prerequisite: permission of instructor.

EDUC 404 Practicum in Classroom Teaching and Management: Secondary School (Grades 7-12) (5-36) Teaching practicum is completed in an assigned school. Approximately twenty hours of participation on a predetermined schedule plus scheduled seminars are required for each credit earned. Placement is approved through the Office of Teacher Education. Prerequisite: permission of instructor.

EDUC 423 Educating Diverse Groups (3) Banks, Thompson, Vasquez Background information is provided on socioethnic/cultural diversity; its impact on school structure, programming, administration. Focuses on socioeconomic, ethnic minority, women, handicapped groups. Educational implications of discrimination based on these factors are emphasized. Prerequisite: admission to Teacher Education Program or teaching experience.

EDUC 501 Advanced Practicum in Community Service Activity (3-18) Opportunity is provided post-baccalaureate students with selective, in-depth participation and teaching experiences in a specific community service organization. Approximately twenty hours of participation plus scheduled seminars are required for each credit earned. Participants wishing to use advanced community service experience to satisfy, in part, graduate program requirements should make such arrangements prior to enrollment with their adviser and the Director of Certification. Prerequisites: application during quarter prior to participation and permission of instructor.

EDUC 502 Advanced Practicum in Classroom Teaching and Management (3-18) Designed to provide certificated teachers with selective, in-depth classroom participation experiences. Activities include, for example, specialized reading instruction, assessment of learning disabilities, remedial or specialized teaching, experimental approaches to learning, etc. Participants wishing to use the advanced teaching practicum to satisfy, in part, graduate program requirements should make such arrangements prior to enrollment with their adviser and the Director of Certification. Prerequisites: application during quarter prior to participation and permission of instructor.

EDUC 700 Master's Thesis (*) Prerequisite: permission of supervisory committee chairperson or graduate program coordinator.

EDUC 800 Doctoral Dissertation (*) Prerequisite: permission of Supervisory Committee chairperson or graduate program coordinator.

College of Engineering

Dean

J. Ray Bowen
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Associate Deans

Neil M. Hawkins
James S. Meditch
Gregory L. Zick

Engineering is an increasingly critical societal enterprise. More than ever before, the engineer is challenged both to design products whose value is high by social and economic measures and to provide for efficient manufacture of such products within constraints of environmental protection and diminishing raw material resources. Requirements imposed on the transportation system and other elements of society's physical infrastructure pose analogous challenges. At the same time, improvements in computer cost and sophistication are dramatically impacting both the products and processes designed by the engineer and the actual practice of engineering.

An engineer with the baccalaureate degree is adequately prepared for many challenging technical assignments in government and industry. Students who plan to engage in research, college teaching, or creative activities on a professional level, however, should undertake graduate study leading to either a master's or doctoral degree.

At the undergraduate level, the College of Engineering offers a flexible curriculum that accommodates varied student needs, both in established departmental programs and in new interdisciplinary studies. The college also offers active educational and research programs, both departmental and interdisciplinary, at the graduate levels. (See Engineering Interdepartmental Curricular Program for nondepartmental undergraduate and graduate programs.)

The College of Engineering has been a major unit of the University since 1899; the first engineering degrees were authorized in mining engineering and metallurgical engineering in 1898. Degrees were added for civil engineering (1901), electrical engineering (1902), mechanical engineering (1906), chemical engineering (1907), ceramic engineering (1919), aeronautical engineering (1929), and nuclear engineering (1955). In 1986, 1,585 upper-division undergraduate majors and 983 graduate students were enrolled in engineering programs taught by a faculty of about 187 members.

College Facilities

Teaching and research activities of the college are conducted in thirteen major campus buildings (and portions of others), which contain the college's offices, classrooms, and research and teaching laboratories. The engineering library, a branch of the University library, provides outstanding collections of books, periodicals, technical reports, and patents of interest to engineers. Computers and terminals are available in all departments and at the University's Academic Computer Center.

Facilities of particular interest to students include a wind tunnel, nuclear reactor, structural testing laboratory, hydraulics laboratory, laboratory for heat-transfer studies, and interdisciplinary research laboratory.

Student Organizations and Activities

All of the major professional engineering societies have student chapters on campus, and every engi-

neering student is encouraged to join the chapter that represents his or her field of interest. The college also has student chapters of the Society of Women Engineers, American Indian Science and Engineering Society, National Society of Black Engineers, and the Society of Hispanic Professional Engineers. The Engineering Student Council, comprising student representatives from all departments and professional societies, is the major college-wide student organization and participates actively in college affairs. Honor societies open to engineering students are Tau Beta Pi and Sigma Xi.

Students serve with faculty members on engineering policy committees, which make recommendations concerning teacher evaluation, curriculum revisions, advising, grading systems, and other matters of interest to students and faculty.

Financial Aid

The college offers financial assistance to undergraduates through industrial scholarships and loan funds. Scholarship information is available at the College Advising Center and at the Office of Student Financial Aid, 105 Schmitz. Most scholarships are given after a year in residence by the student.

Undergraduate Program

The College of Engineering provides curricula that offer a variety of educational experiences to its students. The curricula also facilitate transfer from community colleges and from other four-year colleges and universities.

Admission

At present, admission to any of the various engineering departments or curricula is competitive and occurs after a student has completed certain required courses and has reached at least sophomore standing. In general, the required courses are: one year of calculus, one or two quarters of chemistry and physics, and one or two quarters of engineering science courses (e.g., statics and dynamics). Each department should be consulted for its specific entrance requirements. Students are strongly encouraged to apply upon completion of these requirements.

Recommended High School Preparation

Substantial high school preparation in mathematics, physical science, and communication is essential for entrance to engineering studies. Required and recommended courses may be determined from the Engineering Advising Center.

Engineering Advising Center

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The Engineering Advising Center assists any student interested in planning the initial portion of an engineering degree program, particularly to the point the student is eligible to apply for admission to one of the eight departments in the college. A student who is interested in engineering is urged to identify engineering as his or her intended major while still in the College of Arts and Sciences and to seek advice in the advising center.

Students are urged to contact the Engineering Advising Center for program, course, or career information and discussion. A first-year, career-planning course (ENGR 110) is available for students who wish more information on career alternatives.

Types of Programs

The college offers three basic programs leading to Bachelor of Science degrees:

Departmental Major. This program leads to a Bachelor of Science degree in a designated field of engineering (e.g., Bachelor of Science in Civil Engineering). It is de-

signed for students who intend to practice as professional engineers in a standard branch of engineering or who plan to undertake graduate study in that field. The curricula for these degrees are accredited by the Accreditation Board for Engineering and Technology, (ABET), the principal engineering accrediting agency in the United States. Accreditation requirements stipulate certain course distribution requirements for the undergraduate degree. A description of how each of the accredited baccalaureate programs meets the ABET requirements is available from the department office and from the Engineering Advising Center. Accredited four-year curricula leading to baccalaureate degrees are offered in aeronautical and astronautical, ceramic, chemical, civil, electrical, industrial, mechanical, and metallurgical engineering. A curriculum leading to a Bachelor of Science in Computer Engineering degree is offered through the Department of Electrical Engineering.

Application to a department program at the upper-division level is made at a time that lower-division requirements are satisfied. Currently, enrollment limits imposed by faculty size and laboratory/classroom space available are such that entry into a specific department may be competitive. In general, a student applicant must demonstrate scholastic aptitude, as evidenced by the attainment of grades whose average ranges from 2.0 to 3.4 (depending upon the program) in mathematics, natural science, and engineering science. The student is urged to plan ahead by learning his or her future department's requirements and particularly by noting which requirements must be fulfilled by the time the application is made. The major departments permit entry in any quarter of the year. Others permit entry only during Autumn Quarter.

Nondepartmental Professional Program. This program leads to a Bachelor of Science in Engineering degree and is designed for students who have well-defined, special educational objectives that departmental programs do not satisfy. Graduates can practice as professional engineers in newly developing fields, or they may embark on graduate study in these or allied fields (see Engineering Interdepartmental Curricular Program).

Nonprofessional Program. Leading to a Bachelor of Science degree, this program is intended for students who wish to have significant exposure to science and engineering courses, but who do not plan to engage in professional engineering practice (see Engineering Interdepartmental Curricular Program).

General Requirements for Graduation. To graduate, students must meet or exceed the requirements of the University, the college, and their particular program or department. College requirements are listed in this section, and program or departmental requirements are given in the specific section that describes the program or department.

All departments of the college have continuation policies that specify a minimum rate of progress as well as minimum academic performance levels. These policies may be more restrictive than those generally applied by this university and may change in time. Information on current policy is available at the departmental offices.

Selecting courses that fulfill graduation requirements is the responsibility of each individual. Students are urged to check carefully the course and credit requirements of the program in which they are enrolled.

The college requires a minimum number of credits within certain areas of study and some specific courses within certain areas. All programs require:

MATHEMATICS: 23 CREDITS

Specific courses required are MATH 124, 125, 126, and 238. The remaining 5 credits must be taken at the 200 level or higher; MATH 302, 205, ENGR 401, 402, 403, or MATH 327 are recommended.

NATURAL SCIENCE: 23 CREDITS

Chemistry (4 credits) at the level of CHEM 140 or equivalent and PHYS 121 and 122 (8 credits) are required. The 11 additional credits are often completed by further study in chemistry or physics, but students may elect advanced courses in such other fields as astronomy, atmospheric sciences, biology, geological science, geophysics, or oceanography. Elementary survey courses are not acceptable in this category.

FUNCTIONAL TECHNIQUES: 12 CREDITS

ENGR 141, Introductory FORTRAN Programming (4 credits), and a college-level writing course (e.g., ENGR 130 [5 credits]) are required. The remaining credits are to be selected from the following areas of study: visual presentation, written and oral communication, computational technology, design and synthesis, and laboratory techniques. At least three of the five areas must be represented by the courses used to meet the functional techniques requirement.

ENGINEERING SCIENCE: 16 CREDITS

No specific courses are required by the college. Courses may be selected from materials science, mechanics, linear systems, computer operation and organization, and thermodynamics. In special cases, and with the major adviser's approval, a student may include in the engineering science category various courses in mathematics, science, and engineering (usually upper-division courses not in the major field).

A major department may specify as many as 16 credits of particular courses, not already specified for all students, from the mathematics, natural science, functional techniques, and engineering science areas (see individual departmental requirements). Such courses are intended to provide the student with a strong background for the chosen major field of study.

Students who have completed 135 credits or more of their degree program may use courses numbered in the 100 and 200 series to satisfy basic requirements of the College of Engineering only with their major adviser's approval. Engineering science and functional techniques requirements are normally satisfied by upper-division students with the substitution of 300- or 400-level courses that are not in the student's major department or professional program.

HUMANITIES AND SOCIAL SCIENCES: 30 CREDITS

A minimum of 10 credits is required in each area. Humanities includes courses in literature, art, music, drama, philosophy, etc., which stress the essential qualities of individual forms of expression. Language courses must be concerned with literature, not skills; similarly, art or music courses must be devoted to music or art forms, not development of students' performing skills. Social sciences include courses in history, economics, psychology, sociology, etc., which stress the social nature of mankind and the development and analysis of societies and/or social institutions.

UPPER-DIVISION ENGINEERING COURSES OF STUDY: 66 CREDITS

Major departments or specific programs may require as many as 78 credits in their curricula.

Special Programs

Cooperative Education and Minority Internship Program
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Director: Helene C. Beaver

The Cooperative Education and Minority Internship Program of the College of Engineering provides the opportunity for pre-engineering students and all departmental students to combine practical, full-time, on-the-job engineering experience with alternate periods of full-time academic study. Advantages of participation in this program include assistance for the student in deciding which branch of engineering to follow; additional income to help defray college expenses; relevance and motivation for study, based on real engineering work; and work experience and employment contacts that often result in a higher starting salary after graduation.

Information may be obtained from the Director of Cooperative Education, College of Engineering, FH-10.

Continuing Education Programs

Engineering noncredit short courses, conferences, televised instructional programs, and late-afternoon credit classes are offered to the professional community. These offerings range from refresher courses, which assist engineers who are planning for professional registration, to credit courses leading to a graduate degree. In general, the offering of noncredit and credit continuing education programs is based on need or demand. Courses are announced in *Spectrum*, by special announcements, professional society newsletters, and news media.

Special Facilities**OFFICE OF ENGINEERING RESEARCH**

Coordinator: Neil M. Hawkins
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The Office of Engineering Research attempts to promote, stimulate, and coordinate research in all fields of engineering. Its primary role is to maintain records of grant and contract proposals and awards. It allocates limited resources to various college units to increase the number and quality of research grants and contracts in the College of Engineering. These resources include funds to prepare proposals, to present proposals to possible funding agencies, and to locate potential sources. Support to enhance direct contact with funding sources such as travel supplements is given priority.

AEROSPACE AND ENERGETICS RESEARCH PROGRAM

Director: Abraham Hertzberg
120 Aerospace Research and Engineering Laboratory

The Aerospace and Energetics Research Program is directed toward high-technology engineering research and teaching through research. The program has the task of anticipating, and even trying to outpace, the critical technology needs of our nation. The research and teaching programs of this laboratory, therefore, emphasize those engineering skills that both match the requirements of the present and future and develop in students a broad understanding of the impact of technology on society. Suitable programs are designed to develop in the student through his particular research program the imagination and, more importantly, the willingness to respond to the complex and rapidly changing future of engineering. This ideal directs the faculty's efforts and creates within the principal investigators, research faculty, and students the concept of engineering as an adventure.

The program is marked by a catholic approach to research, with programs covering many fields, usually centered about energy or aerospace. For example, currently active research programs in plasma engineering related to fusion power, space and terrestrial solar energy systems, laser bioengineering experiments, and studies of the basic technology of high-power laser systems, which represent some of the interests of the principal investigators working together in the Aerospace and Energetics Research Program.

BRITTLE MATERIALS DESIGN CENTER

Co-Directors:
J. R. Bollard
R. C. Bradt
318 Roberts

The Brittle Materials Design Center is an interdisciplinary activity of the College of Engineering that involves design methodology studies and research on the utilization of high technology ceramics and composite materials in advanced structures for use in hostile environments.

The design methodology portion includes a unique academic program available to senior-level undergraduate and graduate students in aeronautics and astronautics, ceramic engineering, civil engineering, mechanical engineering, and metallurgical engineering. Teaching faculty members from the different engineering disciplines are involved in a series of courses that may be utilized to satisfy undergraduate design requirement in several departments. Detailed information on these courses is available in the descriptive material of each of the participating disciplines.

Interdisciplinary research involves faculty and students from the College of Engineering and the College of Arts and Sciences. Support is obtained from several federal agencies and industrial organizations.

OCEAN ENGINEERING LABORATORY

Director: Bruce H. Adee
326 Mechanical Engineering

The diverse ocean engineering research program is housed in various areas around the campus. At the Applied Physics Laboratory, the emphasis is on underwater acoustics and instrumentation research, while wave channels and hydraulic modeling are the main facilities in use at the Harris Hydraulics Laboratory. The Mechanical Engineering Building houses computer facilities, including a computer-controlled data-acquisition system and a small laboratory used to support field experiments. A large portion of the laboratory activities involve field experiments. Where wave measurement is required, a mobile semisubmersible wave-measuring platform is available and has been used extensively in conjunction with radio-controlled ship model tests.

Research activities undertaken by the faculty include marine acoustics, marine hydrodynamics, coastal structures, floating breakwaters, marine materials, marine propulsion, marine transportation safety, ship-building productivity, and computer-aided design and engineering.

WASHINGTON MINING AND MINERAL RESOURCES RESEARCH INSTITUTE

Director: Osgood J. Whittemore
304 Roberts

This state institute was established in January, 1980, at the University. Its responsibilities include the conduct of research, investigations, demonstrations, and experiments of a basic and/or practical nature in relation to mining and mineral resources and the provision for the training of mineral engineers and scientists. The institute is under the direction of the Department of Materials Science and Engineering.

Engineering Interdepartmental Curricular Program

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The College of Engineering directly administers nondepartmental undergraduate and graduate degree programs, all of the college's lower-level courses, and upper-level courses not encompassed by regular departmental offerings. These courses are designated ENGR; in general, ENGR courses are supervised and taught by regular departmental faculty members.

Undergraduate Programs

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Coordinator: Amy Maki

The interdisciplinary engineering studies program offers an opportunity to construct individual curricula designed to fill particular educational goals. Two types of curricula are available for this purpose: the professional program, leading to the degree of Bachelor of

Science in Engineering, and the nonprofessional program, culminating in the degree of Bachelor of Science.

A student in these programs does not join an engineering department. Instead, the Office of Academic Affairs provides a base for his or her records and initial advising. The student must develop a personal program of study approved by a faculty adviser with similar interests. This program must be reviewed and approved by the faculty member who oversees all interdisciplinary study programs. Students are urged to contact the Office of Academic Affairs for information on established procedures and guidelines for entry into the nondepartmental B.S.E. and B.S. programs. Entrance requirements and the continuation policy for participation in these programs are consistent with those of other departments in the college.

Bachelor of Science in Engineering Degree

Typical B.S.E. programs include engineering science, energy systems, environmental, nuclear, ocean, structural, and surveying engineering as well as mineral resources. Others may evolve in keeping with student or faculty interests. Admission into this program (usually after completion of 90 credits) is competitive with a grade-point average of at least 2.80 in technical courses required for entry. A minimum of 75 credits must be completed after entering the program before a B.S.E. degree is awarded.

Bachelor of Science Degree

The nonprofessional Bachelor of Science degree provides greater flexibility than does the Bachelor of Science in Engineering degree. It can be an excellent base of subsequent professional studies in law, medicine, or business. It may also be the primary educational objective in such fields as technical writing, engineering sales, or environmental studies. Detailed requirements are available from the coordinator in the Office of Academic Affairs.

Graduate Programs

The college also offers graduate programs leading to the Master of Science in Engineering, Master of Engineering, and Master of Science degrees, without designation of a specific major. Approved programs lead to the M.S.E. degree in bioengineering, civil, mechanical, electrical, or interengineering; an approved program leads to the M.Eng. degree in aeronautics and astronautics; and approved programs lead to the M.S. degree in bioengineering, civil engineering, materials science and engineering, and scientific and technical communication. Admission requires a B.S. degree in engineering, mathematics, or physical science and substantial evidence of aptitude for graduate study. Submission of scores on the Graduate Record Examination is required. Admission to the interengineering option requires a statement describing the applicant's objectives. Application for admission should be made to the Graduate School. Graduate and entrance requirements, which differ for the various programs, may be obtained from the office of the Dean, College of Engineering.

Faculty

Chairperson

Mark P. Haselkorn

Professors

Butterfield, Earl C.,* 1981, ‡(Education), (Psychology), Ph.D., 1963, George Peabody; cognitive science.

Leahy, Jack T., 1958, (English), M.A., 1957, Washington; literature of the Third World, the literature of travel, developing countries.

Keels, Dell R., 1949, (Emeritus), M.A., 1942, Idaho; Ph.D., 1949, Washington; folklore, myth, and folktale.

Souther, James W.,* (Emeritus), 1948, M.A., 1948, Washington; communication process and communication in organizations, document design.

Trimble, Louis P., 1955, (Emeritus), Ed.M., 1953, Eastern Washington; technical writing for nonnative speakers.

White, Myron L., 1947, (Emeritus), Ph.D., 1958, Washington; technical editing and publications management.

Associate Professors

Bereano, Philip L.,* 1975, (Women Studies), J.D., 1965, Columbia; M.R.P., 1971, Cornell; technology assessment, technology and social values, women and technology, public policies regarding technologies, work, genetic engineering, alternative technologies and the environment.

Botting, David C., 1955, (Emeritus), M.A., 1947, Washington; Ph.D., 1950, Chicago; history and social ecology of technology.

Coney, Mary B.,* 1976, M.A., 1964, Illinois; Ph.D., 1973, Washington; writing and theories of technical discourse.

Douthwaite, Geoffrey K., 1961, M.S.E.E., 1963, Washington; computer applications of engineering mathematics, statics and dynamics, technology and its impact on society.

Farkas, David K.,* 1983, M.A., 1969, Chicago; Ph.D., 1976, Minnesota; document design, publications practices and technologies, information systems.

Haselkorn, Mark P.,* 1985, M.A., 1973, M.A., 1980, Ph.D., 1977, Michigan; man/machine interface, natural language processing, the computer in technical communication.

Higbee, Jay A., 1952, (Emeritus), M.A., 1949, Washington; D.S.S., 1955, Syracuse; human rights, impact of technology on society, contemporary affairs and the media.

Ramey, Judith A.,* 1983, M.A., 1971, Ph.D., 1983, Texas; computer documentation, computers and information management.

Assistant Professor

Spyridakis, Jan H.,* 1977, M.A.T., 1972, Ph.D., 1986, Washington; document design, comprehension processes, technical writing and editing, computer-assisted instruction.

Lecturer

Williams, Thomas R., 1977, M.C., 1981, Washington; production editing and document design.

Course Descriptions

Courses for Undergraduates

Functional Techniques

ENGR 111 Engineering Problems (5) Introduction to solving problems in statics and dynamics. Applications of vectors and calculus to rectilinear motion, statics, momentum, work and energy, and rotational motion. Designed to develop the ability to analyze and solve engineering problems. Prerequisites: MATH 124 and permission of instructor.

ENGR 123 Introduction to Engineering Graphics (3) AWSpS Freehand sketching, lettering, scales, use of instruments, layout drawings, orthogonal projection, descriptive geometry, pictorials, and basic dimensioning. Communicating technical information in engineering design and research. Introduction to computer-aided design drafting.

ENGR 124 Engineering Graphics With an Introduction to Design (3) AWSpS Engineering graphics for developing design and research ideas; freehand sketching, layout, detail and assembly drawings, applied descriptive geometry. Design projects assigned to illustrate design processes and application of engineering graphics in design and research. Includes graphical mathematics, report preparation, computer-aided design, patent drawings, manufacturing processes. Prerequisite: 123 or equivalent.

ENGR 130 Introduction to Technical Writing (5) AWSpS Principles of organizing, developing, and expressing technical information. Report forms and rhetorical patterns common to scientific and technical disciplines (description, process, research and laboratory reports). Technical writing conventions such as illustration and heading use, style, and tone. Kinds of writing required of students during their academic careers.

ENGR 140 Measurement and Experimentation (4) AWSp Collection and analysis of data on practical subsystems in the context of engineering situations. Common laboratory instrumentation is explained and utilized. Results are synthesized into engineering report form as both group and individual experiences. Prerequisites: MATH 124, PHYS 121.

ENGR 141 Introductory FORTRAN Programming (4) AWSpS Computer programming using FORTRAN language. Includes use of one-, two-, and three-dimensional arrays and subroutines. Emphasizes problem-solving techniques using structured or modular programming concepts. Prerequisite: MATH 105 or permission of adviser.

ENGR 199 Special Projects (1-3, max. 3) AWSpS Students propose problems to solve to an engineering faculty member. The problems may be selected from the student's own experiences and interests, from the interest of the faculty member, or from other sources such as faculty or graduate students doing research projects, or from personnel in the physical medicine area, occupational therapy, hospital, industry, government, etc. Corroboration by an engineering faculty member is required. Project suggestions are available.

ENGR 202 Special Projects (1-3) AWSpS Projects on topics of current interest in engineering. Prerequisite: permission of instructor.

ENGR 275 Fundamentals of Computer Operating and Organization (4) AWSp Organization and operation of digital computers. Information, instruction formats, addressing, flow of control, processor and system components, and software systems. The digital computer studied at various levels (microprogramming, machine, and system). Prerequisite: 141.

ENGR 280 Introduction to System Engineering (4) AWSp Applied general systems theory presented as a framework for system engineering. Concepts of system hierarchies, trade-offs, and feedback applied in two team-oriented projects. Prerequisite: 141.

ENGR 331 Advanced Technical Writing (3) AWSp Principles of presenting technical material logically, concisely, and effectively to meet the requirements of various situations and audiences. For majors in engineering and similar professional programs. Style of writing required of professionals in these technical fields. Prerequisite: junior standing or permission of instructor.

ENGR 332 Technical Briefings and Presentations (3) AWSp Technical information for different audiences and different purposes. Includes analyzing the professional situation, preparing the presentation, and the role and use of visuals. For students in engineering and similar professions and for those in the natural, social, and health sciences. Concentrates on professional papers, management briefings, and public presentations. Prerequisite: junior standing or permission of instructor.

Engineering Sciences

ENGR 170 Fundamentals of Materials Science (4) AWSpS Elementary principles underlying the structure and properties of materials utilized in the practice of engineering. The properties of inorganic and organic materials are related to atomic, molecular, and crystalline structure. Metals, ceramics, multiphase systems, and natural and synthetic polymeric materials are included. Mechanical stress, electromagnetic fields, irradiation, and thermal and chemical changes are considered with respect to their influences on mechanical, electrical, and chemical properties. For advanced freshmen and sophomores. Prerequisite: CHEM 150 or permission of adviser.

ENGR 171 Materials Science Laboratory (1) AWSpS Experiments in materials science designed to illustrate fundamentals related to the structure and the properties of engineering materials; optical microscopy, x-ray diffraction, mechanical properties, electrical conductivity, crystal growth, solid-state reactions. Prerequisite: 170, which may be taken concurrently.

ENGR 198 Educational Projects in Materials Science (1-5) AWSpS In-depth study of special topics in materials science with special seminars and lectures, participation in materials science research projects or curriculum development projects involving science or industrial arts classes. May be repeated for credit. Prerequisite: permission of instructor.

ENGR 210 Engineering Statics (4) AWSpS Principles of statics, basic concepts, parallelogram law, Newton's law, resultants, force-couple relationships, equilibrium diagrams, equilibrium analysis, three-dimensional structures, two-dimensional frames, trusses, beams, and friction. Vector algebra used throughout the course. Prerequisites: MATH 126, PHYS 121; recommended: graphics background.

ENGR 220 Introduction to Mechanics of Materials (4) AWSpS Introduction to the concepts of stress, deformation, and strain in solid materials. Development of basic relationships between loads on structural and machine elements such as rods, shafts, and beams, and the stresses, deflections, and load-carrying capacity of these elements under tension, compression, torsion, bending, and shear forces, or combinations thereof. Prerequisite: 210.

ENGR 230 Kinematics and Dynamics (4) AWSpS Kinematics of particles, systems of particles, and rigid bodies; moving reference frames; kinetics of particles, systems of particles, and rigid bodies; equilibrium, energy, linear momentum, angular momentum, Euler equations, and special problems (e.g., central force motion, vibration). Prerequisite: 210.

ENGR 260 Thermodynamics (4) AWSpS Introduction to the basic principles of thermodynamics, from a predominantly macroscopic point of view. Development of the basic laws of thermodynamics, together with their illustration by application to energy transformations and state changes in engineering problems. Prerequisites: MATH 126, 100-level physics and chemistry courses.

Electives

ENGR 110 Career Planning I (1) AW Presentations by various faculty and staff members, students, and recent graduates offer an introduction to the College of Engineering, curricular options, fields of engineering, interdisciplinary programs, and information of general interest. Offered on credit/no credit basis only. Limited to freshmen, sophomores, or transfer juniors.

ENGR 301 Creating the Future (3) W Douthwaite Examines the concept of alternative individual and societal futures and the opportunities for creating them. Many authors are reviewed, a number of scenarios for the future are explored, and several methods of forecasting are investigated.

ENGR 305 Environmental Radioactivity (3-4) Sp Nature of various sources of radioactivity encountered today and to be expected in the future. Natural radioac-

tivity, radon in the home; radiation from nuclear weapons, nuclear power plants, fuel reprocessing plants, and medical diagnosis; radiation effects on plants and animals; radiation therapy and other useful applications and methods of detection.

ENGR 310 Social Constraints on Engineering Design (3) WSp Bereano Ways in which social goals affect engineering design decisions. Social values and public policy issues that generate design criteria using such engineering cases as space travel, energy conservation, nuclear waste disposal. For students from any discipline. Offered on credit/no credit basis only. Prerequisite: junior standing or permission of instructor.

ENGR 341 Computer Applications of Numerical Methods (3) AWSpS Development and application of numerical methods and algorithms to solve problems in engineering. Simultaneous equations, curve fitting, root-finding algorithms, Taylor series analysis, numerical integration, ordinary differential equations. Joint with AMATH 341. Prerequisites: 141 or equivalent and MATH 238, which may be taken concurrently.

ENGR 345 Advanced Topics in Digital Computing (3) AWSpS The concept of the higher-level language. Advanced FORTRAN techniques used to construct an interpreter, including the full set of FORTRAN 77 statements, the machine-dependent features of the CDC/CYBER 170-750, real and integer binary number conversion, object-time formatting, and introduction to use of control cards. Several programs in addition to the interpreter are written and executed. Prerequisite: 141 or equivalent.

ENGR 346 Assembly Language Programming (3) AWSpS The central processor assembler language, COMPASS, of the CDC/CYBER 170-750 computer, including program structure and organization, COMPASS language instructions, pseudoinstruction, and macroprogramming techniques. Integer and floating-point conversion, character manipulation, simple and nested loops, array accessing, COMPASS-FORTRAN subroutine linkage, and instruction timing. Programs are coded and executed on the computer. Prerequisite: 141 or equivalent.

ENGR 351 Inventions and Patents (1) Sp Law and procedures for patenting inventions, employer-employee relationship, and trademarks. Primarily for engineering students. Prerequisite: junior standing.

ENGR 360 Introductory Acoustics (3) Sp Introduction to propagation of acoustical waves; emphasis on propagation of sound waves in air, but material is applicable to propagation of sound waves in liquids, including underwater acoustics, and to propagation of stress waves in solids. Includes a historical development of acoustics, terminology, and units employed. Prerequisite: PHYS 123, MATH 238.

ENGR 401 Methods in Applied Mathematics I (4) Asp Acquisition of technique and experience in application of areas of mathematics encountered in science and engineering; illustrated by case studies from many fields. Applications of vector differential calculus; line and surface integrals, integral theorems; complex variables; Taylor and Laurent series, contour integration. Joint with AMATH 401. Prerequisites: MATH 205, MATH 327 or A 370, and AMATH 351 or MATH 238 or permission of instructor.

ENGR 402 Methods in Applied Mathematics II (4) AW See 401. Applications of ordinary differential equations; phase plane, stability; systems of differential equations; power series solutions; Laplace transforms. Joint with AMATH 402. Prerequisites: MATH 205; MATH 327 or A 370; and AMATH 351 or MATH 238 or permission of instructor.

ENGR 403 Methods in Applied Mathematics III (4) Sp See 401. Application of partial differential equations, special functions; Fourier series and Fourier transforms. Joint with AMATH 403. Prerequisite: 402 or permission of instructor.

ENGR 415 Technology Assessment Methods and Analysis I (3 or 5) W Bereano In-depth analysis of the concept, practice, and methods of technology assessment (policy analysis that concentrates on social consequences of technological development): social, political, economic, and environmental impacts of new technologies; options for channeling these developments; and relevant decision-making institutions and processes. Joint with URBDP 515.

ENGR 421 Introduction to Technology as a Social and Political Phenomenon (3) A Bereano Introductory survey presenting some of the issues pertaining to technology and social change, technology and values, etc. Emphasis on the social, political, and economic aspects of current problems that have important technological components. Extensive reading. Prior technical background not required.

ENGR 450 Gas Discharges for Plasma Processing and Other Applications (3) Ribe, Vlases Lectures and demonstrations on direct-current and radio-frequency electrical discharges for sputtering, plasma etching and other plasma processing applications. Prerequisites: MATH 238, PHYS 122 or E 231.

ENGR 454 Alternative Technology (3) Bereano Exploration of the evolution of technological forms that are small-scaled, decentralized, etc., emphasizing the public policy aspects of these developments. Topics include the relationship between alternative technologies and worker-controlled enterprises, community planning, the politics of technological change, the Third World, and decentralized development. Background in engineering or technical design is not required.

ENGR 468 Women and Technology (3) Sp Bereano Comparison of technological rationality with feminist modes of thought. Focuses on the particular impact of technologies on women and on contributions by the women's movement and feminism to our understanding of technology. Joint with SOC 470 and WOMEN 490. Prerequisite: permission of instructor.

ENGR 490 Reliability and Risk Analysis (3) Principles of reliability and safety analysis, including Markov models and fault-tree/event-tree construction; introduction to fundamental concepts in probabilistic risk analysis (PRA); examples of PRA for energy production technologies and site-specific chemical plant applications; introduction to value-impact tradeoff analysis and acceptance of risk by society. (Formerly NUC E 490.)

ENGR 493 System Engineering Project (3) A system engineering project course that develops requirements and specifications and management systems for system development. Integration of simulation optimization, control and decision theory methods to the system engineering of large complex projects. Prerequisite: senior standing, permission of instructor.

ENGR 498 Special Topics in Engineering (1-5, max. 6) AWSpS

ENGR 499 Special Projects in Engineering (1-3, max. 6) AWSpS

Cooperative Education

ENGR 321- Engineering Cooperative Education (2-, max. 16) AWSpS Engineering practicum; the integration of classroom theory with on-the-job training. Periods of work alternate with periods of study. Open only to students who have been admitted to the Engineering Cooperative Education Program. Offered on credit/no credit basis only.

ENGR 322 Engineering Cooperative Education Postwork Seminar (1-5, max. 16) AWSpS Reporting and evaluation of co-op work experience, and discussion of current topics in engineering. To be taken during the first quarter in school following each work session. Offered on credit/no credit basis only.

Aeronautics and Astronautics

206 Guggenheim

Aeronautics and Astronautics deals with atmospheric and space flight and a broad spectrum of related engineering science. Established in 1930, the department offers a full complement of degree programs and is unique in the Pacific Northwest.

Undergraduate Program

Reiner Decher, Undergraduate Program Coordinator

The department offers the Bachelor of Science in Aeronautical and Astronautical Engineering degree, based on a program of study of engineering science with emphasis on the design and development of vehicles operating within the atmosphere or space. The program is accredited by the Accreditation Board for Engineering and Technology, and all graduates must meet certain specific distribution requirements.

Admission

Entrance into the department requires the equivalent of at least 75 applicable credits and a 2.50 grade-point average in specified courses. These are minimum requirements; admission is competitive. Details of the entrance requirements, application deadlines, application forms, and advising literature may be obtained from the department office.

Technical Preparation

The department has the following recommendations and requirements for technical preparation beyond those courses required of all engineering students. In mathematics, MATH 302 is recommended. In natural science, CHEM 150 and PHYS 123, 224, and 225 are recommended. In engineering science, ENGR 210, 230, and 260 are required; ENGR 210 must be taken before Autumn Quarter of the junior year and ENGR 230 and 260 before Winter Quarter of the junior year. In practice, both of these courses should be taken before Autumn Quarter to avoid an overload. In addition, ENGR 170 or E E 306 (4 credits) are recommended in the first two years.

Professional Courses

The department program begins in the Autumn Quarter of the junior year. Exceptions are very unusual and must be coordinated with the undergraduate adviser. Required junior courses: A A 300, 301, 302, 311, 312, 320, 321, 322, 330, 331, 332, 370. Required senior courses: A A 410 or 420, 460, 498 and 24 credits of senior technical electives, with at least 21 chosen from department offerings.

Additional free electives may be needed to meet the 182 credits required for graduation. Appropriate technical electives include electronics, automatic control, mathematics, applied mathematics, computer science, physics, and astronomy. Senior programs should be planned with the assistance of the faculty adviser.

Graduate Program

Ian M. Fyfe, Graduate Program Coordinator

The Department of Aeronautics and Astronautics offers programs that provide a foundation in the engineering sciences and study in various engineering applications. These lead to the degrees of Master of Science in Aeronautics and Astronautics, Master of Engineering, or Doctor of Philosophy.

Master of Science in Aeronautics and Astronautics Degree

The program of study is tailored to the needs and interests of the student. Each program must be approved by the department graduate committee and must provide breadth through a variety of subjects, depth through extensive study of a specialized field, and analytical strength. Minimum programs consist of either 39 credits of course work, or 30 credits of course work and a 9-credit thesis.

Master of Engineering Degree

The Master of Engineering program is intended to provide course work and research beyond that for the degree of Master of Science in Aeronautics and Astronautics. The student must complete an approved program of study and research, which usually consists of a prior Master of Science degree, followed by a minimum 30 credits of course work and a 9-credit thesis.

Doctor of Philosophy Degree

The doctoral program consists of lectures, seminars, discussions, and independent study, enabling the student to master and to make original contributions to a particular field. The formal steps for obtaining the degree are listed in the general requirements section of this catalog. In addition to those requirements, the student is expected to be in continuous full-time residence for one academic year after advancement to Candidate standing.

Research Activities

Research facilities include the Kirsten 8x12-foot low-speed wind tunnel, a high-pressure air supply and several smaller tunnels, shock and Ludwig tubes, a projectile accelerator, material and structural test machines, a dynamic fracture laboratory, a composite material laboratory, a twin-engine aircraft, a six-meter solar concentrator, and various engineering physics laboratories. A variety of computer facilities is available, including a new computational fluid dynamics laboratory. A close relationship is maintained with the Aerospace and Energetics Research Laboratory, where interdisciplinary research is conducted.

Externally funded research is carried out by faculty members and students on such topics as cloud buoyancy, vortex generator aerodynamics, wind tunnel blockage, combustor shear layers, computational aerothermodynamics, fluid-mechanical optics, swirling flows, propeller-hull interactions, ramjet accelerators, solar-pumped lasers, free-electron lasers, space power systems, space launchers, flight-trajectory optimization, ceramic material characterization, ceramic structures, impact mechanics, creep of composite materials, composite material structures and fracture, and viscoelastic analysis.

Admission

Students who have earned a baccalaureate degree in an accredited program of aeronautics and astronautics or closely related field are eligible for the Master of Science program. Backgrounds in related fields require review on a case-by-case basis, and preparatory courses may be required, depending on the student's previous studies and educational objectives. Admission is competitive, with the equivalent of a 3.00 grade-point average in previous technical study a minimum standard. Submission of verbal, quantitative, and analytical scores on the Graduate Record Examination is required.

Admission to the Doctor of Philosophy program is based on satisfactory performance on a departmental qualifying examination. Admission to that examination is based on evidence of superior academic ability.

Additional Information

Students who intend to work toward advanced degrees must apply for admission to the Graduate School. Most students are financially supported by their employers or by the department as teaching or research assis-

stants. For further information on this or other aspects of department programs, contact: Graduate Program Coordinator, 206 Guggenheim, FS-10.

Faculty

Chairperson

David A. Russell

Professors

Bollard, R. John H.,* 1961, M.E., 1949, Canterbury (New Zealand); Ph.D., 1954, Purdue; mechanics of materials, structural mechanics, aeroelasticity, design and crash-worthiness of aircraft.

Christiansen, Walter H.,* 1967, M.S.A.E., 1957, Ph.D., 1961, California Institute of Technology; gas dynamics and gas physics, high-power gas lasers and their application, energy conversion.

Clark, Robert N.,* 1966, ‡(Electrical Engineering), M.S.E., 1951, Michigan; Ph.D., 1969, Stanford; dynamics and control.

Eastman, Fred H., 1927, (Emeritus), M.S., 1929, Massachusetts Institute of Technology; aeronautics and astronautics.

Fyfe, Ian M.,* 1959, M.M.E., 1954, Delaware; Ph.D., 1958, Stanford; dynamics, wave propagation in solids and fluids.

Ganzer, Victor M., 1947, (Emeritus), B.S.A.E., 1941, Washington; aeronautics and astronautics.

Hertzberg, Abraham,* 1966, M.A.E., 1949, Cornell; high-power lasers, fusion research, solar energy, space systems, energy systems, heat transfer.

Holsapple, Keith A.,* 1965, M.S.E., 1964, Ph.D., 1965, Washington; solid mechanics, continuum mechanics, structures, waves, finite elements methods.

Joppa, Robert G.,* 1947, M.S., 1951, Washington; M.A., 1962, Ph.D., 1972, Princeton; aircraft flight mechanics, stability and control, V/STOL testing, airplane design, flight testing.

Kevorkian, Jirair,* 1964, (Applied Mathematics), † M.S., 1956, Georgia Institute of Technology; Ph.D., 1961, California Institute of Technology; mathematical fluid mechanics, nonlinear wave propagation, resonance phenomena, perturbation methods, applied mathematics.

Kurosaka, Mitsuru, 1987, M.S., 1961, Tokyo; Ph.D., 1968, California Institute of Technology.

Parmerter, R. Reid,* 1963, M.S., 1959, Ph.D., 1963, California Institute of Technology; structures, solid mechanics, fracture mechanics.

Pearson, Carl E.,* 1965, (Applied Mathematics), † Ph.D., 1949, Brown; wave propagation, fluid mechanics, numerical analysis.

Russell, David A.,* 1967, M.Sc., 1957, Ph.D., 1961, California Institute of Technology; fluid mechanics and gas physics, aerodynamics, shock processes, laser fluid dynamics.

Street, Robert E., 1948, (Emeritus), M.A., 1934, Ph.D., 1939, Harvard; aeronautics and astronautics.

Vagners, Juris,* 1967, (Applied Mathematics), † M.Sc., 1963, Ph.D., 1967, Stanford; optimal control and estimation theory, applications to aircraft systems.

Associate Professors

Breidenthal, Robert E., Jr.,* 1980, M.S., 1974, Ph.D., 1978, California Institute of Technology; turbulence, mixing, combustion, vorticity.

Bruckner, Adam P.,* 1972, (Research), (Bioengineering), M.A., 1968, Ph.D., 1972, Princeton; energy conversion, propulsion, space power systems, solar energy, heat transfer, biomedical applications of lasers.

Decher, Reiner,* 1967, S.M., 1962, Ph.D., 1968, Massachusetts Institute of Technology; aircraft propulsion, fluid mechanics, energy conversion.

Lin, Kuen Y.,* 1984, M.S., 1973, Ph.D., 1977, Massachusetts Institute of Technology; composite materials, structural mechanics, finite element methods.

Mattick, A. Thomas,* 1975, (Research), M.S., 1971, Ph.D., 1975, Massachusetts Institute of Technology; energy conversion, gas lasers, gas physics.

Rae, William H., Jr.,* 1956, M.S., 1959, Washington; experimental low-speed aerodynamics.

Assistant Professors

Eberhardt, Scott,* 1986, M.S., 1981, Ph.D., 1984, Stanford; computational fluid dynamics, numerical analysis.

Hermanson, James C., 1986, (Research), M.S., 1980, Ph.D., 1985, California Institute of Technology; fluid mechanics, propulsion, combustion, space systems.

Course Descriptions

Courses for Undergraduates

A A 300 Aerodynamics I (4) A *Breidenthal, Decher, Rae* Aerodynamics as applied to the problems of performance of flight vehicles in the atmosphere. Prerequisite: junior standing or permission of instructor. Entry card required.

A A 301, 302 Aerodynamics II, III (4,4) W,Sp *Breidenthal, Decher, Rae* Kinematics and dynamics of flow fields; incompressible flow about bodies. Thin airfoil theory; finite wing theory. Compressible fluids; one-dimensional compressible flow; two-dimensional supersonic flow. Viscous flows; boundary layers. Prerequisites: MATH 238 and ENGR 260 for 301; 301 for 302. Entry card required.

A A 311 Orbital and Atmospheric Flight Mechanics (3) W *Fyle, Vagners* Review of kinematics and particle dynamics. Dynamics of systems of particles. Gravitational field of the earth. Keplerian motion. Application to orbital transfer problems. Rigid-body dynamics. Prerequisite: ENGR 230. Entry card required.

A A 312 Dynamics of Flight Vehicles (3) Sp *Bollard, Fyle* Vibration theory. Characteristics of single and multiple degree of freedom linear systems with forced inputs. Approximate methods for determining principal frequencies and mode shapes. Application to simple aeroelastic problems. Prerequisite: 311. Entry card required.

A A 320, 321, 322 Junior Laboratory I, II, III (2,2,2) A,W,Sp *Breidenthal, Bruckner* Theory, calibration, and use of instruments. Measurement techniques, analysis of data, report writing. Laboratory experiments on subsonic aerodynamics, supersonic flow, material properties, structures, vibrations. Recommended: PHYS 131, 132, 133. Entry card required.

A A 330, 331, 332 Structural Analysis I, II, III (4,4,4) A,W,Sp *Bollard, Holsapple, Parmerter* Development of the equations of elasticity, viscoelasticity, and plasticity. Plane stress, plane strain; torsion, bending, and stability of rods and beams; virtual work, potential energy, Castigliano's theorem; statically indeterminate structures. Prerequisite: 331 for 332. Entry card required.

A A 370 Introduction to Applied Analysis (3) Holsapple, Pearson Advanced calculus, from applications point of view. Review of ordinary differential equations. Fourier series and integrals. Laplace transformation. Bessel functions, Legendre polynomials. Review of vector analysis. Line, surface, and volume integrals. Prerequisite: MATH 238. Entry card required.

A A 400 Gas Dynamics (3) A *Christiansen, Russell* Introduction to kinetic theory; velocity distribution function, transport properties. Free molecule flow. Thermodynamics of real gases. One-dimensional gas dynamics: ideal and real gas flows, nonsteady waves, idealized nozzle flow, diffusers, oblique shocks. Prerequisites: 302 and ENGR 260 or permission of instructor.

A A 401 Fluid Mechanics (3) Sp *Christiansen, Kurosaka, Russell* Equations of motion of viscous, heat conducting, compressible fluid. Potential flow: panel methods, method of characteristics, linear solutions. Laminar and turbulent boundary layers: similarity, finite difference methods, approximate solutions via integral techniques. Prerequisites: 302 and ENGR 260 or permission of instructor.

A A 410 Aircraft Design (4) W *Joppa* Preliminary design of a modern airplane to satisfy a given set of requirements. Estimation of size, selection of configuration, weight and balance, and performance. Satisfaction of stability, control, and handling qualities requirements. Recommended: 440.

A A 411 Aerospace Structural Design (3) Sp *Bollard, Joppa* Experience in design of aerospace structural systems using modern materials by development of a preliminary design for a chosen vehicle or vehicle component with attention to the design process, reliability, efficiency, and safety. Prerequisite: 410 or 420.

A A 420 Spacecraft and Space Systems Design I (4) W *Hertzberg* Expanding role of space has created a new technology with unique components and systems. The methodology will be developed for treating the special power, transportation, attitude control, etc., systems required for current and anticipated spacecraft. Applications extend from communications to solar power from space. Prerequisite: senior standing.

A A 430 Finite Element Structural Analysis (3) A *Holsapple, Lin* Introduction to the finite element method. Applications to trusses, beams, frames, box beams, plane stress, and heat transfer. Prerequisite: 332.

A A 431 Plates and Shells (3) W *Bollard, Lin, Parmerter* Introduction to the theory of plates and shells. Membrane theory of shells of revolution, cylindrical and conical shells. Axisymmetric bending of shells of revolution. Stability of structures. Prerequisite: 332.

A A 440, 441 Flight Mechanics I, II (3,3) A,Sp *Joppa, Rae* Calculation of aerodynamic coefficients and stability derivatives. Prediction of performance, stability, and control characteristics of a specified aircraft. Vehicle equations of motion near a flat earth; the performance problem within the atmosphere; an introduction into the dynamic stability of vehicles subject to aerodynamic forces. Comparison of wind tunnel and derived aerodynamic characteristics. Determination in flight of performance, stability, and control characteristics; and comparison with predicted and wind tunnel results. Prerequisites: 302 for 440; 440 for 441.

A A 450, 451 Control in Aerospace Systems I, II (3,3) A,Sp *Vagners* Review of linear, ordinary differential equations. Linearization of mathematical models for aircraft and spacecraft, state space models. Laplace transformation, stability criteria, frequency domain and time-domain analysis techniques. Feedback control and compensation methods. Digital control methods. Applications to aerospace vehicle control problems. Prerequisite: MATH 238; recommended: 311, 312.

A A 460, 461 Propulsion I, II (3,3) A,W *Decher, Kurosaka* Study of the aero- and thermodynamics of rocket engines. Rocket vehicle performance. Introduction to space propulsion. Air-breathing engines as propulsion systems. Turbojets, turbofans, turboprops, ramjets, hybrid engines. Aerodynamics of gas-turbine engine components. Prerequisites: 302, ENGR 260.

A A 470 Analytical Problems in Aeronautics (3) W Numerical methods for algebraic and differential equations. Transforms. Introduction to perturbations, eigenvalues, nonlinearities. Probability and statistics. Variational idea. Prerequisites: MATH 238, ENGR 141.

A A 480 Systems Dynamics (3) W *Bollard, Fyle* Equations of motion and solutions for selected problems; natural frequencies and mode shapes; of contin-

uous systems; response of simple systems to applied loads, including random excitation. Prerequisite: senior standing.

A A 481 Elementary Aeroelasticity (3) Sp *Bollard* Discussion of aeroelastic problems in aircraft design; elementary development of static and dynamic aeroelastic problems, divergence, control effectiveness, flutter. Prerequisite: 480 or permission.

A A 498 Special Topics in Aeronautics and Astronautics (0-1, max. 2) AWSp Lectures and discussions on topics of current interest in aviation and space engineering. Two quarters required for credit.

A A 499 Special Projects (2-5, max. 10) AWSp Investigation on a special project by the student under the supervision of a faculty member. A maximum of 6 credits may be applied toward senior technical electives. Prerequisite: senior standing.

Courses for Graduates Only

A A 501 Physical Gasdynamics I (3) A *Christiansen, Hertzberg* Equilibrium kinetic theory; chemical thermodynamics; thermodynamic properties derived from quantum statistical mechanics; reacting gas mixtures; applications to real gas flows and gas dynamics. (Offered odd-numbered years.)

A A 502 Physical Gasdynamics II (3) W *Christiansen, Hertzberg* Introduction to vibrational relaxation and nonequilibrium chemistry. Nonequilibrium physics applied to flow. Brief introduction to nonequilibrium kinetic theory. Application to a variety of research and development areas such as high-temperature energy systems and gas lasers. Prerequisite: 501 or permission of instructor. (Offered even-numbered years.)

A A 504 Fluid Mechanics (3) A *Christiansen, Decher, Kurosaka, Russell* Review of thermodynamics; vectors and dyads. Derivation of the Navier-Stokes equations, stream functions and potential functions; integrals of the equations of motion. Boundary conditions and discontinuity surfaces in fluids. Exact solutions. Dimensional analysis. Highly viscous flows.

A A 505 Fluid Mechanics of Inviscid Flow I (3) W *Christiansen, Decher, Kurosaka, Russell* Ideal incompressible flow; potential and stream functions. Airfoil theory and lifting line theory. Introduction to nonsteady flow; sound waves and surface waves; special topics. (Offered even-numbered years.)

A A 506 Fluid Mechanics of Inviscid Flow II (3) Sp *Christiansen, Decher, Kurosaka, Russell* Ideal compressible flow; supersonic airfoils; shock waves; slender-body theory; lifting surface theory; approximate methods. Transonic flow; similarity; special topics. Prerequisite: 505. (Offered even-numbered years.)

A A 507 Aerodynamics of Viscous Fluids I (3) W *Kurosaka, Russell* Introduction to viscous flow; exact solutions of the laminar equations of motion; approximate equations. Exact solutions for laminar boundary-layer equations. Approximate methods for compressible laminar boundary layers. (Offered odd-numbered years.)

A A 508 Aerodynamics of Viscous Fluids II (3) Sp *Breidenthal, Kurosaka, Russell* The phenomena of turbulence; transition prediction; Reynolds stresses; turbulent boundary-layer equations. Approximate methods for turbulent boundary layers. Prerequisite: 507 or permission of instructor. (Offered odd-numbered years.)

A A 509 Computational Fluid Dynamics I (3) W *Eberhardt* Numerical approximation of the inviscid compressible equations of fluid dynamics. Analysis of numerical accuracy, stability, and efficiency. Use of explicit, implicit, and flux split methods. Discussion of splitting, approximate factorization, discrete point, and finite volume approaches. Applications to the solution of simple hyperbolic systems of equations and the Euler equations.

A A 510 Computational Fluid Dynamics II (3) Sp Eberhardt Numerical approximation of equations of compressible viscous flow. Mesh requirements for resolving viscous effects in high Reynolds number flows. Analysis of numerical accuracy, stability, and efficiency. Use of explicit and implicit methods, boundary condition procedures. Applications to solution of the Navier-Stokes equations. Prerequisite: 509 or permission of instructor. (Offered odd-numbered years.)

A A 513 Gas Laser Theory and Practice (3) Sp Christiansen, Hertzberg, Russell Physics and fluid mechanics of high-power lasers, emphasis on performance of modern gas dynamic lasers, flowing chemical lasers, and gaseous electric lasers. Techniques of obtaining population inversions, power extraction, basic thermodynamics, and the interaction of optical radiation with matter. Applications of high-power lasers also are emphasized. (Offered even-numbered years.)

A A 516 Stability and Control of Flight Vehicles I (3) A Joppa Static and dynamic stability and control of flight vehicles in the atmosphere. Aerodynamics for stability derivatives. Response to control inputs and external disturbances. Effect of stability derivatives on flight characteristics. Handling qualities. Introduction to automatic control.

A A 517 Stability and Control of Flight Vehicles II (3) W Joppa, Vagners Specification of flight vehicle performance objectives. Control system components, sensor characteristics, choice of system models. Compensator design, frequency domain design of stability augmentation systems, single/multiple loop autopilot design and evaluation. Use of computer-aided control design packages. Prerequisite: 516.

A A 518 Stability and Control of Flight Vehicles III (3) Sp Vagners Introduction to Linear-Quadratic-Gaussian (LQG) optimal control theory. Synthesis of stability augmentation systems and autopilot control laws using LQG methodology. Relationship of LQG results to frequency domain criteria. Reduced-order controller synthesis, digital design and implementation. Use of computer-aided control design packages. Prerequisite: 517.

A A 523 Special Topics in Fluid Physics (3) AWSp

A A 524 Aerothermodynamics of Aircraft Gas Turbine Engines I (3) W Decher, Kurosaka Aircraft gas turbine engine cycle analysis. Component performance measures. Preliminary design of engines, including component losses. Off-design performance. Variable geometry engines. (Offered even-numbered years.)

A A 525 Aerothermodynamics of Aircraft Gas Turbine Engines II (3) Sp Decher, Kurosaka Estimation of component performances. Inlets, description of flow distortion. Aerodynamics of turbines and compressors. Radial equilibrium theory, through-flow theory, the cascade transformation. Behavior of mixers. Prerequisite: 524. (Offered even-numbered years.)

A A 526 Aerothermodynamics of Aircraft Gas Turbine Engines III (3) A Decher, Kurosaka Aircraft engine noise. Description and measurement of noise, correlation functions, power spectra. Elementary duct acoustics, rotor-stator interaction, effect of design blade loading. Turbine noise, core noise, acoustic linings. Jet noise, Lighthill theory, scaling laws. (Offered odd-numbered years.)

A A 527 Energy Conversion I (3) A Decher, Hertzberg Energy sources: resource magnitude estimates. Heat generation by advanced reactors, combustion, solar collection. Analysis of power systems for space and advanced commercial power generation. High-temperature cycles. (Offered even-numbered years.)

A A 528 Energy Conversion II (3) W Decher, Hertzberg Heat exchangers, energy storage, heat rejection. Direct conversion of heat to electricity. Electrochemical processes. Recommended: 527. (Offered odd-numbered years.)

A A 529 Space Propulsion (3) Sp Decher Nuclear, and heat transfer of nuclear-heated rockets. Electrothermal, electromagnetic, and electrostatic thrusters. Prerequisite: permission. (Offered odd-numbered years.)

A A 530 Mechanics of Solids I (3) A Bollard, Holsapple, Lin, Parmerter General concepts and theory of solid mechanics. Behavior of elastic, viscoelastic, and plastic solids. Linear theory of elasticity and thermoelasticity. Wave propagation in solids.

A A 531 Mechanics of Solids II (3) W Fyfe, Holsapple, Parmerter Theory of plasticity; yield surfaces, hardening rules; flow rules; path dependence; anisotropy. Limit theorems, slip line theory. Concepts of failure and fatigue. Prerequisite: 530 or equivalent or permission of instructor. (Offered odd-numbered years.)

A A 532 Mechanics of Composite Materials (3) Sp Holsapple, Lin, Parmerter Analyses and design of composite materials for aerospace structures. Anisotropic elasticity. Laminated plate theory. Viscoelastic behavior and wave propagation in composites. Prerequisite: 530 or permission of instructor. (Offered odd-numbered years.)

A A 535 Analysis of Shells (3) Sp Parmerter Nonlinear equations of shallow shells. Solution of the linearized equations for shells of revolution and other shapes. Composite shells; buckling. Postbuckling deformation of shells. (Offered even-numbered years.)

A A 540 Finite Element Analysis I (3) W Fyfe, Holsapple, Lin Formulation of the finite element method using variational and weighted residual methods. Element types and interpolation functions. Application to elasticity problems, thermal conduction, and potential flow.

A A 541 Finite Element Analysis II (3) Sp Fyfe, Holsapple, Lin Advanced concepts of the finite element method. Hybrid and boundary element methods. Nonlinear, eigenvalue, and time-dependent problems. Prerequisite: 540 or permission of instructor.

A A 548 Applied Optimal Control and Estimation I (3) W Review of calculus of variations, definition of the dynamic optimization problem, constraints and Lagrange multipliers, the Pontryagin minimum principle, necessary conditions for optimality, the Hamilton-Jacobi equation, singular arc problems, linear quadratic control problem. Joint with E E 548. Prerequisite: E E 584 or equivalent.

A A 549 Applied Optimal Control and Estimation II (3) Sp Review of continuous random processes, definition of the linear quadratic optimal control/estimation problem for continuous systems in the presence of noise, the certainty-equivalence principle, duality of regulator/follower-filter/smoothing problems, necessary conditions for optimality synthesis of steady-state regulators and filters using eigenvector decomposition techniques. Riccati equation factorization. Luenberger observers. Joint with E E 549. Prerequisites: 548 or E E 548, E E 505, or equivalent.

A A 550 Applied Optimal Control and Estimation III (3) A Review of discrete random processes, definition of the discrete linear quadratic optimal control/estimation problem, factorization methods for discrete filters, Luenberger observers, reduced order filters, suboptimal filters. Joint with E E 550. Prerequisite: 549 or E E 549 or permission of department Chairperson.

A A 553 Vibrations of Aerospace Systems (3) Sp Bollard, Fyfe Natural frequencies and modal analysis; forced vibrations and motion-dependent forces. Structural damping; composites and periodic structures. Measurements for structural dynamic testing. Prerequisite: 571 or equivalent. (Offered odd-numbered years.)

A A 555 Special Topics in Aerospace Systems (3) AWSp

A A 567 Analysis in Engineering and Science I (3) A Complex variable and associated topics. Branch cuts, series and product expansions. Contour integration, numerical implications. Harmonic functions. Complex potential (and singularities) in physical problems. Conformal mapping; applications and examples. Grid generation. Fourier and Laplace transforms, inversions, and asymptotics. Spectral decomposition, FFT method. Complex matrices. Joint with AMATH 567.

A A 568 Analysis in Engineering and Science II (3) W Survey of properties and practical solution techniques for ordinary differential equations. Series expansions. Eigenvalue problems. Transforms and applications. Variational methods. Asymptotic expansions. Perturbations, regular and singular. Difference equations. Numerical procedures. Joint with AMATH 568. Recommended: ENGR 401 or equivalent.

A A 569 Partial Differential Equations (3) Sp Properties of diffusion, wave, and Laplace-type equations. Initial and boundary-value problems. Series expansions, transform methods. Singularities, Green's functions. Classification of second-order equations; theory and applications of method of characteristics. Joint with MATH 569 and AMATH 569. Prerequisite: 568 or MATH 428 or ENGR 403 or permission of instructor.

A A 571 Principles of Dynamics I (3) A Fyfe, Vagners Review of rigid-body dynamics; calculus of variations. Lagrangian mechanics. The canonical equations of Hamilton; canonical transformations. Hamilton-Jacobi theorem; Hamiltonian perturbation theory. Periodic and quasiperiodic motion. Stability of dynamical systems; resonance in dynamical systems.

A A 575 Continuum Mechanics I (3) W Holsapple, Parmerter General foundation of the fundamental concepts of motion, stress, energy, and electromagnetism for a continuum. General equations of conservation of mass, momentum, and energy. Linear and nonlinear elastic, viscous, and inelastic materials. Joint with CESM 521.

A A 583 Special Topics in Solid Mechanics (3) AWSp

A A 584 Applied Linear Algebra and Introductory Numerical Methods (3) A Applied linear algebra: matrix operations, linear systems, matrix factorization, eigenvalues, numerical methods, applications to optimization, circuits, differential equations. Surveys of numerical methods: nonlinear systems, curve fitting, ordinary differential equations, quadrature, basic ideas in partial differential equations. Joint with AMATH 584.

A A 585, 586 Approximate Numerical Analysis II, III (3,3) W,Sp Advanced topics in numerical analysis. More detailed consideration of topics in 584. Emphasis on methods for partial differential equations, integral equations, finite elements, stability and accuracy, mesh generation, adaptive meshes, sparse matrices, variational methods. Post-master's sequence. Joint with AMATH 585, 586. Prerequisites: 567, 584, and 568, 569, or equivalent. (Offered even-numbered years.)

A A 590 Special Topics in Applied Analysis (3) AWSp

A A 599 Special Projects (1-5, max. 15) AWSp Investigation on a special project by the student under the supervision of a faculty member.

A A 600 Independent Study or Research (*) AWSp

A A 700 Master's Thesis (*) AWSp

A A 800 Doctoral Dissertation (*)

Bioengineering

309 Harris Hydraulics Laboratory

The Center for Bioengineering provides a comprehensive, multidisciplinary program of research and educa-

tion. The concepts and techniques of the physical sciences and engineering are applied to problems in the health sciences. Major areas of current bioengineering research include biomaterials, biomathematics, biomechanics, cochlear prosthesis, controlled drug-release systems, laser applications, mechanics of mucociliary transport, microanalysis of subcellular structures, microcirculatory exchanges and blood flow, muscle, and ultrasonic instrumentation. For a description of this program, its faculty, and its courses, see the Interschool or Intercollege Programs section of this catalog.

Chemical Engineering

105 Benson

Chemical engineering is concerned with processes for transforming raw materials into energy and into a great variety of consumer products, such as gasoline, pulp and paper, fertilizers, rubber, polymers and composites, pharmaceuticals, and electronic materials. Chemical engineers work on research and development of these materials and on the processes for making them, as well as on the design and operation of chemical plants and equipment by which production is achieved. This must be done with efficiency economy, and concern for society and the environment. Some chemical engineers are employed by government agencies. Few other professions can match the diversity of job opportunities available to graduates in chemical engineering.

Chemical engineers employ the skills of mathematics, physics, chemistry, and, increasingly, biology. The chemical engineer develops competence in the use of fundamental tools for engineering analysis and design: thermodynamics, chemical kinetics and reactor design, fluid mechanics, heat and mass transfer, process control, and economics. At the University, the student studies intensively in these fields to acquire knowledge and skills applicable in a variety of specialized fields and industries. Flexibility, in fact, is the hallmark of the chemical engineer. Graduates of the department are given thorough grounding in the three main pillars of a liberal education—science, technology, and the humanities and social sciences.

Undergraduate Program

Bachelor of Science in Chemical Engineering Degree

The Bachelor of Science in Chemical Engineering degree offered by the department is an accredited, professional program generally completed in four years. Its completion should enable the graduate either to find employment in industry or to continue on to graduate school.

Information on degree requirements is available in detail from the department. In brief, the required 180 credits are to be distributed in accordance with the following minimum number of credits in each component: mathematics, 23; physics, 12; chemistry, 37; communication skills, 12; engineer science electives, 18; humanities and social sciences, 30; chemical engineering, 41; and unspecified electives, 7. Each student is required to develop special competence in a selected subject by taking a minimum of three courses in that area. Engineering science and free electives may be used for this purpose. The areas are subject to change, but those currently being considered are applied mathematics, biotechnology, colloids and interfacial science, computers applied to chemical engineering, electronic materials, environmental engineering, food science and engineering, surface science, polymers and composites, and transport phenomena. A minimum grade-point average of 2.00 in chemical engineering courses, based on the first time each course is taken, is required for graduation.

The department participates in the Cooperative Education Program of the college. Most courses, however,

are usually given only once each year, which makes participation in the program difficult. The student should consult an adviser about the situation at any specific time.

Advising in the Department

All students, including freshmen and sophomores, who are considering chemical engineering as a major may, and are encouraged to, be advised in the department.

Admission Requirements

Admission to the department is limited, and application requirements are subject to change. Students should consult an adviser about current requirements. Applications from women and minorities are encouraged. The applicant must have completed at least 12 credits at this university and the following courses: MATH 124, 125, 126, 238 (18 credits); CHEM 140, 150, 151, 160, 231, 241 (20); PHYS 121, 122 (8), ENGR 141, 260 (8). In addition, it is strongly recommended that students complete PHYS 123. Currently, all applicants are admitted who have at least a 2.50 grade-point average for these specified courses as well as an overall grade-point average of at least 2.50 for all courses applicable to the B.S.Ch.E. degree. Applications for admission of students with a grade-point average lower than 2.50 will be considered by the admissions committee.

Application Procedure and Timing

Application is made by filling out an application form available in the department office.

Any student may apply for admission as soon as he or she meets the admission requirements. In anticipation of admission, students may preregister for departmental courses, but if denied admission they must withdraw from these courses during the change of registration period (first week of the quarter). Admission decisions for Winter Quarter applicants will be made immediately after Autumn Quarter grades are available to the department, normally December 30-31. Students who are admitted Winter Quarter must have had CH E 310, MATH 238, and at least 14 credits of chemistry at the 200 level or above (generally, 11 credits of organic chemistry and CHEM 455) by the end of the Autumn Quarter.

Admission for the Disadvantaged

While the sole purpose of the admission requirement is to limit enrollment to a number that can be taught well with the resources available, the department recognizes that this may eliminate some disadvantaged students whose potential is high but who, through extenuating circumstances of their background, have had limited access to early education that provides adequate experience in abstract reasoning. For purposes of special consideration for admission, a disadvantaged student is here defined as one who: (1) is economically disadvantaged as shown by eligibility for a Basic Need Grant on the National Financial Aid Program, or (2) is educationally disadvantaged, having attended a school without a full complement of college preparatory work available, or (3) has ethnic minority status with a group showing historic underrepresentation in the field of engineering. These students are encouraged to apply for admission and to attach to their application a letter to the admissions committee that provides information on the applicant that he or she believes is relevant to the admission decision.

Entrance to Chemical Engineering Courses

Entrance into most chemical engineering courses is ordinarily limited to majors in chemical engineering, pulp and paper technology, and the B.S.E. program. Other students who wish to take departmental courses must meet the admission requirements of the department, have the course prerequisites, and fill out a Chemical Engineering course request form.

Entry to a departmental course is ordinarily limited to students who have not previously passed the course.

Continuation Policy

The department policy on continuation is consistent with the continuation policy of the college. Details may be obtained from the department.

Graduate Program

The department offers studies leading to the degrees of Doctor of Philosophy, Master of Science in Chemical Engineering, and Master of Science in Engineering. The doctoral degree is centered on the dissertation with a foundation in course work. Primarily a research degree, the doctorate is generally completed in four to five years beyond the baccalaureate degree.

In the master's program primary emphasis is placed on course work, and the degree generally requires between fifteen and twenty-four months of study. Thesis and nonthesis options are available, with the former requiring both course work and research.

The program of study normally includes basic subjects of importance to all chemical engineers, such as thermodynamics, transport phenomena, kinetics, and applied mathematics. In addition, students are invited to take more specialized courses in chemical engineering or in other departments. Students usually take four courses during their first quarter. Subsequently, less time is spent on course work and more on research.

The department has about seventy full-time graduate students, roughly one-third of whom are working toward the M.S. degree and two-thirds toward the doctorate. They study and collaborate with members of the faculty in an atmosphere that is informal, friendly, and intellectually vigorous. The range of interests among the faculty members is quite broad, so students in courses and in research work have access to a variety of fields while receiving individual attention and guidance.

Research Facilities

The department is fortunate in having outstanding facilities. The chemical engineering building, Benson Hall, is supplied with much new research equipment. The building contains classrooms, offices, stockrooms, a well-staffed machine shop, laboratories, and a variety of specialized research equipment, including a VAX 11/750 computer, as well as three Apollo work stations and many microcomputers. Each graduate student is provided desk space in a small laboratory or office as well as access to larger laboratories in the building. Students also may use the services of the Academic Computer Center, the glassblowing shop, and the Chemistry-Chemical Engineering Library in neighboring Bagley Hall.

Admission Requirements

A student is accepted for admission to the Graduate School as a chemical engineering major by joint action of the Graduate School and the department after consideration of a formal application. Most students applying for admission as graduate students have a Bachelor of Science degree in chemical engineering. If a student has had an undergraduate degree in chemistry, physics, mathematics, or another branch of engineering, he or she may obtain a graduate degree in chemical engineering by meeting certain additional requirements.

The Graduate Record Examination (GRE), not including the advanced test, is generally required of all applicants, but exceptions can be made. In addition, applicants who do not have a baccalaureate degree in chemical engineering from an accredited university in the United States must take the advanced test in chemistry or engineering.

Financial Aid

The department has various sources of support for qualified graduate students. Prospective students in-

interested in applying for admission and support should request application forms from the department. The completed forms and reference letters should be received in the department office by January 31, if possible, and by March 15 at the latest. Offers of financial support are usually made in February and March. Students who receive financial support must be registered for 9 or more credits.

Correspondence and Information

Graduate Program Coordinator
Department of Chemical Engineering, BF-10

Faculty

Chairperson

Charles A. Sleicher

Professors

Allan, G. Graham,* 1966, (Forest Resources),† Ph.D., 1956, Glasgow; D.Sc., 1970, Strathclyde; fiber and polymer science, creativity and innovation.

Babb, Albert L.* 1952, (Bioengineering), (Nuclear Engineering),† M.S., 1949, Ph.D., 1951, Illinois; nuclear engineering, solvent extraction molecular diffusion, biomedical engineering.

Berg, John C.* 1964, Ph.D., 1964, California (Berkeley); interfacial phenomena, surface and colloid science.

Bowen, J. Ray,* 1981, M.S., 1957, Massachusetts Institute of Technology; Ph.D., 1963, California (Berkeley); combustion.

David, Morton M., 1953, (Emeritus), D.Eng., 1950, Yale; chemical engineering.

Davis, E. James,* 1983, Ph.D., 1960, Washington; transport in porous media, microparticle physics and chemistry, surface and colloid science.

Finlayson, Bruce A.* 1967, M.S., 1963, Rice; Ph.D., 1965, Minnesota; modeling of chemical reactors, polymer flow, flow through porous media.

Garlid, Kermit L.* 1960, (Nuclear Engineering),† Ph.D., 1961, Minnesota; nuclear fuel cycles, radioactive waste management, process dynamics.

Heideger, William J.* 1957, (Bioengineering), M.S.E., 1956, Ph.D., 1959, Princeton; interfacial mass transfer, biomedical transport phenomena.

Hoffman, Allan S.* 1970, (Bioengineering),† M.S., 1955, Sc.D., 1957, Massachusetts Institute of Technology; application of polymers in medicine and biotechnology.

Horbett, Thomas A.* 1973, (Research), (Bioengineering),† Ph.D., 1970, Washington; interfacial proteins, cell interactions, insulin delivery systems.

Johanson, Lennart N.* 1951, (Emeritus), M.S., 1943, Ph.D., 1948, Wisconsin; chemical engineering.

McCarthy, Joseph L.* 1941, (Emeritus), (Forest Resources),† M.S., 1936, Idaho; Ph.D., 1938, McGill; thermodynamics, lignin and cellulose, chemistry, pulp and paper science, biochemical engineering.

McKean, William T.* 1979, (Forest Resources),† Ph.D., 1968, Washington; pulp and paper science, mass transfer in wood and fibers, unit operations in papermaking.

Moulton, R. Wells, 1941, (Emeritus), M.S., 1934, Ph.D., 1938, Washington; chemical engineering.

Pilat, Michael J.* 1967, ‡(Civil Engineering), M.S.Ch.E., 1963, Ph.D., 1967, Washington; air resources engineering (design of air-pollution-control equipment).

Ratner, Buddy D.* 1972, (Bioengineering),† Ph.D., 1972, Polytechnic Institute of Brooklyn; polymer surfaces, interaction of polymeric materials with biological systems.

Sarkanen, Kyosti V.* 1961, (Forest Resources),† M.Sc., 1952, Ph.D., 1956, State University College of Forestry (New York); chemistry of lignin and cellulose.

Seferis, James C.* 1977, Ph.D., 1977, Delaware; polymeric composites, polymer science and engineering.

Sleicher, Charles A.* 1960, (Environmental Studies), S.M., 1949, Massachusetts Institute of Technology; Ph.D., 1955, Michigan; fluid mechanics, heat transfer.

Associate Professors

Kaler, Eric W.* 1982, Ph.D., 1982, Minnesota; surfactants, colloid science, scattering.

Krieger, Barbara B.* 1975, M.S., 1972, Ph.D., 1975, Wayne State; reaction engineering, chemical kinetics and catalysis simulation.

Ricker, N. Lawrence,* 1978, M.S., 1972, Ph.D., 1978, California (Berkeley); chemical process design, simulation, and control.

Assistant Professors

Fisher, Rod R.* 1987, M.S., 1984, Ph.D., 1987, Iowa State; biochemical separations.

Holt, Bradley R.* 1984, Ph.D., 1984, Wisconsin; process control, process design.

Manson, Jan-Anders E.* 1985, (Research), Ph.D., 1981, Chalmers University of Technology; advanced processing of polymers and composites, including injection molding.

Stuve, Eric M.* 1985, M.S., 1979, Ph.D., 1984, Stanford; catalytic and electrochemical surface science.

Course Descriptions

Courses for Undergraduates

CH E 309 Creativity and Innovation (2) *Allan* Understanding creativity and creative thinking; its challenges and dynamics through knowledge, judgment, planning, and observation. Techniques of creative thinking. Design and development of creative games. Computer-aided creative thinking. Creation, protection, and exploitation of a useful idea, including bargaining and negotiations. Joint with FPE 309. Prerequisite: junior standing or permission of instructor.

CH E 310 Material and Energy Balances (4) *A* Chemical and physical process calculations: steady- and unsteady-state material and energy balances with specific examples in vapor-liquid contact operations and multiphase extraction, and introductory thermochemistry. Prerequisite: ENGR 260, which may be taken concurrently, although inadvisably.

CH E 326 Chemical Engineering Thermodynamics (4) *W* Phase equilibria and chemical equilibria in multicomponent systems; theories of solution; chemical reaction analysis. Prerequisites: 310; CHEM 456 or ENGR 260.

CH E 330 Transport Processes I (4) *W* Diffusive transport of momentum, heat and mass; general aspects of fluid flow; the Navier-Stokes equations; one-dimensional flow with engineering applications. Prerequisites: 310 and MATH 238, which may be taken concurrently.

CH E 336 Chemical Engineering Laboratory I (2) Lectures on statistical analysis of data, experimental procedures, and report writing; laboratory experiments on transport phenomena, polymer properties, and data acquisition. Experimental techniques and report writing. Prerequisite: 330.

CH E 340 Transport Processes II (4) *Sp* Heat transfer, basic principles, and applications. Conduction, convection, and radiation. Prerequisite: 330.

CH E 435 Transport Processes III (4) *A* Mass transfer, basic principles, and applications to equipment design. Physical separation processes. Prerequisites: 310, 326, 330, 340.

CH E 436 Chemical Engineering Laboratory II (3) *A* Continuation of 336. Lectures on experimental design, instrumentation, and report writing; laboratory experiments on fluid mechanics and heat transfer. Experimental planning, procedures, and report writing. Prerequisites: 330, 336, 340.

CH E 437 Chemical Engineering Laboratory III (3) *W* Continuation of 436. Laboratory investigation of chemical engineering principles applied to equipment design with emphasis on mass transfer operations and chemical reactors. Prerequisites: 435, 436, 465.

CH E 455 Surface and Colloid Science Laboratory (3) *Sp* *Berg* Laboratory techniques, equipment, and underlying fundamentals in surface and colloid science. Experiments in the measurement of surface tension, adsorption, wetting and spreading, colloid properties, emulsion preparation and stability, electrophoresis, and interfacial hydrodynamics. Prerequisites: 326, 330, CHEM 461.

CH E 456 Physical Chemistry (3) Chemical thermodynamics. Laws of thermodynamics presented with applications to phase equilibria, chemical equilibria, and solutions. Honors section available Autumn Quarter. Joint with CHEM 456. May be taken without CHEM 455. Prerequisites: CHEM 150 or 155, MATH 126, and college physics. Recommended: MATH 238.

CH E 458 Surface Analysis (3) Understanding of solid surfaces for research and development in microelectronics, catalysis, adhesion, biomaterials science, wear, and corrosion science. Newer methods available to study surfaces of materials. Electron emission spectroscopies (ESCA, Auger): ion scattering, ion spectroscopic, photon spectroscopic, and thermodynamic methods. Joint with BIOEN 492.

CH E 465 Reactor Design (3) *A* Application of principles of chemical kinetics to the design of commercial-scale chemical reactors; characterization of batch and flow reactors in homogeneous and heterogeneous systems. Prerequisites: 310, 326, 330, 340.

CH E 467 Biochemical Engineering (3) Application of basic chemical engineering principles to biochemical and biological process industries such as fermentation, enzyme technology, and biological waste treatment. Rapid overview of relevant microbiology, biochemistry, and molecular genetics. Design and analysis of biological reactors and product recovery operations. Joint with BIOEN 467. Prerequisites: 340, organic chemistry; recommended: 465.

CH E 468 Air-Pollution Control Equipment Design (3) Designs to control air pollutants from stationary sources. Procedures for calculating design and operating parameters. Fundamental mechanisms and processes of gaseous and particulate control equipment for absorption and adsorption of gaseous pollutants; electrostatic precipitation and filtration of particulate pollutants. Actual case studies. Joint with CEWA 468 and M E 468. Prerequisite: senior standing or permission of instructor.

CH E 470 Chemistry of Wood (3) *A* Chemical and physical properties of cellulose, lignin, hemicellulose, and extractives; wood as a raw material for the chemical industry. Prerequisite: CHEM 102 or 232 or permission.

CH E 471 Pulping and Bleaching Processes (3) *W* *Sarkanen* Conversion of wood to mechanical and chemical pulps. Kraft, sulfite, and semichemical pulping processes. Chemical recovery systems. Bleaching of mechanical and chemical pulps. Joint with FPE 476.

CH E 472 Papermaking Processes (3) *Sp* Fiber sources and properties. Secondary fibers. Stock prep-

aration, sheet forming, water removal, finishing. Coating, lamination, and printing. Paper products. Joint with FPE 477.

CH E 473 Pulp and Paper Laboratory (2) *Sarkanen* Laboratory experiments in chemical and semi-chemical pulping of wood. Bleaching of chemical and high-yield pulps. Physical and chemical characteristics of pulp fibers. Joint with FPE 478. Prerequisite: FPE 476.

CH E 475 Computer Analysis in Chemical Engineering (3) Model building/simulation of chemical engineering processes: reactor design, fiber spinning, electrochemistry, biotech processes. Numerical methods include integrating ordinary differential equations as initial and boundary-value problems; finite difference, collocation, Galerkin methods. For each model the appropriate tool is developed. Prerequisite: ENGR 341.

CH E 480 Process Dynamics and Control (4) *W* Analysis of the dynamics of simple chemical process units and systems; applications to stability, control, and instrumentation of such processes. Weekly two-hour laboratory included. Prerequisites: 310, 326, 330, 340.

CH E 481 Process Optimization (3) *Sp* Concepts and techniques of optimizing chemical engineering processes and systems, including classical and direct methods of search, linear and nonlinear programming, dynamic programming, statistical experimental design, and evolutionary operation. Prerequisites: 435, 485.

CH E 482 Advanced Topics in Process Control (3) *Sp* *Holt, Ricker* Current topics in process control design and analysis. Possible topics include robustness analysis and design, time delay compensation, modern frequency response techniques, discrete control, adaptive control, model-based control, and nonlinear control. Prerequisite: 480.

CH E 485 Process Design I (3) *W* Applied economics in chemical engineering design and operations; market survey and plant location; introduction to plant and process design. Prerequisite: 435.

CH E 486 Process Design II (5) *Sp* Comprehensive design of a specific process, including economic feasibility studies, utilization of market survey and plant location studies, process equipment design and optimization, and overall plant integration and layout. Prerequisites: 435, 465, 485.

CH E 487 Industrial Waste Management (3) Application of chemical engineering concepts to industrial waste management and to the analysis of constraints and criteria encountered in such application. Includes design of biological and physical control systems as well as nontreatment alternatives. Prerequisite: permission of instructor.

CH E 490 Engineering Materials for Biomedical Applications (3) *W* *Hoffman* Combined application of the principles of physical chemistry, biochemistry, materials engineering, mass transfer, and fluid mechanics to biomedical problems. Case studies include considerations of the selection of materials, the design and the operation of instruments, components of, or entire, artificial organs (heart, kidney, lung) and artificial structural elements (bone, teeth, skin), all for use in contact with body fluids. Joint with BIOEN 490. Prerequisite: organic chemistry or permission of instructor. (Offered even-numbered years.)

CH E 491 Controlled Release Systems—Principles and Applications (3) *W* *Hoffman* Mechanisms for controlled release of active agents and the development of useful systems for this purpose. Release mechanisms include diffusive, convective, or erosive driving forces. Applications to the biomedical, agricultural, forestry, and oceanography fields. Some special case studies covered in detail. Joint with BIOEN 491. Prerequisite: permission of instructor. (Offered odd-numbered years.)

CH E 495 Physicochemical Transport Phenomena (3) Low Reynolds number hydrodynamics for flow around solid and fluid spheres and near surfaces. Convective diffusion in liquids within capillary tubes and outside the flat plate, the rotating disk, the sphere. Flow and convective diffusion in porous media. Electrokinetic phenomena, including electrophoresis, electro-osmosis, streaming potential. Applications to electrochemistry. Prerequisite: 330.

CH E 498 Special Topics in Chemical Engineering (1-4, max. 6) Topics of current interest in the field. Subject matter changes from year to year. Prerequisite: permission of instructor.

CH E 499- Undergraduate Research (1-6, max. 12) *AWSp* Independent research projects in chemical engineering. Prerequisite: permission of instructor.

Courses for Graduates Only

CH E 523 Seminar in Chemical Engineering (0-1) *AWSp* Topics of current interest in chemical engineering. Offered on credit/no credit basis only.

CH E 525 Chemical Engineering Thermodynamics (4) *A* Review of principles of thermodynamics. Applications to problems in multiphase and multicomponent systems; theories of solutions. Prerequisite: undergraduate thermodynamics.

CH E 526 Topics in Thermodynamics (3) Classical and molecular thermodynamics of phase equilibria, solution theory, thermodynamic stability, and critical phenomena. Prerequisite: 525 or permission of instructor.

CH E 530 Momentum, Heat, and Mass Transfer I (4) *A* Derivation of the differential equations for mass, energy, and momentum transport. Principles of fluid mechanics; creeping flow, turbulence, boundary-layer theory.

CH E 531 Momentum, Heat, and Mass Transfer II (4) Continuation of 530. Flows of fluid-particle systems; convective heat transfer, natural convection. Prerequisite: 530.

CH E 532 Separation Processes (3) Design of industrial processes for separation and purification of materials. Covers classification and selection of separation techniques, efficiency of separators, energy conservation concepts, and methods for design calculations.

CH E 533 Mass Transfer (3) Molecular mass transport; single-phase mixing; age distributions and residence time analysis; transfer across interfaces; coupled heat and mass transfer; effects of chemical reaction; design considerations.

CH E 543, 544 Fluid Turbulence (3,3) *W,Sp* Methods of characterizing fluid turbulence; spatial, temporal velocity correlations; energy spectra; probability concepts; isotropic, nonisotropic turbulence; hot-wire measurement techniques; phenomenological turbulence models; higher-order closure models; local equilibrium concepts; recent advances in modeling techniques. Joint with M E 543, 544. Prerequisite: 6 credits of graduate fluid mechanics or permission of instructor. (Offered even-numbered years.)

CH E 555 Interfacial Phenomena (4) *Sp* *Berg* Surface tension, capillary statics, wetting and spreading phenomena; thermodynamics of capillary systems, adsorption, surfactant monolayers and micellar solutions; capillary hydrodynamics, interfacial turbulence and applications in distillation, absorption, and extraction. Prerequisites: 525, 530, or permission of instructor. (Offered even-numbered years.)

CH E 556 Principles and Applications of Colloidal Materials (3 or 4) *Sp* *Berg, Hoffman* Preparation, stabilization, properties, and destruction of important colloidal materials. The theory and structure of the electrical double layer, electrokinetics. Includes se-

lected case studies pertinent to air and water pollution, biological fluids, industrial processes. (Offered odd-numbered years.)

CH E 558 Surface Analysis (3) *W* *Ratner* Understanding of solid surfaces for research and development in microelectronics, catalysis, adhesion, biomaterials science, wear, and corrosion science. Newer methods available to study surfaces of materials. Electron emission spectroscopies (ESDA, Auger); ion scattering, ion spectroscopic, photon spectroscopic, and thermodynamic methods. Joint with BIOEN 592.

CH E 560 Reactions at Solid Surfaces (3) Fundamental studies of adsorption systems and reactions that occur at surfaces with application toward heterogeneous catalysis, electrochemistry, etching, and corrosion. Analysis of reaction poisons and promoters, acid-base theory of metal surfaces, jellium theory of metals, and water and ion adsorption, plus other topics of current interest. Recommended: 558 or CHEM 560.

CH E 564 Applications of Chemical Kinetics (3) Fast reactions and highly energetic reactions with applications to combustion, explosions, and lasers. Coupling of transport processes and reaction rates, photochemical kinetics, intermolecular energy transfer, free radical, and chain reaction kinetics. Rate plasmas, flames, and biological systems.

CH E 565 Kinetics and Catalysis (3) *Finlayson, Krieger, Stuve* Homogeneous and heterogeneous systems with emphasis on chemical engineering principles applied to industrial reactor design. Prerequisite: 525.

CH E 566 Control of Gaseous Air Pollutants (3) *Sp* *Pilat* Physical and chemical processes used to control gaseous air pollutants. Absorption into liquids. Aqueous spray dryer scrubbers. Adsorption beds. Control of sulfur oxide and nitrogen oxide. Case studies of control systems. Joint with CEWA 566. Prerequisite: 435 or 468 or permission of instructor. (Offered even-numbered years.)

CH E 567 Control of Particulate Air Pollutants (3) *Sp* *Pilat* Processes used to control emissions of particulate air pollutants. Use of settling chambers, cyclones, fabric filters, wet scrubbers, and electrostatic precipitators to control aerosol particles. Case studies of particulate air-pollutant control systems. Joint with CEWA 567. Prerequisite: 468 or permission of instructor. (Offered odd-numbered years.)

CH E 570 Chemistry of High Polymers (3, max. 6) *Allan* Fundamentals of high polymer chemistry, including kinetics of addition and condensation polymerization, the determination of average molecular weights and chain length distributions, solution properties and the relationship between molecular structure and plastic film and fiber properties of various polymers. Prerequisite: an undergraduate sequence in organic chemistry.

CH E 571 Polymer Physics and Engineering (3) *Sp* *Seferis* Description and analysis of methods for processing polymeric materials. Introduction to solid polymer physics with emphasis on the coupling of structure morphology and properties. Development of structure-property models for quantitative description and control of properties in synthetic and natural polymers and composite materials.

CH E 572 Advanced Polymeric Composites (3) *Seferis* Design, manufacture, and properties of organic and inorganic particle and fiber-reinforced polymers. Advanced techniques for characterization of processing and properties, including anisotropic elasticity/viscoelasticity theory, polymerization and network formation of matrices, theory of reinforcement, environmental and chemical effects. Prerequisite: 571 or MSE 423 or permission of instructor.

CH E 574 Cellulose and Lignin (3) *W* *Sarkanen* Chemistry and technology of cellulose, lignin, and related substances. Preview of the chemistry of conver-

sion of wood to pulp, paper, and by-products. Prerequisite: 470.

CH E 575 Nonlinear Analysis in Chemical Engineering (3) Sp *Finlayson* Comparison of numerical techniques: similarity, perturbation, finite difference, Galerkin, orthogonal collocation methods as applied to nonlinear chemical engineering problems. (Offered odd-numbered years.)

CH E 580 Topics in Chemical Engineering Design (3, max. 9) Lectures and seminars on current design methods in chemical engineering, including technical and economic feasibility of processes, design and optimization of process equipment, and environmental and social constraints. Prerequisite: undergraduate chemical engineering design, admission to chemical engineering nonthesis master's program, or permission of instructor.

CH E 582 Advanced Topics in Process Control (3) Sp *Holt, Ricker* Current topics in process control design and analysis. Possible topics include robustness analysis and design, time delay compensation, modern frequency response techniques, discrete control, adaptive control, model-based control, and nonlinear control. Prerequisites: undergraduate control class and graduate standing.

CH E 590 Advanced Topics in Biomaterials (3) Major, controversial issues in application of synthetic materials to medical problems. Blood compatibility, bioadhesion, intraocular lenses, contact lenses, polyurethanes, biodegradation, protein adsorption, corrosion, bone fixation, new materials, artificial heart, medical device regulation. Joint with BIOEN 590. Prerequisite: 490 or BIOEN 490.

CH E 599 Current Topics in Chemical Engineering (1-3, max. 12) Readings or lectures and discussions of topics of current interest in the field of chemical engineering. Subject matter changes from year to year. Prerequisite: permission of instructor.

CH E 600 Independent Study or Research (*) AWSpS

CH E 700 Master's Thesis (*) AWSpS

CH E 800 Doctoral Dissertation (*) AWSpS

Civil Engineering

Colin B. Brown, Chairperson
201 More, FX-10

Civil engineering is a profession serving the public. A very broad field, it interfaces closely with society in the planning, design, construction, and management of facilities serving the needs of people. These activities include all transportation modes: highways, aerospace, rivers, and harbors; water resources, hydraulics, and coastal engineering; structures, mechanics, and geotechnical engineering; surveying, mapping, and photogrammetry; urban planning and development; water supply, wastewater treatment, and water-quality management; solid- and hazardous-waste disposal; and quality control and management of the air resource.

A civil engineer may specialize in one or several of these activities and may further specialize in a particular function, such as design or management. The civil engineer's work frequently provides close associations with the legal profession, urban and regional planners, economists, public officials, biologists, chemists, financial consultants, architects, and system analysts. An essential ingredient in education and practice is a consideration not only of the technological-science aspects of a particular problem but also of its relationship to social, economic, political, and environmental constraints.

To better accommodate these wide areas of interest, the department is organized into three academic pro-

grams: Structural and Geotechnical Engineering and Mechanics; Transportation, Surveying, and Construction Engineering; Environmental Engineering and Science.

Undergraduate Program

Admission to the department is usually at the junior level. Enrollment in the department is limited; students who desire entrance must formally apply to, and be accepted by, the departmental admissions committee. The primary admission criterion is degree of qualification for probable success in the engineering degree program as evidenced by academic performance, work experience, and other factors. Specific courses required are: MATH 124, 125, 126, 205; CHEM 140; PHYS 121, 122; ENGL 131; and ENGR 210, 220, 230. Prospective students should obtain a copy of the departmental undergraduate advising guide and the departmental application form, both of which are available in 201 More.

Bachelor of Science in Civil Engineering Degree

The minimum number of credits required for graduation with the Bachelor of Science in Civil Engineering degree is 183. The requirements of the College of Engineering apply to a specified 104-credit minimum in mathematics, natural sciences, functional techniques, engineering science, humanities, and social sciences. Upper-division requirements in civil engineering include a common core of specified courses taken in the junior year.

Correspondence and Information

Undergraduate Advising Office
201 More, FX-10

Graduate Program

John F. Stanton
Graduate Program Coordinator

The Department of Civil Engineering offers courses leading to the degrees of Master of Science in Civil Engineering and Doctor of Philosophy. The department also provides authorized options leading to the college-wide Master of Science and Master of Science in Engineering degrees.

The three master's programs are intended to accommodate the needs of three categories of students: the M.S.C.E. for those who have completed an undergraduate degree in civil engineering and plan to continue with their professional training; the college-wide M.S.E. for other engineering graduates who wish to do graduate work in civil engineering; and the college-wide M.S. for those whose Bachelor of Science degrees are not in engineering, but who desire to apply their training in science to the solution of problems in some specific sector related to civil engineering. The nonengineer may take additional course work to obtain an M.S.E. degree.

Graduate work is offered in most fields of civil engineering. To accommodate these wide areas of interest, the department is organized into three academic graduate programs: structural and geotechnical engineering and mechanics; transportation, surveying, and construction engineering; and environmental engineering and science.

Priority for admission is based on an applicant's apparent ability to progress satisfactorily in a graduate degree program. The applicant's scholastic record is of major importance; usually, at least a B, or 3.00 grade-point, average in the junior and senior years is required. Consideration is also given to the Graduate Record Examination scores and other information.

Degree Requirements

The requirement for the master's degree is a minimum of 39 credits, of which 30 must be in formal course work and 9 in thesis. A nonthesis program is available, requiring a minimum of 45 credits, of which at least 3 credits will be individual study with the advisory committee chairperson. For all master's degrees, at least 3 credits must be from outside the major field of study.

Students working for the Ph.D. degree must complete an approved program of studies and research normally requiring an additional two or three years beyond the master's degree.

Financial Aid

Fellowships and scholarships are available. Most graduate students who receive financial assistance are research assistants. The number of positions depends upon the current level of funding. Additionally, some students are supported as teaching assistants.

Research Facilities

More Hall and Wilcox Hall have structural, concrete, and bituminous materials, soil mechanics, surveying and photogrammetry, computer, water-quality, solid-wastes, and air-quality laboratories as well as an air-monitoring station and equipment for fieldwork in the construction, water, air, and solid-waste programs. Facilities for experimental studies in hydraulics and coastal engineering and in fluid mechanics are located in the Harris Hydraulics Laboratory.

Correspondence and Information

Graduate Program Coordinator
201 More, FX-10

Faculty

Chairperson

Colin B. Brown

Professors

Bogan, Richard H.,* 1954, M.S., 1952, Sc.D., 1954, Massachusetts Institute of Technology; water and air resources, environmental engineering.

Brown, Colin B.,* 1969, Ph.D., 1962, Minnesota; structural engineering and systems.

Burges, Stephen J.,* 1970, M.S., 1968, Ph.D., 1970, Stanford; surface and groundwater hydrology, water resource systems analysis and design.

Carlson, Dale A.,* 1955, (Emeritus), M.S.C.E., 1951, Washington; Ph.D., 1960, Wisconsin; water resources and solid-waste management.

Clanton, Jack R., 1948, (Emeritus), M.S.C.E., 1939, Pittsburgh; structural engineering.

Colcord, Josiah E.,* 1949, M.S.C.E., 1949, Minnesota; surveying engineering.

Dunn, Walter L., 1954, (Emeritus), M.P.H., 1953, California (Berkeley); transportation planning.

Elias, Ziad M.,* 1969, Ingénieur, 1958, Paris (France); Sc.D., 1963, Massachusetts Institute of Technology; engineering mechanics.

Evans, Roger J.,* 1966, Sc.M., 1959, Brown; Ph.D., 1965, California (Berkeley); engineering mechanics, structural engineering.

Ferguson, John F.,* 1974, M.S., 1964, Ph.D., 1970, Stanford; chemical and biological processes in water and waste treatment and in natural water systems.

Hammer, Vernon B., 1947, (Emeritus), M.S., 1941, Harvard; solid-waste management.

Hartz, Billy J.,* 1955, (Emeritus), M.S., 1954, Ph.D., 1955, California (Berkeley); engineering mechanics, structural mechanics.

Hawkins, Neil M.,* 1968, (Architecture), M.S., 1959, Ph.D., 1961, Illinois; structures and materials.

Hennes, Robert G., 1934, (Emeritus), M.S., 1928, Massachusetts Institute of Technology; transportation engineering.

Holtz, Robert D. II,* 1988, M.A., 1962, Minnesota; Ph.D., 1970, Northwestern; soil mechanics and highway engineering.

Lettenmaier, Dennis P.,* 1976, (Research), M.S., 1973, George Washington; Ph.D., 1975, Washington; systems analysis and water resources planning.

Mar, Brian W.,* 1967, (Environmental Studies, Fisheries), M.S., 1956, Ph.D., 1958, M.S.C.E., 1967, Washington; system engineering, environmental management, interdisciplinary management.

Mattock, Alan H.,* 1964, M.Sc., 1949, Ph.D., 1955, London; structural behavior and design.

Meese, Richard H., 1946, (Emeritus), S.M., 1941, Harvard; soil mechanics and foundations.

Neece, Ronald E.,* 1959, M.S.C.E., 1951, Lehigh; Sc.D., 1958, Massachusetts Institute of Technology; hydraulic and coastal engineering.

Nihan, Nancy L.,* 1974, M.S.C.E., 1967, Ph.D., 1970, Northwestern; transportation planning and systems analysis.

Pilat, Michael J.,* 1967, (Chemical Engineering),† M.S.Ch.E., 1963, Ph.D., 1967, Washington; air resources engineering (design of air-pollution-control equipment).

Richey, Eugene P., 1954, (Emeritus), M.S., 1947, M.S.C.E., 1948, California Institute of Technology; Ph.D., 1955, Stanford; hydraulic engineering.

Roeder, Charles W.,* 1977, M.S., 1971, Illinois (Urbana); Ph.D., 1977, California (Berkeley); structures and materials.

Rossano, August T., Jr., 1963, (Emeritus), S.M., 1941, Sc.D., 1954, Harvard; air resources.

Sawhill, Roy B.,* 1956, (Emeritus), M.S.E., 1952, California (Berkeley); transportation engineering, traffic engineering and traffic safety.

Schneider, Jerry B.,* 1968, (Environmental Studies, Urban Design and Planning), M.C.P., 1961, California (Berkeley); Ph.D., 1966, Pennsylvania; planning and programming, major public utilities.

Seabloom, Robert W.,* 1954, (Emeritus), M.S.C.E., 1956, Washington; water-quality and solid-waste management.

Sergev, Sergius I., 1924, (Emeritus), M.E., 1923, Washington; structural engineering.

Stensel, H. David,* 1984, M.E., 1968, Ph.D., 1971, Cornell; water pollution, sanitary engineering.

Sylvester, Robert O., 1947, (Emeritus), S.M., 1941, Harvard; water resources.

Terrel, Ronald L.,* 1970, (Emeritus), M.S.C.E., 1981, Purdue; Ph.D., 1967, California (Berkeley); pavement design and construction materials.

Vasarhelyi, Desi D., 1950, (Emeritus), Dr.Ingr., 1944, Technical University (Budapest); structural engineering.

Veress, Sándor A.,* 1965, M.S., 1956, Sopron (Hungary); Ph.D., 1969, University de Laval (Quebec); photogrammetry.

Welch, Eugene B.,* 1968, (Environmental Studies), M.S., 1959, Michigan State; Ph.D., 1967, Washington; water resources and aquatic biology.

Wenk, Edward, Jr.,* 1970, (Emeritus), (Public Affairs),† M.S., 1947, Harvard; Dr.Eng., 1950, Johns Hopkins; structural mechanics, marine technology affairs, decision analysis, futures and science policy.

Wessman, Harold E., 1948, (Emeritus), (Public Affairs),† M.S., 1925, Ph.D., 1936, Illinois; structural engineering.

Zerbe, Richard O.,* 1976, ‡(Public Affairs), Ph.D., 1969, Duke; economics, economics of regulation and pollution-control strategies.

Associate Professors

Banerjee, Sunimal,* 1981, M.S., 1973, Rutgers; Ph.D., 1978, California (Berkeley); foundation and geotechnical engineering, soil mechanics.

Benjamin, Mark M.,* 1977, M.S., 1973, M.S., 1975, Ph.D., 1979, Stanford; chemistry of natural waters, chemical and biological treatment of water and wastewater.

Chenoweth, Harry H., 1946, (Emeritus), M.S.C.E., 1957, Washington; engineering mechanics and hydraulic engineering.

Chu, Wen-Sen,* 1982, M.S., 1976, Ph.D., 1979, California (Los Angeles); computational hydraulics, numerical methods, water resources engineering.

Covert, David S.,* 1975, (Research), ‡(Environmental Health), M.S., 1971, Ph.D., 1974, Washington; environmental health aspects of aerosols and ambient monitoring.

Goldblatt, Steven M., 1982, ‡(Architecture, Building Construction, Education), J.D., 1977, Golden Gate; construction law.

Harrison, Halstead,* 1971, ‡(Atmospheric Sciences, Environmental Studies, Geophysics), Ph.D., 1960, Stanford; atmospheric chemistry.

Hinze, Jimmie W.,* 1984, M.S., 1972, Texas; Ph.D., 1976, Stanford; construction engineering and management.

Horner, Richard R.,* 1981, (Research), M.S., 1966, Pennsylvania; Ph.D., 1978, Washington; effects of human activities on aquatic ecosystems, nonpoint source water pollution, environmental impact assessment, aquatic ecosystem monitoring.

Kent, Joseph C.,* 1952, M.S., 1948, Stanford; Ph.D., 1952, California (Berkeley); hydraulic engineering.

Konichek, Dorland H., 1954, (Emeritus), B.S.C.E., 1930, North Dakota State; general engineering.

Larson, Timothy V.,* 1976, M.S., 1972, Ph.D., 1976, Washington; airborne particles, air-quality modeling, and instrument development.

Mahoney, Joe P.,* 1978, M.S.C.E., 1970, Ph.D., 1979, Texas A&M; construction materials, pavement systems.

Miller, Gregory R.,* 1983, M.S.C.E., 1981, Ph.D., 1984, Northwestern; structural materials, solid mechanics, nonlinear dynamics.

Miller, William M.,* 1951, (Emeritus), M.S.C.E., 1952, Washington; materials.

Palmer, Richard N.,* 1979, M.S., 1973, Stanford; Ph.D., 1979, Johns Hopkins; civil engineering systems, computer methods, water resources planning and management.

Reed, Dorothy A.,* 1983, M.S.E., 1977, Ph.D., 1980, Princeton; structural and wind engineering and expert systems.

Rutherford, G. Scott,* 1981, M.S.C.E., 1968, Washington State; Ph.D., 1974, Northwestern; transportation planning and engineering.

Spyridakis, Dimitris E.,* 1970, M.S., 1959, Ph.D., 1965, Wisconsin; soil and water chemistry.

Stanton, John F.,* 1978, M.S., 1975, Cornell; Ph.D., 1978, California (Berkeley); structural engineering, analysis and design.

Strausser, Howard S.,* 1955, (Emeritus), M.S.E., 1950, Johns Hopkins; hydraulic engineering.

Assistant Professors

Jahren, Charles T., 1987 M.B.A., 1983, Ph.D., 1987, Purdue; construction engineering and management, especially waterfront and marine construction and temporary structures.

Janssen, Don J.,* 1985, M.S., 1980, Ph.D., 1985, Illinois; construction materials, pavements.

Kramer, Steven L.,* 1984, M.Eng., 1979, Ph.D., 1984, California (Berkeley); soil mechanics, foundation engineering, geotechnical earthquake engineering.

Mannerling, Fred L.,* 1986, M.S., 1979, Purdue; Ph.D., 1983, Massachusetts Institute of Technology; traffic flow theory, networks, econometric methods, equilibrium in transportation markets.

Shawcroft, Robert G., 1980, (Research), M.U.P., 1975, Ph.D., 1979, Washington; information systems in transportation planning and construction management.

Yeh, Harry H.,* 1983, M.S., 1977, Washington State; Ph.D., 1983, California (Berkeley); fluid mechanics, wave motions.

Course Descriptions

Courses for Undergraduates

Core Courses

CIVE 213 Plane Surveying (3) ASP Colcord
Plane surveying methods involving levels, transits/theodolites, and distance measurement. Computation of local coordinates, areas, and volumes. Mapping by stadia and other techniques. Introduction to public land system. Plan and profile preparation. Prerequisite: MATH 124 or Q SCI 291.

CIVE 250 Environmental Pollution: Assessing Problems and Solutions (5) Sp Carlson, Welch
Problems in air, water, land environment caused by increasing demands on resources; their definition, control or prospects for control from engineering viewpoint. Ecological cycles, quantity/quality of wastes, biological effects of pollutants, energy, legislation and policy. Joint with ENV S 250.

CIVE 306 Construction Engineering I (3) WSP Hinze
Introduction to construction engineering, planning, scheduling, methods, contracts, and specifications. Production estimates; equipment selection; ownership and operating costs; role of the engineer in construction. Prerequisite: civil engineering students only or by departmental permission.

CIVE 316 Surveying Engineering (4) ASP Veress
Introduction to geodetic and photogrammetric concepts and their applications to engineering surveys. Errors. Measurement of position with modern techniques, including use of tachymetric, optical, and electronic instruments. Reduction to plane coordinates. Analysis and adjustment of measurements by computer. Prerequisites: ENGR 141 or permission, mathematics including matrix algebra and statistics desired. Civil engineering students only or by departmental permission.

CIVE 320 Transportation Engineering I (3) AW Mannerling
Introduction to the historical development of transportation with important legislation. Review of operating characteristics of transportation modes, review of methods used to predict travel demand and capacity supply; study of basic geometric fundamentals and their relationship to design with emphasis on highways, concepts of administration, and management of transportation systems. Prerequisite: 316, which may be taken concurrently.

CIVE 342 Fluid Mechanics (4) ASP Neece
Elementary mechanics of incompressible fluids. Hydrostatics. Continuity, energy, and momentum equations. Introduction to potential flow. Resistance phenomena for laminar and turbulent flows. Dynamic similitude. Prerequisites: ENGR 210, 230, and civil engineering students only or by departmental permission.

CIVE 345 Hydraulic Engineering (4) AW Neece
Extension and application of fluid mechanics principles to hydraulic engineering problems. Open channel flow, pipeline systems, turbomachinery, unsteady flow in pipes, diffusion and mixing processes, surface water hydrology. Prerequisites: 342 and civil engineering students only or by departmental permission.

CIVE 350 Environmental Engineering — Water and Air Quality (4) AW Ferguson
Description of water and air resources and parameters that charac-

terize their quality. How their use alters their properties, emphasis on effects of civil engineering projects; significance to engineer/scientist and society. Laboratory sessions stress water-quality analysis techniques and significance. Prerequisite: civil engineering students only or by departmental permission.

CIVE 351 Water Supply and Waste Management (3) WSp Bogan, Stensel Fundamentals of water supply: surface- and ground-water sources, demand, and system design. Municipal sewerage systems: wastewater quantity and quality, and fundamentals of engineering design for collection, treatment, and disposal. Solid wastes: characteristics and quantities, collection, treatment, and disposal. Prerequisites: 345, which may be taken concurrently, 350, and civil engineering students only or by departmental permission.

CIVE 363 Constructional Materials (4) ASp Mahoney, Miller General treatment of physical and mechanical properties and engineering behavior of metallic and nonmetallic materials. Steel, aluminum, concrete, wood. Laboratory testing, instrumentation, and investigation into macrobehavior. Correlation with microstructure and various aspects of materials science. Prerequisites: ENGR 220 and civil engineering students only or by departmental permission.

CIVE 366 Basic Soil Mechanics (4) WSp Banerjee, Kramer Introduction to basic soil properties, soil classification, volumetric relationships, compaction, consolidation, soil rheology, shear strength, bearing capacity, and lateral stresses against retaining structures. Prerequisites: ENGR 220 and civil engineering students only or by departmental permission.

CIVE 379 Mechanics of Structural Elements (3) ASp Elias, Evans Review of engineering theory of beams, combined stresses, beam deflections and influence lines, indeterminate beams; principle of virtual work, application to beams; unsymmetrical bending, shear center, torsion of open and closed thin-walled sections; composite beams; inelastic bending of beams; elastic stability, beam-columns, column design formulas. Prerequisites: ENGR 220 and civil engineering students only or by departmental permission.

CIVE 380 Structural Analysis I (3) AW Elias, Evans, Reed Types of structures, loadings, object, and role of structural analysis. Force method applied to statically determinate and statically indeterminate structures. Behavior of determinate and indeterminate structures under service loads and beyond the elastic limit. Stiffness analysis through moment distribution. Prerequisites: 379 and civil engineering students only or by departmental permission.

CIVE 381 Concepts of Structural Design (3) WSp Brown, Mattock, Reed, Roeder, Stanton Planning, design, and constructional aspects of structures. Criteria for structural adequacy and efficiency. Examination of the design process. Introduction to design of components. Prerequisites: 380 and civil engineering students only or by departmental permission.

CIVE 390 Civil Engineering Systems (3) WSp Mar, Nihan, Palmer, Reed Introduction to civil engineering system processes. Decision methods, economic considerations, and optimization. Examples illustrating quantitative and subjective aspects of civil engineering practice. Prerequisite: civil engineering students only or by departmental permission.

CIVE 423 Heritage of Civil Engineering (3 or 4) W Colcord Contribution of civil engineering to civilization based on the lives and projects of prominent engineers and cultures. Incidents and individuals from prehistory to the nineteenth century give the student an awareness of the profession and its influence on society. Industrial archaeology and historic sites are considered. An additional 1 credit may be earned by participating in a special project. Emphasis on the control of elements and the methodology, planning, objectives, and reasons for the project. May be used as social science distribution. Prerequisite: junior standing.

CIVE 430 Ethics in Engineering (2-3) Evans Professional engineering code of ethics from a perspective of contemporary Western ethical theories. Expansion of the moral community, environmental ethics. Case studies relating to professionalism and to environmental consequences of engineering projects. Prerequisite: senior standing in engineering or permission of instructor; recommended: PHIL 240.

CIVE 491 Deterministic Systems (3) A Mar, Palmer Development of quantitative methods for mathematical problem solving with emphasis on computer applications. Linear programming, mathematics of the simplex algorithm, sensitivity analysis, dynamic programming, systems simulation, and goal programming. Class project required. Prerequisite: 390 or equivalent or permission of instructor.

CIVE 492 Stochastic Systems (3) W Burges, Mar, Nihan, Palmer Introduction to probability distributions and statistics useful in systems analysis, conditional distributions, queuing theory and applications, Monte Carlo simulation, chance-constrained mathematical programming, and stochastic dynamic programming. Emphasis on application of the techniques to civil engineering systems problems, including transportation, water resources, structural and information systems. Prerequisite: 491 or permission of instructor.

Transportation, Surveying, and Construction Engineering

CETS 400 Computer-Aided Design (3) A Schnelder Review and evaluation of computer-aided design hardware, software, and applications in civil engineering. Use of interactive graphic software to solve complex, multiobjective design problems. Prerequisite: senior standing in civil engineering or permission of instructor.

CETS 405 Construction Planning and Scheduling (3) W Hinze Principles of construction planning and scheduling, including network analysis of construction activities, examination of arrow and precedence diagrams, time-cost tradeoffs, resource leveling, resource allocation, PERT, integrated cost/schedule systems, computer applications, and a CPM project.

CETS 406 Construction Engineering II (3) A Hinze Heavy construction equipment. Equipment economics, contractor equipment policies, equipment specifications, selection and performance of equipment, estimating productivity of construction equipment, and engineering support for construction operating. Prerequisite: CIVE 306 or permission of instructor.

CETS 407 Contracts and Specifications (3) WSp Hinze Construction industry, forms of organizations, real property laws, and bidding procedures. Basic elements of contracts, types of specifications, general conditions of standard construction contracts, legal disputes related to construction contract provisions, surety bonds and construction insurance. Prerequisite: CIVE 306 or permission of instructor.

CETS 410 Traffic Engineering Fundamentals and Surveys (3) A Mannering, Nihan General review of the fundamentals of traffic engineering, including their relationship to urban planning, municipal engineering, and highway safety, with special emphasis on traffic engineering field surveys and data analysis. Prerequisite: senior or graduate standing in engineering or permission of instructor.

CETS 411 Highway and Traffic Engineering—Geometric Design (3-5) W Mannering Factors and elements in geometric design of arterials, intersections, freeways, interchanges, parking facilities, including problem solution. Prerequisites: CIVE 320 and senior or graduate standing in civil engineering.

CETS 412 Traffic Flow Theory (3) Sp Mannering, Nihan Introduction to traffic flow theory, characteristics. Measurement, statistical representation of traffic characteristics. Speed-flow-concentration models and

relationship to level of service, highway capacity. Human element. Car-following and shock-wave analysis. Application of queuing theory to traffic events; introduction to traffic flow simulation. Prerequisites: CIVE 320 and senior standing in civil engineering.

CETS 415 Photogrammetry (3) A Veress Geometrical characteristics of photographs. Planning and control considerations for mapping. Theory of stereoscopy, parallax measurement, interior and exterior orientation. Photogrammetric instrumentation (production of maps, orthophotos, and cross-sections). Evaluation of accuracies and error sources. Prerequisite: CIVE 316 or permission of instructor.

CETS 416 Remote Sensing of Environment (3) Sp Colcord Satellite and aerial image acquisition. Analysis of multispectral, multisensor imagery for object identification and for baseline engineering and environmental studies. Factors and aberrations in system components and in target signatures and evaluation models. Prerequisites: CIVE 316 or equivalent, senior standing in engineering or science.

CETS 417 Cadastral Survey Design (3) W Colcord System of public lands. Boundary and riparian law and case discussion. Multipurpose cadastre concepts and survey control design. Survey record research, cost considerations, recordation, specifications. Site and subdivision planning and design. Prerequisite: CIVE 316 or permission of instructor.

CETS 419 Electronic Surveying (3) W Principles of electronic measurements of distances and directions. Environmental and geometrical reductions. Instrumentation. Calibration procedures. Two- and three-dimensional modeling. Analysis and optimization of geodetic networks. Applications in civil engineering projects. Prerequisite: CIVE 316 or permission of instructor.

CETS 424 Pavement Design (3) AW Janssen, Mahoney Current and developing procedures for the structural thickness design of pavements. Bituminous and concrete pavements for highways, airports, and special heavy loading. Elastic layered systems, slab theory. Performance evaluation for maintenance and overlay design. Prerequisite: senior or graduate standing in civil engineering.

CETS 440 Transportation Technologies and Systems (3) Sp Rutherford Review and evaluation of conventional and innovative vehicle systems, fuel types, command and control systems, and information systems. Technology forecasting and assessment techniques. Alternative futures for the role of transportation system in society. Prerequisite: CIVE 320 or permission of instructor.

CETS 464 Construction Materials II (4) ASp Janssen Types, sources, uses, performance behavior from construction point of view of aggregates; asphalt products and mixtures; Portland cement, concrete; other materials. Materials the civil engineer is responsible for selecting and manufacturing on job site. Prerequisites: CIVE 363 or equivalent, senior standing in engineering or architecture.

CETS 470 Urban Transportation Planning and Design (3) A Nihan, Rutherford Brief review of major issues in urban transportation planning. Planning process discussed and transportation models introduced. Uses a systems framework, including goals and objectives, evaluation, implementation, and monitoring. A design term project, individual or small groups, utilizes material presented on a contemporary problem. Prerequisites: senior standing and CIVE 320 or graduate standing and permission of instructor.

CETS 471 Urban Transportation Demand Forecasting (3) W Nihan The urban transportation planning process and its traditional travel demand modeling components, including trip generation, trip distribution, mode choice, and route assignment techniques. Quick response method, sketch planning, and other alternatives to the conventional modeling process. Prerequisites: senior standing and CIVE 390.

CETS 472 Computer-Aided Planning of Urban Systems (3) W Schneider Survey of on-line planning applications; use of various on-line systems to solve urban systems design problems; investigations of hardware/software tradeoffs; human factors in man-computer systems design theory as it relates to problem-solving activity. Joint with URBDF 429. Prerequisite: CIVE 390 or permission of instructor.

CETS 498 Special Topics: Transportation, Construction, and Surveying (1-5, max. 6) Special topics in civil engineering offered as course with lecture and/or laboratory. Maximum of 6 credits in combination of 498 and 499 may be applied toward an undergraduate degree. Prerequisites: senior standing in civil engineering and permission of instructor.

CETS 499 Special Projects: Transportation, Construction, and Surveying (1-5, max. 6) AWSpS Individual undergraduate research projects. Maximum of 6 credits in combination of 498 and 499 may be applied toward an undergraduate degree. Prerequisites: any CETS 400-level course, which may be taken concurrently, and permission of instructor.

Structural and Geotechnical Engineering and Mechanics

CESM 431 Seismology and Earthquake Engineering (3) Kramer, Stanton Presents an overview of earthquake processes and details of the characteristics of destructive ground motion; illustrates the effects of such motion on engineering structures; reviews current practice in estimating earthquake hazards for important structures such as nuclear power plants. Joint with GPHYS 431. Prerequisite: MATH 238 or permission of instructor.

CESM 466 Foundation Design (3) WSP Banerjee, Kramer Design considerations for foundations and retaining structures. Subsurface investigations and determination of soil properties for design. Design of shallow and deep foundations and retaining structures. Foundations and soil considerations for waterfront structures. Prerequisite: CIVE 366.

CESM 467 Soil Mechanics (3) A Banerjee Elementary seepage theory. Seepage through earth embankments and toward well points. Soil strength review. Mechanics of landslides. Selection of parameters and methods of analysis for slope stability. Control and correction of slope failures. Prerequisites: CIVE 351, 366.

CESM 470 Advanced Mechanics of Materials (3) AW Brown, Miller, Roeder, Stanton General theory of torsion and bending of straight and curved beams; beams on elastic foundations and beam-columns. Prerequisite: CIVE 379 or permission of instructor.

CESM 471 Structural Analysis II (3) AW Elias, Evans, Reed Governing equations of linear structural analysis in matrix form. Principles of virtual displacements and virtual forces. The stiffness and flexibility methods of analysis with emphasis on the stiffness method and programming applications. Elements of plastic analysis. Collapse mechanism and collapse load. Upper- and lower-bound theorems. Prerequisite: CIVE 380.

CESM 472 Applied Elasticity (3) Sp Brown, Elias, Evans, Miller Governing equations of linear elasticity with applications to two-dimensional problems. Airy's stress function. Kirchhoff's theory of plate bending. Solutions for rectangular and circular plates. St. Venant's torsion problem. Virtual work and energy theorems with applications. Prerequisite: CIVE 379.

CESM 480 Design of Metal Structures (3) AWSp Brown, Miller, Roeder, Stanton Introduction to the design and behavior of metal structures by working stress and plastic design methods. Includes plastic design and analysis; upper- and lower-bound plasticity theorems; buckling of beams and columns; application of design methods and codes. Design of a simple frame is required. Prerequisites: 471, CIVE 381.

CESM 481 Design of Reinforced Concrete Structures (3) AWSp Brown, Hawkins, Mattock, Stanton Fundamentals of design of buildings in reinforced concrete in accordance with current codes and practices. Prerequisite: CIVE 381.

CESM 482 Prestressed Concrete Design (3) ASP Hawkins, Mattock, Stanton Analysis, design, and construction of reinforced and prestressed concrete structures. Prerequisite: 481 or graduate standing.

CESM 486 Design of Timber Structures (3) WSP Evans, Miller The design and construction of timber structures, using elements made of sawn wood, glued-laminated wood, and plywood. Prerequisite: CIVE 381.

CESM 487 Structural Unit Masonry (3) W Lobert, Mattock Structural behavior and design of reinforced brick, tile, and unit concrete masonry structures. Joint with ARCH 426. Prerequisite: CIVE 381 or permission of instructor.

CESM 489 Design Project (3) Sp Mattock Design projects that synthesize the material of the prerequisite courses. Emphasizes the complete design operation, including preliminary decisions, computations, presentation of work by drawings, specifications, maintenance, and supervision. Prerequisites: 480, 481.

CESM 498 Special Topics: Structures, Geotechnical and Mechanics (1-5, max. 6) AWSp Special topics in civil engineering offered as course with lecture and/or laboratory. Maximum of 6 credits in combination of 498 and 499 may be applied toward an undergraduate degree. Prerequisites: senior standing in civil engineering and permission of instructor.

CESM 499 Special Projects: Structures, Geotechnical and Mechanics (1-5, max. 6) AWSpS Individual undergraduate research projects. Maximum of 6 credits in combination of 498 and 499 may be applied toward an undergraduate degree. Prerequisites: any CESM 400-level course, which may be taken concurrently, and permission of instructor.

Environmental Engineering and Science

CEWA 430 Biological Problems in Water Pollution (3) W Taub Ecological aspects of water-pollution problems arising from such processes as electrical power production, oil utilization, pest-control practices, and land management. Not available to undergraduates as a continuing education technical elective. Joint with FISH 430. Prerequisite: senior standing in fisheries, civil engineering, or other science major, or permission of instructor.

CEWA 431 Laboratory for Biological Problems in Water Pollution (2) W Laboratory experiments and field visits relating to biological problems in water pollution. Laboratory fee may be required. Not available to undergraduates as a continuing education technical elective. Joint with FISH 431. Prerequisite: concurrent registration in 430.

CEWA 434 Ecological Effects of Waste Water (3 or 5) A Welch Principles of aquatic ecology that relate to causes and effects of water quality problems in lakes and streams. Includes population growth kinetics, nutrient cycling, eutrophication, acidification, oxygen/temperature requirements, and effects of various wastes on aquatic animals. Joint with FISH 434. Prerequisite: senior or graduate standing in engineering or science.

CEWA 435 Physiological Effects of Water Pollutants (3) Sp Brown Physiological effects of water pollutants on economically important or endangered fishes, especially with respect to wastewater. Types of industrial, urban, and agricultural entities that contribute wastes to natural waters. Monitoring procedures and assessment of changes in fisheries as a consequence of waste effluents. Joint with FISH 435. Prerequisites: upper-division or graduate standing, organic chemistry, and some background in any of the following: general physiology, cell biology, biochemistry, chemical biology, sanitary engineering.

CEWA 442 Introduction to Hydraulics in Water Resources (3) A Neece Physics of water movements in natural freshwater bodies and inshore marine waters. Brief review of some essential fluid mechanics. Flow in rivers and streams; motions in lakes, reservoirs, and estuaries. Some aspects of diffusion. Not open to students with undergraduate civil engineering backgrounds. Prerequisites: senior or graduate standing and permission of instructor. (Offered even-numbered years.)

CEWA 444 Coastal Engineering I (3) W Yeh Linear theory of water waves, wave transformations due to boundary conditions, sediment motion, elementary tidal theory; applications illustrated by laboratory experiments and selected case histories. Joint with O ENG 444. Prerequisite: CIVE 342.

CEWA 445 Computational Hydraulics (3) A Chu Introduction to unsteady hydraulic problems in open channels and pressure conduits; their solutions by numerical techniques. Existing models used to analyze problems in hydraulic flood routing, tidal river hydraulics, transient flows in pipes, unsteady transport phenomena. Practical applications emphasized. Prerequisites: CIVE 345, MATH 238, and senior standing in civil engineering.

CEWA 446 Analysis Techniques for Groundwater Flow (3) W Burges Development of appropriate equations to describe saturated groundwater flow, and application of numerical methods for solving groundwater flow problems. Participants required to solve specific problems using numerical techniques developed during the course. Prerequisite: CIVE 342 or equivalent.

CEWA 447 Physical Hydrology (3) A Burges Global water picture, data sources and data homogeneity, precipitation, evapotranspiration, flow to wells, hydrographs. Hydrologic data frequency analysis. Hydrologic design: flood mitigation, drainage. Introduction to deterministic and stochastic models. Prerequisite: senior standing or permission of instructor.

CEWA 448 Open-Channel Engineering (3) WSP Neece, Yeh Water flow in natural and constructed channels. Analysis and design of canals, transitions, energy dissipators, and similar structures. Analysis of surface profiles and effect of nonlinear alignment on flow. Introduction to river mechanics. Design-oriented problems. Prerequisite: CIVE 345.

CEWA 449 Water Resources and Hydraulic Engineering Design (3) WSP Burges, Neece, Yeh Opportunity to effect design solutions for projects or major project components in areas of water resources engineering or hydraulic and coastal engineering. Problems include irrigation, multiple- or single-purpose reservoirs (e.g., flood, water supply, hydroelectric), hydraulic structures, and coastal facilities. Prerequisites: senior standing in civil engineering and permission of instructor.

CEWA 451 Environmental Engineering Design (3) AW Bogan Introduction to the theory and the practice of planning and design of urban water supply, sewerage, solid wastes, and drainage collection systems. Evaluation of service areas and service requirements and their relationships to urban and regional planning activities. Engineering methods and computer programs for designing basic system elements. Prerequisite: CIVE 351.

CEWA 453 Water and Wastewater Treatment (3) Sp Bogan, Carlson, Stensel Objectives of water and wastewater treatment; associated physical, chemical, and biological phenomena; design of common treatment systems. Prerequisite: CIVE 351 or permission of instructor.

CEWA 454 Environmental Engineering Design Studies (3) Sp Bogan, Stensel Individual and group design studies involving local communities. Preparation of comprehensive plans and preliminary design

studies for water supply, sewage and drainage, and solid-waste management systems. Preparation of engineering reports dealing with selected design problems. Prerequisite: 451 or permission of instructor.

CEWA 455 On-Site Wastewater Disposal (3) Sp Seabloom, Spyridakis Latest information on design, construction, operation, maintenance of individual and small community wastewater disposal systems. Conventional water carriage septic tank soil absorption systems considered with new alternatives, such as mounds, evapotranspiration systems, anaerobic filters, pressure drainfields, sand filters. Nonwater carriage methods studied. Pressure and vacuum sewers introduced. Prerequisite: senior standing.

CEWA 456 Aquatic Chemistry (3) ASp Benjamin, Ferguson, Spyridakis Principles of chemical equilibrium relevant to natural water systems; the nature and effect of chemical interactions of domestic and industrial waste effluents on natural water systems; chemical principles involved in the treatment of water and wastewaters. Prerequisite: one year of general chemistry or equivalent.

CEWA 457 Water-Quality Analysis (3) W Spyridakis Laboratory evaluation of chemical quality of natural and wastewaters. Theory and application of instrumentation used in water-quality measurement.

CEWA 461 Air-Pollution Control (3) A Pilat Fundamental concepts of air pollution. Emission sources, atmospheric dispersion, ambient concentrations, adverse effects, governmental regulations, emission standards, air-quality standards, processes and equipment for controlling emissions. Joint with ENVH 461. Prerequisite: senior standing.

CEWA 466 Air-Quality Modeling (3) W Larson Air-quality models relating air pollution emissions to environmental concentrations. Meteorological dispersion models and various "receptor" models based on chemical "fingerprinting" of sources. Current problems. Joint with ATM S 466. Prerequisite: 461 or permission of instructor.

CEWA 467 Air-Pollution Source Testing and Equipment Evaluation (3) Sp Pilat Engineering evaluation of air pollutant sources and air-pollution control equipment. Air-pollutant source testing and stack sampling. Analysis of equipment performance and source emissions in the field and in the laboratory. Prerequisite: senior standing or permission of instructor.

CEWA 468 Air-Pollution Control Equipment Design (3) W Pilat Designs to control air pollutants from stationary sources. Procedures for calculating design and operating parameters. Fundamental mechanisms and processes of gaseous and particulate control equipment for absorption and adsorption of gaseous pollutants; electrostatic precipitation and filtration of particulate pollutants. Actual case studies. Joint with CH E 468 and ME 468. Prerequisite: senior standing or permission of instructor.

CEWA 470 Solid-Waste Disposal (3) W Bogan, Carlson Elective for undergraduate and graduate engineers and urban planners covering the sources and the handling of industrial, municipal, and agricultural solid wastes, with examination of processing, by-product recovery, and disposal methods. The roles of urban and industrial planning and of collection and transportation aspects in solid-waste production and disposal are discussed, especially as related to community location and planning and to methods of hauling and controlling wastes concentration and utilization.

CEWA 471 Hazardous Wastes Engineering (3) Sp Stensel Classification of hazardous wastes; resource conservation, Recovery Act regulations; superfund; groundwater contamination, solutions. Hazardous waste site remedial action; case histories; sampling; landfill design. Stabilization and processing technologies, including incineration, carbon adsorption, emerg-

ing techniques. Risk assessment analysis, siting problems for hazardous waste facilities. Prerequisite: CIVE 351 or permission of instructor.

CEWA 485 Water and Air Quality Sampling (2) Sp Larson, Spyridakis, Welch Samples collected from lakes, streams, precipitation, and air and resulting (and supplemental) data interpreted for cause-effect and statistical inference. Design for water and air quality monitoring programs. Prerequisite: 434 or permission of instructor.

CEWA 488 Special Topics: Water and Air Resources (1-5, max. 6) AWSp Special topics in civil engineering offered as course with lecture and/or laboratory. Maximum of 6 credits in combination of 488 and 499 may be applied toward an undergraduate degree. Prerequisites: senior standing in civil engineering and permission of instructor.

CEWA 499 Special Projects: Water and Air Resources (1-5, max. 6) AWSps Individual undergraduate research projects. Maximum of 6 credits in combination of 488 and 499 may be applied toward an undergraduate degree. Prerequisites: any environmental engineering and science 400-level course, which may be taken concurrently, and permission of instructor.

Courses for Graduates Only

Core Courses

CIVE 540, 541 Social Management of Technology I, II (3,3) A,W Wenk Interaction of technology and society through general principles and case studies of contemporary issues. Systems analysis of technological enterprise, its scientific base, roles of capital, specialized manpower, organizational structure and management; decision making and institutional behavior; goal generation; strategies, risk assessment and policy planning. 540: policy process; 541: policy analysis. Joint with PB AF 540, 541. Prerequisites: permission of instructor for 540; 540 for 541.

CIVE 700 Master's Thesis (*) AWSps

CIVE 800 Doctoral Dissertation (*) AWSps

Transportation, Surveying, and Construction Engineering

CETS 507 Heavy Construction Estimating (3) W Hinze, Staff Principles and procedures for estimating and bidding heavy construction projects. Site investigation, methods analysis, breakdown of project into common construction operations, quantity take-off, cost analysis, cost distribution, cost summarization, and bid preparation.

CETS 508 Construction Administration (3) Hinze, Staff Conceptual estimating and detailed estimating. Estimating as it applies to labor, materials, equipment, and overhead. Cost control for construction operations. Quality control. Accounting and taxation in construction. Managing project security, subcontractors, submittals, change orders, correspondence, testing, and start-up.

CETS 509 Construction Productivity (3) Hinze Work improvement techniques applied to construction operations. Review of major contributions in behavioral science that may be applicable to the construction industry. Case studies. Innovative productivity programs successfully implemented on construction projects. Safety on construction projects, especially as influenced by managerial practices.

CETS 511 Traffic Systems Operations (3) Sp Nihan Operational planning, management of arterial and freeway traffic systems. Review of transportation system management strategies to achieve more efficient use of existing infrastructure, including improved and innovative traffic control systems and demand management policies, measures of effectiveness, impact assessment, traveler response. Introduction to use of relevant computer models and packages.

CETS 515 Advanced Photogrammetry (4) W Veress Basic principles of analytical photogrammetry. Measuring instruments. Reduction of photo coordinates, geometry of aerial photographs, relation between object and picture space formation of models, design of photogrammetric project. Prerequisites: 415, 530.

CETS 517 Industrial Photogrammetry (2) W Veress Metric, nonmetric cameras. Mathematical base of close-range photogrammetry. Industrial applications, quality control, deformation measurements, two-media photogrammetry, optical characteristics of water. X-ray photogrammetry. Data reduction. Prerequisites: 415, 530.

CETS 518 Aerial Triangulation (3) Sp Veress Radial aerotriangulation; instrumental aerial triangulation by independent pairs, aeropolygon, aeroleveling and independent geodetic control methods. Semianalytical aerotriangulation. Mathematical strip and block adjustment. Analytical aerotriangulation methods. Prerequisite: 515.

CETS 520 Seminar (1, max. 6) AWSp Prerequisite: permission of thesis supervisor.

CETS 529 Urban Region Geocoding and Land-Based Information Systems (3) Multipurpose street network and land-based information systems. The United States Census geocoding system, automated map overlay systems, and cadastral file information use. Applications to land surveying, urban and transportation planning, and geographic analysis. Joint with GEOG 529 and URBPD 529.

CETS 530 Adjustment Computations (4) A Veress Two- and multidimensional distributions and concept of errors, variances, covariances, weight and error propagation. Least square adjustment by variation of parameters and other methods. Adjustments of hybrid systems using matrix notation inversion by high-speed computers. Prerequisite: permission of instructor.

CETS 531 Geodesy (4) W Earth models. Concepts of mathematical and physical geodesy. Computations on the ellipsoid. The earth's gravity field. Geodetic reference systems. Fundamentals of geodetic astronomy and gravimetry. Astrogeodetic and gravimetric geoid determination. Least squares estimation of geodesy. Prerequisites: 530, CIVE 316, or permission of instructor.

CETS 532 Satellite Geodesy (4) Sp Reference frames. Keplerian and Cartesian orbital elements. Satellite orbit dynamics. Long-arc and short-arc orbit determination. Use of satellite observations for determination of positions and of the earth's gravity field. Applications of the NAVSTAR GPS and TRANSIT satellite systems in surveying and navigation. Prerequisite: 531 or permission of instructor.

CETS 541 Transit Systems Planning (3) W Rutherford Planning, operational methods for urban public transportation. Review of technological, operating characteristics of vehicles and systems; financing, management, institutional aspects. Paratransit. Short-range planning, operational strategies, revenue-fare structures. Service monitoring. Mode choice, transit demand relating to service. Computer-aided methods for planning, design of transit systems. Prerequisite: graduate standing or permission of instructor.

CETS 543 Airport Engineering (3) Sp Mahoney Definitions and terminology relating to airport engineering. Characteristics of aircraft, air traffic control, and resulting impact upon design process. Airport capacity, configuration, and planning associated with terminal design. Emphasis on geometric and structural design of pavements and airside. Design projects relating to airport engineering required. Prerequisite: permission of instructor.

CETS 564 Soil and Site Improvement (3) W Janssen Development, improvement, and utilization of marginal natural earth materials through compaction

and stabilization using chemicals, portland cement, lime, asphalt, salt, and others. Includes discussion, design, and evaluation of foundation soil treatment, as well as surface materials for pavement subgrades, slope protection, dust palliation, and general site improvement. Prerequisites: 424, 464.

CETS 570 Land Use/Transportation Models (3) A Schneider Review of theoretical basis of several existing models used to forecast urban growth patterns and their associated land use, transportation, and energy requirements. Model validation studies in relation to empirical studies of urban growth and change. Environmental implications of alternative urban growth patterns. Joint with URBDP 530.

CETS 571 Analytical Methods in Transportation (3) Nihan Application of analytical and statistical methods to transportation planning problems. Analysis of probability distributions that describe variables. Development of statistical models for predicting transportation phenomena. Elementary sampling theory applied to transportation data. Mathematical programming applications in transportation. Network analysis. Prerequisite: graduate standing or permission of instructor.

CETS 572 Transportation Data Collection and Analysis (3) Sp Mannering Data collection methods, survey sampling, experimental design in transportation planning and engineering. Preliminary planning, sampling methods, sources of errors, sample size, survey instruments, survey administration, data processing. Analysis of variance, experimental design. Illustrative examples drawn from various branches of transportation planning and engineering. Prerequisite: graduate standing or permission of instructor.

CETS 573 Transportation Systems Evaluation (3) Schneider Principles and concepts of alternatives analysis and evaluation in relation to decision-making processes of large-scale transportation projects. Estimation of capital, operating/direct user costs, benefit/cost concepts, impact identification, forecasting/assessment, equity/financing considerations, methods for improving decision-making process. Prerequisite: graduate standing or permission of instructor.

CETS 574 Advanced Travel Demand Theory and Applications (3) Sp Rutherford New methods for estimating and forecasting travel demand. Individual as economic, psychological decision-making unit. Theoretical background to models, model structures, model specification, attitudinal measurement, empirical estimation, market segmentation, aggregation issues, model transferability, parameter updating. Practical applications, directions of present and future research. Prerequisite: graduate standing or permission of instructor.

CETS 599 Special Topics: Transportation, Construction, and Geometrics (2-5, max. 15) AWSpS Prerequisites: permission of instructor and department Chairperson.

CETS 600 Independent Study or Research (*) AWSpS

Structural and Geotechnical Engineering and Mechanics

CESM 501 Structural Mechanics I—Statics (6) A Evans, Miller Equations of a continuum for small displacements, applications to linear elasticity. Kirchhoff plate theory, problems in advanced strength of materials. Virtual work, minimum potential energy, force and displacement methods of structural analysis. Direct stiffness method. Approximate solutions, geometric stiffness matrix. Linearized buckling.

CESM 502 Structural Mechanics II—Dynamics (3) W Miller, Reed Lagrange's equations. Free vibrations of linear, single, and multiple degree of freedom systems. Damping. Mode superposition. Forced vibrations by time history and by response spectrum meth-

ods. Free and forced vibrations of continuous systems. Wave propagation in rods and beams. Prerequisite: 501.

CESM 503 Materials (3) A Brown, Hawkins, Miller, Roeder Behavior of materials used in civil engineering structures. Yield and failure surfaces. Physical and phenomenological models of plastic and viscoelastic behavior. Fracture mechanics. Fatigue models and predictions. Damping and friction. Behavior of anisotropic and composite materials.

CESM 504 Finite Element Methods in Structural Mechanics (3) Sp Elias Extension of the matrix methods of structural analysis to the solution of elasticity, plate, and shell problems by use of finite element approximations. Discussion of convergence and bounding and extension to investigation of stability and finite deformations. Prerequisite: 501 or permission of instructor.

CESM 511 Advanced Reinforced Concrete Design (3) W Hawkins, Mattock, Stanton Behavior and design of reinforced concrete members and structures. Members subject to torsion and torsion combined with flexure and shear; members with small shear span/depth ratios, slabs.

CESM 512 Advanced Prestressed Concrete Design (3) W Hawkins, Mattock, Stanton Prestress loss. Design of statically indeterminate prestressed concrete structures; continuous beam, frame, and slab structures (cast in place or assembled from precast units). Prerequisite: 482 or equivalent.

CESM 513 Advanced Steel Design (3) W Roeder Factors influencing strength and serviceability of steel structures; LRFD limit state design procedures. Use of theories of plasticity and stability in development of design methods and specifications, bolted and welded connections, temperature effects, and effect of different fabrication methods on behavior of structure. Prerequisites: 501, 503.

CESM 514 Design for Earthquakes I (3) Sp Hawkins, Roeder, Stanton Linear elastic analysis for prediction of structural behavior in earthquakes. Ground-shaking and earthquake mechanism. Factors affecting severity and frequency of shaking. Ductility and multilevel design approach. Response spectra and design codes such as UBC and ATC, and evaluation of rationale for these specifications. Design problem. Prerequisites: 501, 502.

CESM 515 Design for Earthquakes II (3) Hawkins, Roeder, Stanton Nonlinear structural behavior in evaluation of seismic performance of structures. Structural ductility for steel and concrete structures. Effects of stability on ductility. Prediction of structural performance using nonlinear-analysis computer programs. Discussion of design concepts such as base isolation and random nature of earthquake excitation. Prerequisites: 511, 513, 514.

CESM 516 Design for Wind (3) Sp Reed Wind effects on structures, including atmospheric boundary layer flow, bluff body aerodynamics, structural dynamics, and aeroelasticity; development and use of ANSI standards; estimation of along-wind, across-wind, and torsional response of tall buildings; design strategies for avoiding wind-induced discomfort in humans. Fundamentals of wind-tunnel testing. Prerequisites: 501, 502.

CESM 520 Seminar (1, max. 6) AWSpS Required for doctoral students. Prerequisite: permission of thesis supervisor.

CESM 521 Continuum Mechanics I (3) Elias, Evans, Miller General foundation of fundamental concepts of motion, stress, and energy for a continuum. General equations of conservation of mass, momentum, and energy. Linear and nonlinear elastic, viscous, and inelastic materials. Joint with A A 575. Prerequisite: 501.

CESM 522 Continuum Mechanics II (3) Elias, Evans, Miller Development of classical and non-classical constitutive theories relating to real materials. Applications in metals, concrete, ice, wood, rock, soils, and composites. Prerequisite: 521.

CESM 523 Reliability and Design (3) Brown, Reed Introduction to theory of structural reliability and its application to design procedures in civil engineering, including probability theory; assessment of uncertainties; code specification (first-order, second-moment format) and the related concept of risk and the influence of socioeconomic factors; loads, load combinations, and probabilities of damage.

CESM 524 Random Vibrations of Structures (3) Sp Reed Random vibration theory, emphasis on estimation and analysis of dynamic response of civil engineering structures, including probability theory; analysis of stationary random processes in time and frequency domains; statistics of narrow-band processes; modeling of stationary and nonstationary signals, such as wind velocity and earthquake acceleration data. Prerequisites: 501, 502.

CESM 531 Special Structures (3, max. 6) Special topics such as shells; inflated structures, suspended structures, or other specialized forms of civil engineering structures. May be repeated for credit, providing topics differ.

CESM 561 Advanced Geotechnical Engineering I (3) A Banerjee, Kramer Advanced topics of geotechnical engineering, including theories of lateral earth pressure, bearing capacity, stress distribution, and consolidation. Application to design of retaining structures and shallow foundations, calculation of settlement rate and distribution. Prerequisite: CIVE 366 or equivalent.

CESM 562 Advanced Geotechnical Engineering II (3) A Banerjee, Kramer Advanced topics of geotechnical engineering, emphasizing shear strength of soils. Strength and stress-strain behavior of sands and clays under various loading and drainage conditions. Laboratory and *in situ* strength-testing methods. Stress path concepts and application of normalized strength parameters. Prerequisite: 467 or equivalent.

CESM 563 Advanced Geotechnical Engineering III (3) W Banerjee, Kramer Topics of particular importance to geotechnical consulting engineering practice. Analysis and design of deep retained excavations, control of settlement of facilities, pile and pier foundations. Case studies and performance evaluation of practical projects. Prerequisite: 561 or equivalent.

CESM 564 Seepage and Slope Stability (3) W or Sp Banerjee, Kramer Analysis of groundwater flow and seepage through dams using analytical and numerical techniques. Various one- and two-dimensional methods of analysis of soil slopes under static and seismic conditions. Computer application of stability analysis methods to slope-stability problems. Prerequisite: 467 or equivalent or permission of instructor.

CESM 565 Soil Dynamics and Earthquake Engineering (3) Sp Banerjee, Kramer Wave propagation in elastic, homogeneous, isotropic medium. Layered ground response by wave propagation analysis. Nature of earthquake shaking; ground motion attenuation; soil conditions' influence on ground motion; dynamic soil properties. Soil liquefaction, settlement; soil-structure interaction; effect on lateral pressures, slope stability. Prerequisite: 467 or equivalent, or permission of instructor.

CESM 599 Special Topics: Structures and Mechanics (2-5, max. 15) AWSpS Prerequisites: permission of instructor and department Chairperson.

CESM 600 Independent Study or Research (*) AWSpS

Special Program in the Design of Brittle Ceramic Materials

CESM 536 Brittle Material Design Problem (3, max. 9) AWS *Bollard, Emery, Kobayashi, Love, Miller, Scott, Taggart, Whittemore* Interdisciplinary efforts in the solution of design problems involving brittle (ceramic) materials. Student teams of an interdisciplinary mix and team teaching are utilized. Joint with CER E 536 and MET E 536.

Environmental Engineering and Science

CEWA 520 Seminar (1, max. 6) AWSp Required of all graduate students in Environmental and Engineering Science each quarter.

CEWA 525 Seminar in Atmospheric Problems Associated With Air Pollution (2) W *Charlson, Harrison* For both engineers and atmospheric scientists in the atmospheric problems related to air pollution. Joint with ATM S 525. Offered on credit/no credit basis only. Prerequisite: ATM S 301 or permission of instructor.

CEWA 540 Hydrodynamics (4) A *Neca, Yeh* Applications of the equations of motion to the flow of ideal and real fluids. Fundamentals of fluid potential motion. Viscous flows; Navier-Stokes equations and some exact solutions. Boundary-layer theory. Introduction to turbulence. Two- and three-dimensional examples, including free surface flows. Applications of field equations to problems of engineering significance. Prerequisite: CIVE 342 or equivalent.

CEWA 541 Hydrodynamics in Water Quality (3) W *Neca* Theoretical, field study, and laboratory model approaches to diffusion in problems of concern to water resources engineers. Joint with O ENG 541. Prerequisite: CIVE 342 or permission of instructor.

CEWA 544 Coastal Hydraulics (3) Sp *Yeh* Theory of water waves. Classical water wave problem and approximate solution techniques. Evolution equations for wave systems, and their solutions. Stability analysis. Random waves analyzed by time series techniques. Joint with O ENG 544. Prerequisite: familiarity with linear wave theory and FORTRAN.

CEWA 545 Advanced Computational Hydraulics (4) Sp *Chu* Review of hydrodynamic and transport equations for hydraulic engineering application; numerical solution methods; implementation and practice with existing two- and three-dimensional numerical models; numerical model calibration and verification techniques; case studies. Theoretical and civil engineering decision makers aspects. Prerequisites: 445, 540, 541 or permission of instructor.

CEWA 547 Advanced Hydrology (3) W *Burges* Detailed treatment of statistical methods used in hydrologic analysis. Stochastic hydrology, detailed examination and use of a deterministic watershed model (e.g., Stanford Watershed Model). Economic aspects of hydrologic design. Prerequisite: graduate standing in civil engineering or permission of instructor.

CEWA 550 Biological Waste Treatment (4) A *Ferguson, Stensel* Biological treatment processes and systems used in water-quality control. Biological and engineering consideration of wastewater treatment, including theory, purpose, analysis, laboratory evaluation, and design of secondary and tertiary processes. Prerequisite: CIVE 350 or equivalent or permission of instructor.

CEWA 551 Sanitary Engineering Unit Operations (4) W *Benjamin, Ferguson* Major unit operations employed in water and waste treatment, including solids separations, filtration, chemical coagulation, ion exchange, and gas transfer and adsorption. Theory and basic principles. Development of mathematical models, laboratory demonstrations, and evaluation of current design criteria and methods. Prerequisite: 456 or permission of instructor.

CEWA 553 Topics in Ecological Effects of Wastewater (3) W *Welch* Application of ecological concepts for analysis and interpretation of bioenvironmental problems and data from inland and coastal waters. Students participate in presentation and discussion of current research on selected topics. Prerequisites: 434, 456, or permission of instructor.

CEWA 554 Advanced Topics in Environmental Engineering, Chemistry, and Biology (3) *Benjamin, Ferguson, Spyridakis* Special topics of current importance in environmental engineering. Application of fundamental chemical and biological principles to the study of such phenomena as the behavior of aqueous colloids, corrosion processes, bacterial metabolism in chemically complex solutions, and acid precipitation. May be taken more than once for credit. Prerequisites: 550, 551.

CEWA 556 Industrial Waste Treatment (3) Sp *Benjamin, Ferguson, Stensel* Survey of laws and regulations governing industrial waste discharge. Sources, amounts, and characteristics of wastes from various industries. Specialized treatment processes, case studies, and site visits. Prerequisite: 550 or 551 or permission of instructor.

CEWA 557 Water Resources Management (3) W *Mar* Engineering, social, and economic factors involved in water resource development and management; water policies, programs, and administration; use relationships and conflicts; considerations for regional water resource systems.

CEWA 558 Water-Quality Management (3) Sp *Mar, Palmer* Engineering, social, and economic factors involved in water resource development and management; water policies, programs, and administration; conflict resolution; regional water resources system consideration. Recommended: 434, 447, 456, and CIVE 491.

CEWA 559 Water Resources System Management (3) A *Burges, Mar, Palmer* Application of advanced quantitative methods, including linear and dynamic programming, to the analysis and management of water resources. Quantitative analysis of water quantity and quality issues in specific settings. Prerequisites: 447, 557, CIVE 491; recommended: 558.

CEWA 560 Topics in Environmental Health (3) A *Larson* Introduction to human biology, including physiology, epidemiology, and toxicology. Study of contemporary environmental health problems and practices as they relate to radiological health, solid-waste disposal, food- and water-borne diseases, occupational health, biometeorology, and bioengineering.

CEWA 562 Industrial Sources of Air Pollution (3) W *Pilat* Study in depth of the major sources of air pollution, including analysis of flow diagrams, raw materials, off-streams, pollution-control facilities, and environmental impact. Field trips to representative plants; trip reports and term paper. Prerequisite: 461 or permission of instructor.

CEWA 563 Air Resources Management (3) Sp *Larson, Pilat* Technical, administrative, and legal aspects of air conservation. Current case studies involving engineering analysis, air-quality modeling, and regulatory aspects at local, state, and federal governmental levels. Prerequisite: 461 or permission of instructor.

CEWA 565 Aerosol Science and Technology II (3) Sp *Charlson* Sequel to 564; focusing on current research with regard to atmospheric aerosols. Prerequisite: permission of instructor.

CEWA 566 Control of Gaseous Air Pollutants (3) Sp *Larson, Pilat* Physical and chemical processes used to control gaseous air pollutants. Absorption into liquids. Aqueous spray dryer scrubbers. Adsorption beds. Control of sulfur oxide and nitrogen oxide. Case studies of control systems. Joint with CH E 566. Prerequisite: 468 or CH E 435 or permission of instructor. (Offered even-numbered years.)

CEWA 567 Control of Particulate Air Pollutants (3) Sp *Pilat* Processes used to control emissions of particulate air pollutants. Use of settling chambers, cyclones, fabric filters, wet scrubbers, and electrostatic precipitators to control aerosol particles. Case studies of particulate air-pollutant control systems. Joint with CH E 567. Prerequisite: 468 or permission of instructor. (Offered odd-numbered years.)

CEWA 577 Risk Assessment for Environmental Health Hazards (3) A *Omenn* Context, methodologies, types of data, uncertainties and institutional arrangements for risk assessment. Both qualitative and quantitative approaches to the identification, characterization, and control of environmental hazards to health emphasized through didactic and case studies. Joint with ENV S 577, ENVH 577, and PB AF 577. Prerequisites: ENV S 515, BIOST 511, EPI 511, or permission of instructor.

CEWA 599 Special Topics: Water and Air Resources (2-5, max. 15) AWSpS Prerequisites: permission of instructor and department Chairperson.

CEWA 600 Independent Study or Research (*) AWSpS

Computer Engineering

211 Electrical Engineering

An undergraduate program in computer engineering (Comp.E.) is offered by the Department of Electrical Engineering, leading to the Bachelor of Science in Computer Engineering degree.

Computer engineering is concerned with the design and practical application of computer hardware and software systems to the solution of technological, economic, and societal problems. The computer engineer analyzes a problem and selects from a variety of tools those most appropriate for its solution. A computer engineer can expect to be involved in hardware design, software creation, and systems integration. The program provides an in-depth education in computer engineering while retaining a strong foundation in traditional electrical engineering. The computer engineering program involves digital hardware, software, and architecture. Mathematics, engineering design, laboratory work, and communication skills development are emphasized. A course including a project must be completed during the senior year.

Undergraduate Program

Bachelor of Science in Computer Engineering

Entrance requirements and procedures are very similar to those of electrical engineering with the following exceptions: (1) PHYS 131 must be completed prior to application, and (2) only the following are acceptable 5-credit composition courses—ENGR 130, ENGL 121, 131, 199, or 271. Please refer to the electrical engineering listing in this section of the catalog for additional information.

For graduation with the Comp.E. degree, the following courses are required in addition to the College of Engineering requirements: E E 231, 310, 333, 355, 356, 370, 372, 374, 375, 471, 474, and either 478 or 479, C SCI 413 (48 credits); computer engineering electives (15); approved non-computer engineering electives (7). To graduate, a student must earn a total of 189 credits with a minimum cumulative grade-point average of 2.00 in all required or elective computer engineering courses taken, with no grade below 1.0 in any of those courses. Note that the total engineering design credits earned must total at least 26, while the engineering science credits must total 50. In all cases, in-

dividual programs of study must comply with the requirements set forth in the computer engineering undergraduate handbook in effect at the time of admission. This handbook may be obtained from the department advising office.

Graduate Program

Presently there is no separate graduate program in computer engineering. Students who wish to pursue graduate work can do so however, through the Department of Electrical Engineering at both the master's and doctoral levels. Areas of faculty expertise include digital design, computer architecture, software engineering, machine vision, computer communications, computer applications, data bases, and operating systems. The electrical engineering section of this catalog contains additional information.

Electrical Engineering

211 Electrical Engineering

Electrical engineering is concerned with the utilization of electricity and the electric and magnetic properties of matter to provide society with useful, efficient, and economic products and services. The scope of activity ranges from the planning, design, implementation, and maintenance of large-scale processes, such as worldwide communication networks and regional power generation and distribution systems, to applied research in the development of microelectronic devices for signal processing in all branches of the physical and life sciences and engineering.

In the field of electrical engineering, where rapid technological innovation is the rule rather than the exception, preparation for a professional career requires a solid foundation in fundamental mathematical and physical principles, plus practice in the application of these principles to real problems. In addition, the important role of technology in contemporary society calls for significant emphasis on studies in the humanities and social sciences.

The department's undergraduate programs provide the intellectual tools, analytical and laboratory skills, and humanistic-social studies for professional work. In addition, the program forms a basis for further professional development in graduate school through continuing education programs or through independent study. The core curriculum, which consists of required courses in the college and department, focuses on mathematical and physical principles and on techniques that have applications to real problems. Electives then offer the opportunity to obtain breadth and depth in such areas as electronic devices and circuits, power systems and energy conversion, electrophysics, computer engineering, communication systems, automatic control, and signal processing.

Undergraduate Program

Bachelor of Science in Computer Engineering Degree

See Computer Engineering in this section of the catalog.

Bachelor of Science in Electrical Engineering Degree

Due to the large demand for professional training in electrical engineering in the face of limited space and resources, the Department of Electrical Engineering is unable to accept all qualified applicants for its undergraduate program. Consequently, a separate application is required for admission to the undergraduate program in electrical engineering. Deadlines for submitting such applications are the same as the closing dates that are given in the Academic Calendar at the front of

this catalog for all new and former student applications. Students may only enter the degree programs of the department Autumn or Spring quarters. To be eligible for consideration for admission, a student must satisfy the following conditions: (1) have applied and be admissible to the University or already be a student in good standing; (2) have completed a minimum of 45 credits (i.e., sophomore standing) with a cumulative grade-point average of 2.50 or higher; (3) have completed successfully a year of college calculus (MATH 124, 125, 126); a quarter of differential equations (MATH 238); three quarters of physics using calculus (PHYS 121, 122, 123); a quarter of college chemistry (CHEM 140); a quarter of computer programming (ENGR 141); a quarter of computer operations and organization (ENGR 275); and 5 quarter credits of composition selected from ENGR 130; ENGL 111, 121, 131, 182, 197, 198, 199, 271; or C LIT 240. The cumulative grade-point average in these courses must be 2.50 or higher.

In addition to the overall post-high school grade-point average and the minimum grade requirement in the courses mentioned above, the selection process considers grades in other technical courses taken. The above requirements are minimum, and meeting all of them does not guarantee admission to the program.

Copies of the undergraduate handbook, which contains detailed curriculum requirements and suggestions for the design of an effective sequence of elective courses, are available in 215 Electrical Engineering or in the Engineering Advising Center.

In addition to the College of Engineering requirements, the following courses are required for the electrical engineering program: a core of specified electrical engineering courses: E E 231, 310, 312, 333, 335, 344, 355, 356, 370, 372 and/or 374, 381, and 383 (45); electrical engineering electives (19), and approved electives—non-electrical engineering (8). To graduate, a student must earn a total of 186 credits with a minimum cumulative grade-point average of 2.00 in all electrical engineering courses taken with no grade below 1.0 in any of these courses. In addition, it is required that each student's program of study conform with the Accreditation Board for Engineering and Technology requirement of at least 46 credits in engineering science and 23 credits in engineering design.

The department policy on continuation is consistent with the continuation policy of the college but also includes supplementary requirements specific to the department. Details may be obtained from the department advising office.

Many scholarships specifically for electrical engineering majors, based on merit and financial need, are awarded each year. Students interested in applying for these and other College of Engineering scholarships may obtain information from the Department of Electrical Engineering Scholarship Awards Committee chairperson.

Graduate Program

The Department of Electrical Engineering offers graduate programs leading to the degrees of Master of Science in Electrical Engineering and Doctor of Philosophy. Graduate courses and research programs are offered in electromagnetics, radio science, electronic materials and devices, microelectronics, VLSI design, computer engineering, digital systems, computer architecture, computer networks and distributed systems, software engineering, operating systems, microprocessors, energy systems, power electronics and electric drives, control systems, circuits and network theory, neural networks, telecommunications, signal processing, image and speech processing, machine vision, optics, acoustics, and biosystems. Opportunities also exist for participation in research on medical instrumentation in the bioengineering program and in marine acoustics and instrumentation systems at the Applied Physics Laboratory.

A minimum of 45 credits is required for graduation with the M.S.E.E. degree. Students writing a thesis receive 9 to 12 credits for its preparation, while those selecting a nonthesis degree program must complete a one-term project. The remaining credits must be earned in course work selected, with faculty approval, to prepare the student in an area of specialization. If more flexibility is desired than allowed by the M.S.E.E. requirements, the interdisciplinary degree of Master of Science in Engineering is suggested.

The M.S.E.E. degree is also offered to part-time students employed in local industries through the Televised Instruction in Engineering (TIE) program. Regular graduate courses are offered over cable television or by videotape to enable working engineers to participate in the program without traveling to campus.

To graduate with the Ph.D. degree, a student must pass the departmental qualifying examination, pass an advanced General Examination, pursue an original research problem, and report the results of that research in a dissertation that is a contribution to knowledge. At least one year of course work beyond completion of the M.S.E.E. degree is usually necessary.

Research Facilities

Facilities in the Electrical Engineering Building include laboratories for study of solid-state materials, microtechnology, microwave bioeffects, computer technology, computer systems, machine vision, analog and digital electronics, energy systems, power electronics and electric drives, bioelectronics, control systems, and statistical data analysis. Available also are extensive computer facilities and a new integrated circuit and semiconductor sensor fabrication facility.

Admissions Qualifications

In addition to meeting Graduate School admission requirements, the Graduate Record Examination (GRE) general test is required of all students. In addition, the GRE subject test in engineering is required of all foreign students and those applying for financial aid and strongly recommended for all other applicants. Official test scores must be submitted. Although most applicants have baccalaureate degrees in electrical engineering, applicants with degrees in other branches of engineering, the physical sciences, computer science, or mathematics often are able to pursue graduate study in electrical engineering after some additional preparation. Such applicants must also submit GRE subject test scores.

Financial Aid

Research assistantships, teaching assistantships, scholarships, and fellowships are available to qualified graduate students in all areas of electrical engineering. Certain graduate teaching scholarships and fellowship loans are awarded to U.S. citizens intending to pursue a Doctor of Philosophy degree to be followed by a career in engineering education. The annual stipends for these awards are paid in addition to a teaching or research assistantship.

Correspondence and Information

Graduate Program Coordinator
Department of Electrical Engineering, FT-10

Faculty

Chairperson

Robert P. Porter

Professors

Albrecht, Robert W.* 1961, (Nuclear Engineering),† M.S., 1958, Ph.D., 1961, Michigan; stochastic and dynamic analysis of physical systems, microwave device for sodium-level measurements, autonomous mobile robot.

- Andersen, Jonny,* 1967, M.S., 1962, Ph.D., 1965, Massachusetts Institute of Technology; circuit design, modeling, CAD/CAM and computer graphics.
- Auth, David C.,* 1969, (Affiliate), (Bioengineering), M.S., 1966, Ph.D., 1969, Georgetown; lasers and electro-optical system design, electrophysics, medical instrumentation.
- Baer, Jean-Loup,* 1969, (Computer Science), Doctorat 3e Cycle, 1963, Grenoble; Ph.D., 1968, California (Los Angeles); computer science, parallel processing, computer system architecture, data structures.
- Bergsath, F. Robert, 1947, (Emeritus), S.M., 1938, Massachusetts Institute of Technology; electric power systems.
- Bjorkstam, John L.,* 1955, (Emeritus), M.S.E.E., 1952, Ph.D., 1958, Washington; materials science and engineering, fundamentals and technological applications of magnetic resonance.
- Cheung, Peter W.,* 1984, (Bioengineering), M.S., 1969, Puget Sound; materials science and microelectronics, microprocessor-based biomedical instrumentation.
- Clark, Robert N.,* 1957, (Aeronautics and Astronautics), M.S., 1951, Michigan; Ph.D., 1969, Stanford; automatic control systems, fault detection in dynamic systems.
- Damborg, Mark J.,* 1969, M.S., 1963, Ph.D., 1969, Michigan; control systems theory and applications, power system dynamics and control, data-base methods in computer-aided engineering, expert systems applications.
- Dow, Daniel G.,* 1968, M.S., 1953, Michigan; Ph.D., 1958, Stanford; microwaves, physical electronics, semiconductor devices, sensors.
- Ehrenberg, John E.,* 1972, (Affiliate), S.M., 1968, Massachusetts Institute of Technology; Ph.D., 1973, Washington; communications, signal processing, underwater acoustics.
- Golde, Hellmut,* 1959, (Computer Science), M.S., 1955, Ph.D., 1959, Stanford; computer science, compilers and languages.
- Guliford, Edward C.,* 1959, (Emeritus), M.A., 1950, Utah; Ph.D., 1959, California; electronics, computers.
- Guy, Arthur W.,* 1965, (Bioengineering, Rehabilitation Medicine), M.S.E.E., 1957, Ph.D., 1966, Washington; biological effects and medical applications of electromagnetic fields.
- Haralick, Robert M.,* 1986, (Computer Science), M.S.E.E., 1967, Ph.D., 1969, Kansas; computer vision, artificial intelligence, image processing, pattern recognition, expert systems, parallel computer architecture.
- Hill, W. Ryland, 1941, (Emeritus), M.S.E.E., 1941, California (Berkeley); electrical engineering.
- Holden, Alistair D. C.,* 1958, (Computer Science), M.Eng., 1958, Ph.D., 1964, Washington; computer engineering, speech recognition, computer-aided design, artificial intelligence.
- Hsu, Chih-Chi,* 1958, M.S., 1948, Michigan; Ph.D., 1951, Ohio State; control systems and cybernetics.
- Ishimaru, Akira,* 1956, (Applied Mathematics), Ph.D., 1958, Washington; electromagnetics, optics, acoustics, applied mathematics, scattering theory.
- Johnson, David L.,* 1955, (Computer Science), Ph.D., 1955, Purdue; digital design, artificial intelligence (models of learning systems).
- Lauritzen, Peter O.,* 1965, M.S., 1958, Ph.D., 1961, Stanford; power electronics, electronic devices, instrumentation.
- Lewis, Laurel J., 1946, (Emeritus), E.E., 1935, Ph.D., 1947, Stanford; electrical engineering.
- Lytle, Dean W.,* 1958, M.S., 1954, Ph.D., 1957, Stanford; communication and stochastic systems analysis, marine acoustics.
- Marks, Robert J. II,* 1977, M.S., 1973, Rose-Hulman Institute of Technology; Ph.D., 1977, Texas Tech; optical processing, signal analysis.
- Meditch, James S.,* 1977, S.M., 1957, Massachusetts Institute of Technology; Ph.D., 1961, Purdue; computer-communication networks.
- Moritz, William E.,* 1973, M.S., 1966, Ph.D., 1969, Stanford; computer engineering, microcomputer applications, computer-aided manufacturing.
- Noe, Jerre D.,* 1968, (Computer Science), Ph.D., 1948, Stanford; operating systems, computer measurement and evaluation, distributed computer networks, simulation.
- Noges, Endrik,* 1958, M.S., 1956, Ph.D., 1959, Northwestern; automatic control systems, nonlinear and discontinuous control.
- Peden, Irene C.,* 1981, M.S., 1958, Ph.D., 1962, Stanford; subsurface remote sensing and applied electromagnetics.
- Pinter, Robert B.,* 1964, (Zoology), M.S., 1960, Ph.D., 1964, Northwestern; cybernetics, robotics, biophysics.
- Porter, Robert P.,* 1985, (Computer Science), M.S., 1966, Massachusetts Institute of Technology; Ph.D., 1970, Northeastern; signal processing, underwater acoustics, electromagnetic and acoustic wave propagation, inverse scattering.
- Reynolds, Donald K.,* 1959, (Emeritus), M.A., 1942, Stanford; Ph.D., 1948, Harvard; electronic system design, antenna engineering.
- Rogers, Walter E., 1946, (Emeritus), M.S.E.E., 1948, Washington; electrical engineering.
- Siglmann, Rubens A.,* 1959, M.S., 1961, Ph.D., 1963, Washington; bioengineering, ultrasonics, propagation, acoustics.
- Smith, George S., 1921, (Emeritus), E.E., 1921, Washington; electrical engineering.
- Spindel, Robert C., 1987, (Oceanography), M.S., 1966, Ph.D., 1970, Yale; ocean acoustics, signal processing, acoustic navigation systems, acoustic tomography.
- Stear, Edwin B., 1982, M.S., 1956, Southern California; Ph.D., 1961, California (Los Angeles); control, communications, computer engineering.
- Tanimoto, Steven L.,* 1977, (Computer Science), M.S.E.E., 1973, M.A., 1974, Ph.D., 1975, Princeton; image analysis, artificial intelligence, computer graphics.
- Tsang, Leung,* 1983, M.S., 1973, Ph.D., 1976, Massachusetts Institute of Technology; wave propagation and scattering, remote sensing, optics.
- Venkata, Subrahmanyam S.,* 1979, M.S., 1965, Indian Institute of Technology (India); Ph.D., 1971, South Carolina; energy devices and systems, transmission and distribution, engineering education, computer-aided design.
- Yee, Sinclair S.,* 1966, (Computer Science), M.S., 1961, Ph.D., 1965, California (Berkeley); physical electronics, semiconductor devices, microprocessors.
- Young, James A., Jr.,* 1978, (Affiliate), Ph.D., 1953, Washington; telecommunications, electronic systems, signal processing.
- Zick, Gregory L.,* 1974, (Computer Science), M.S., 1972, Ph.D., 1974, Michigan; computer engineering, operating systems, expert data-base systems, I/O subsystems.
- Associate Professors**
- Afromowitz, Martin A.,* 1975, (Bioengineering), M.S., 1966, School of Engineering and Applied Science (New York); Ph.D., 1969, Columbia; integrated-circuit fabrication, microtechnology, bioengineering instrumentation, sensors, semiconductor physics.
- Alexandro, Frank J.,* 1964, M.S.E.E., 1959, Eng. Sc.D., 1964, New York; control systems, stochastic estimation methods.
- El-Sharkawi, Mohamed A.,* 1980, M.A.Sc., 1977, Ph.D., 1980, British Columbia; large-scale power systems, electric drives and power electronics, stabilizer design of power systems, adaptive power factor controllers.
- Helms, Ward J.,* 1968, M.S., 1963, Ph.D., 1968, Washington; VLSI analog and digital circuit design, integrated circuits, acoustics and audio, silicon compilers.
- Jackson, Darrell R.,* 1976, (Research), M.S.E.E., 1963, Ph.D., 1966, Washington; Ph.D., 1977, California Institute of Technology; signal processing, underwater acoustics, wave scattering.
- Katz, Philip L.,* 1984, (Research), M.S.E., 1965, Ph.D., 1970, Michigan; imaging processing, feature extraction classification, underwater acoustics, acoustics signature analysis, dynamic modeling and optimization.
- Kim, Yongmin,* 1982, (Bioengineering), M.S., 1979, Ph.D., 1982, Wisconsin (Madison); image processing, computer graphics, parallel processing, microcomputer applications, medical instrumentation.
- Lewellen, Thomas K.,* 1987, (Radiology), Ph.D., 1972, Washington; medical imaging, positron emission tomography, magnetic resonance imaging, detector development, reconstruction algorithm development.
- Liu, Chen-Ching,* 1983, M.S., 1978, National Taiwan; Ph.D., 1983, California (Berkeley); planning and operation of power systems, systems and control, power electronics.
- Redeker, Charles C., 1964, M.S.M.E., 1964, Washington; computer programming languages.
- Robbins, Floyd, 1946, (Emeritus), E.E., 1949, Washington; electrical engineering.
- Shapiro, Linda G.,* 1986, (Computer Science), M.S., 1972, Ph.D., 1974, Iowa; computer vision, artificial intelligence, robotics, pattern recognition, intelligent information systems.
- Spelman, Francis A.,* 1961, (Research), (Bioengineering, Otolaryngology), M.S.E.E., 1968, Ph.D., 1975, Washington; biomedical instrumentation, Cochlear implants for the profoundly deaf, cardiovascular control systems, biological image processing.
- Assistant Professors**
- Atlas, Les E.,* 1983, M.S., 1978, Ph.D., 1983, Stanford; speech recognition and processing, digital signal processing, auditory sciences, neural networks.
- Belcher, Edward O.,* 1979, (Research), M.A., 1970, Stanford; Ph.D., 1976, Washington; signal processing, artificial intelligence, underwater acoustics.
- Darling, Robert B.,* 1985, M.S., 1982, Ph.D., 1985, Georgia Institute of Technology; semiconductor devices, solid state, optoelectronics, microelectronics.
- Kuga, Yasuo, 1983, (Research), M.S., 1979, Ph.D., 1983, Washington; optics, electromagnetics.
- Kuhn, Kelvin, 1987, (Research), (Materials Science and Engineering), M.S.E.E., 1985, Ph.D., 1985, Stanford; molecular beam epitaxy.
- Lin, Hual-An "Paul,"* 1985, M.S., 1981, Ph.D., 1983, Ohio State; software engineering, computer communication networks.
- Luby, James C., 1987, (Research), M.S., 1978, Colorado State; Ph.D., 1984, Washington; signal processing, detection, estimation, underwater acoustics.
- Ritcey, James A.,* 1985, M.S.E.E., 1980, Syracuse; Ph.D., 1985, California (San Diego); detection, estimation, and signal processing.
- Sloane, Thomas H.,* 1985, M.S., 1979, Ph.D., 1985, Duke; power electronics, switch-mode power supplies, computer-aided design, measurements, and modeling.
- Soma, Mani,* 1982, (Bioengineering), M.S.E.E., 1977, Ph.D., 1980, Stanford; computer-aided design, device modeling, IC technology and design, bioengineering.
- Soman, Arun K.,* 1985, M.S., 1983, Ph.D., 1985, McGill; computer architecture, fault-tolerant computing, parallel processing, computer algorithms, computer networks, VLSI systems.
- Winebrenner, Dale P., 1986, (Research), M.S.E.E., 1980, California (San Diego); Ph.D., 1985, Washington; wave scattering, remote sensing.

Zieve, Peter B., 1986, (Research), M.S., 1979, Massachusetts Institute of Technology; Ph.D., 1986, Washington; electric energy systems, power electronics.

Lecturer

Potter, William W., 1970, M.S., 1959, Monterey; electronics.

Course Descriptions

Courses for Undergraduates

E E 231 Introduction to Electrical Circuits and Systems (4) AWSp Basic principles of modern circuits and systems theory in circuit analysis. Resistors, sources, and simple circuits, resistance networks; capacitors and inductors, first-order circuits; second- and higher-order circuits; solutions of linear differential equations representing equilibrium equations of networks by time-domain techniques. Prerequisites: MATH 238, which may be taken concurrently, and PHYS 122.

E E 299 Special Topics in Electrical Engineering (1-5) AWSps New and experimental approaches to basic electrical engineering. May include design and construction projects. Prerequisite: permission of department Chairperson.

E E 306 Elements of Electrical Engineering (3-5) AWSp Introductory course for non-electrical engineering majors covering circuit analysis, electronic devices, and rotating machinery. 3-credit portion covers circuit analysis and electronics. 4th credit contains three laboratories to introduce electronic instrumentation and device operation. 5th credit covers machinery with additional laboratory. Prerequisites: PHYS 122, MATH 126.

E E 310 Electronics Laboratory I (3) AWSp Fundamentals of laboratory practices; fundamentals of instrumentation; switches, elementary gates, and flip-flops; elementary amplifiers, input and output impedances; use of integrated circuits and devices to typical applications, such as regulated power supplies, multipliers, operational amplifiers, and oscillators. Prerequisite: 231.

E E 312 Electrophysics Laboratory (2) AWSp One three-hour laboratory period each week; experiments on solid-state devices, properties of materials, generation and guiding of electromagnetic waves. Prerequisites: 310, 381, 383, which may be taken concurrently.

E E 333 Circuits and Systems II (4) AWSp Continuation of 231. System functions, complex frequency, and pole-zero properties. The sinusoidal steady-state. Energy and power. Frequency response of systems. One-sided Laplace transforms, inverse Laplace transform. Response via the Laplace transform system transfer function. Prerequisites: 231, MATH 238.

E E 335 Linear Systems Analysis I (4) AWSp Analysis of linear systems in continuous and discrete time. Differential equation and discrete time difference equation models of linear systems. Z-transform, convolution methods. Continuous and discrete time steady-state response to periodic inputs. The impulse response and convolution representation of linear systems in continuous and discrete time. Fourier series and Fourier transforms. Introduction to spectral concepts and the sampling theorem. Prerequisite: 333.

E E 344 Introduction to Electric Energy Devices and Systems (5) AWSp Introduction to theory and methods of analysis in the use of typical apparatus to generate, transmit, and utilize energy in electrical form. Includes conventions of circuit description, balanced polyphase circuits, complex power concept, transformer, transmission lines, per-unit system, fundamentals of electromechanical energy conversion and practical synchronous, induction, and commutator machines. Prerequisite: 333.

E E 355 Electronics I: Introduction to Digital and Analog Electronics (4) AWSp Characteristics of p-n junctions, MOS and bipolar transistors, analysis and design of simple logic gates, fundamentals of integrated circuits layout. Prerequisites: 231, 383; and 310, 333, which may be taken concurrently.

E E 356 Electronics II: Analog Integrated Circuits (4) AWSp Analog integrated circuit technology, input stages, bipolar and FET, current sources, output stages, frequency response, feedback fundamentals and stability analysis, applications. Includes weekly laboratory. Prerequisites: 333, 355; recommended: 310.

E E 370 Introduction to Digital Systems and Computers (4) Digital logic, Boolean algebra, combinational and sequential circuits, design and operation of digital computers including ALU, memory, I/O, and control. Computer operation and organization, including instruction formats, addressing, and stacks.

E E 372 Introduction to Microprocessors (3) AWSp Utilizing microprocessors, digital computer studied at assembly language level with emphasis on concepts of central processor architecture, memory organization, input/output, and interrupts. Assembly language programming concepts applied to solution of various laboratory problems. Prerequisites: 370, ENGR 141 and ENGR 275.

E E 374 Data Structures (3) AWSp Fundamental algorithms and data structures for their implementation. Techniques for solving problems by programming. Sorting, searching, linked lists, binary search trees, balanced trees, hashing. Prerequisites: 370, ENGR 275, ENGR 141 or equivalent knowledge of programming.

E E 375 Discrete Mathematics for Computer Engineering (3) A Symbolic logic, set theory, algebraic structures, groups and formal languages, graphs, lattices and Boolean algebra, finite fields, and computability with computer engineering applications.

E E 381 Applied Electromagnetics (4) AWSp Electromagnetic waves in linear media; some effects of boundaries; transmission lines; electrostatic and magnetostatic fields. Prerequisite: 333, which may be taken concurrently; recommended: MATH 327.

E E 383 Semiconductor Materials and Devices (4) AWSp Introduction to the basic electronic properties of semiconductor materials and devices. Energy bands, dynamics of electrons and holes, equilibrium statistics, carrier mobility and recombination. Electrostatics of p-n junction FETs, capacitors, and MOS-FETs. I-V characteristics of p-n junctions and bipolar transistors. Prerequisites: 231, PHYS 123 and admission to Electrical Engineering.

E E 399 Special Topics in Electrical Engineering (1-5) AWSps New and experimental approaches to current electrical engineering problems. May include design and construction projects. Prerequisite: permission of department.

E E 400 Advanced Topics in Electrical Engineering (1-4, max. 8) AWSps Contemporary topics at the advanced undergraduate elective level. Faculty presents advanced elective topics not included in the established curriculum. Prerequisite: permission of instructor.

E E 411 Introductory Network Synthesis (3) A Network representations in the complex frequency domain, realizability criteria for driving-point and transfer functions, canonical forms, and application of the digital computer in synthesis procedures. Prerequisites: 333 and senior standing.

E E 415 Computer-Aided System Analysis and Design (3) Sp Concepts, principles, and techniques concerned with the sign, testing, and application of general-purpose problem-oriented computer programs for analyzing large-scale systems. Prerequisites: ENGR 141 and senior standing.

E E 417, 418 Introductory Communication Theory I, II (4,3) W,Sp Techniques of analog and digital communications. Elementary concepts of probability, random variables, and processes. Signals, spectra, random signals, and noise. Base-band communication by digital and analog methods. Modulation techniques including AM, FM, PM, PAM, PCM, etc. Information theory, channel capacity, and error-control coding. Prerequisites: 335 and STAT 390 or permission of instructor.

E E 421 Electroacoustics (4) A Fundamentals of acoustics and the electroacoustical aspects of electromechanical systems. Characteristics of transducers. Includes laboratory, to be arranged. Prerequisite: 383 or permission of department.

E E 433 Electronic Circuit Design (4) AWSp Electronic circuit design using modern electronic devices. Topics include application of integrated-circuit amplifiers and multipliers, design of solid-state amplifiers for low noise, wide bandwidth, high frequency, high power output, and the application of modulation theory to modern systems. The design aspect of solid-state electronic circuitry is emphasized. Prerequisite: 356.

E E 436 Medical Instrumentation (4) Sp Spelman Introductory course in the application of instrumentation to medicine. Topics include transducers, signal-conditioning amplifiers, electrodes and electrochemistry, ultrasound systems, electrical safety, and the design of clinical electronics. Laboratory included. Joint with BIOEN 436. For upper-division and first-year graduate students who are preparing for careers in bioengineering—both research and industrial. Prerequisite: 433 or permission of department.

E E 440 Linear Systems Analysis II (4) A Development of advanced Fourier methods, concentration on applications to engineering problems. Analog and digital filters; applications of discrete Fourier transform, including aliasing, short data sets, average transforms, system identification; orthogonal functions for boundary-value problems, two-dimensional Fourier transforms with application to image processing and aperture antennas. Prerequisite: 335.

E E 442 Digital Signals and Filtering (3) W Methods and techniques for digital signal processing. Review of sampling theorems, A/D and D/A converters. Demodulation by quadrature sampling. Z-transform methods, system functions, linear shift-invariant systems, difference equations. Signal flow graphs for digital networks, canonical forms. Design of digital filters, practical considerations, IIR and FIR filters. Digital Fourier transforms and FFT techniques. Prerequisite: 335 or permission of department.

E E 445 Nonlinear Systems Analysis (4) A Dynamic analysis of nonlinear circuits and of other simple systems. Exact methods, graphical methods, approximate methods, including linearization and numerical and analog computer solutions. Stability. Forced vibrations. Prerequisite: 333 or permission of department.

E E 446 Control System Analysis I (4) AWSp Linear servomechanism theory and design principles. Pole-zero analysis, stability of feedback systems by root-locus and real-frequency response methods. Design methods of Bode and Nichols. Introduction to advanced topics in automatic control theory. Prerequisite: 335 or permission of department.

E E 447 Control System Analysis II (3) Sp State-space formulation of multivariable feedback control system problems. Dynamic performance, including stability evaluation, by vector-matrix methods. Application of discrete time methods of feedback control problems. Introduction to nonlinear feedback system analysis including state-space methods, Lyapunov stability theory, and describing functions. Prerequisite: 446 or permission of department; recommended: MATH 303.

E E 452 Fundamentals of Power Electronics (4) A Introduction to the analysis and design of electronic circuits for power conversion and control, including

switch-mode power supplies, converters, the application of semiconductor power switches, and the design of magnetic components. Includes three-hour-per-week laboratory. Prerequisites: 344 and 356, either of which may be taken concurrently.

E E 453 Electric Drives (5) A Elements of solid-state drive systems, speed-torque characteristics of electric motors and industrial loads, solid-state converter. Starting and braking methods of loaded motors. Speed control of electric motors. Solid-state drives. Transient analysis of loaded motors. Special forms of individual- and multimotor drives. Prerequisite: 344 or permission of instructor.

E E 454 Power System Analysis I (4) A Introduction to methods of analyzing power systems. Calculations of line parameters, representation of transmission lines and power system components, power flow analysis and control, economic operation. Introduction to energy control centers. Prerequisite: 344.

E E 455 Power System Analysis II (4) W Analysis of symmetrical and unsymmetrical power systems' networks, fault analysis, and stability studies. Prerequisite: 344 or permission of department.

E E 456 Power System Analysis III (4) Sp Static and dynamic analysis of large power networks. Load flow, optimal generation allocation, state estimation, transient stability, and automatic generation control. Experience in analyzing and designing power systems using modern computer algorithms. Prerequisite: 455 or permission of department.

E E 457 Electric Energy Distribution Systems (4) Sp Introduction to electric utility distribution systems. Primary and secondary network analysis and design, distribution substation problems, distribution transformers, capacitor application, overcurrent and overvoltage protection. System planning and reliability. Prerequisite: 344 or permission; background in system analysis desirable.

E E 461 Electrochemistry (3) Sp Fundamentals of electrochemistry with applications to batteries and industrial processes. Emphasis is on obtaining a basic working knowledge in the field. Joint with CH E 461. Prerequisite: senior standing in engineering or permission of department Chairperson.

E E 467 Antennas and Remote Sensing (3) Sp *Peden, Tsang* Radiation and radio science; antenna fundamentals and applications; wave propagation and earth's environments; remote sensing and geophysical exploration. Prerequisites: 335, 381.

E E 468 Applied Optics (4) W *Marks* Fundamentals of optical image formation, data processing, holography, interferometry, laser principles, optical detection, material interactions, scattering, and fiber optics. Prerequisites: 335, 381.

E E 469 Transmission Lines and Wave Propagation (4) A *Peden* Guided waves on two-conductor transmission lines: steady-state and transient considerations; lossy transmission lines. Mode structures of guided waves in hollow conductors and dielectric rods; surface-wave propagation on coated conductors and dielectrics. Wave propagation in material media of practical importance. Emphasis on problem-solving approaches in electromagnetics; applications to radio science, microwaves, optics, bioengineering, remote sensing. Prerequisite: 381.

E E 471 Computer Architecture and Structure (3) AW Major elements of modern computational systems: processors, control units, and methods, including micro programming, main memory usage, and organization, and system I/O and interconnection. Prerequisites: 370, 372.

E E 473 Wave Shaping (4) WSp Generation and transmission of special waveforms, including pulses, square waves, and linear ramps; clipping, clamping,

and DC restoration; astable, monostable, and bistable multivibrators; applications to analog and digital systems. Includes one four-hour laboratory on alternate weeks. Prerequisite: 356.

E E 474 Fundamentals of Operating Systems (5) AW Introduction to operating systems. Hardware/software interface, process management, primary and secondary, storage management, processor management, performance, networks, and case studies of current operating systems. Prerequisites: 370, 374, ENGR 275.

E E 476 Computer-Aided Design of Digital Systems (3) WSp An elementary knowledge of combinational logic and sequential machines is assumed. More advanced topics in the above subjects are covered. APL is used as a digital design and simulation language to represent and assist in the design of arithmetic functions, machine control, storage, and communication between system components. Prerequisite: 370.

E E 478 Design of Computer Subsystems (5) AW Design of digital computer subsystems and systems, using SSI, MSI, and LSI digital components. Combinational logic, sequential logic, ALU and control-unit designs, memory hardware design, I/O hardware and interface designs, data-acquisition system design, and digital troubleshooting. One three-hour laboratory each week. Prerequisites: 355, 370, 372, and permission of department.

E E 479 Microcomputer System Design (5) WSp *Moritz* Intensive course covering microprocessor architecture and operation, assembly language instructions and programming, system design criteria and techniques for integrating hardware and software into actual systems. Principal emphasis on system design and documentation. Weekly laboratory and a design project included. Prerequisites: 370, 372, and permission of department; highly recommended: 478, which may be taken concurrently.

E E 481 Microwave Electronics (4) A *Dow* Microwave circuits. Smith charts. S-parameter analysis. Waveguides and resonators. Measurement techniques. Microwave integrated circuits. Design of microwave amplifiers and other functional elements. Microwave system concepts. Three hours of laboratory per week. Prerequisites: 335, 381.

E E 485 Semiconductor Devices (3) ASp Physics of p-n junctions and semiconductor surfaces; operating principles of various semiconductor devices. Development of small-signal and switching circuit models. Includes junction transistors, controlled rectifiers, field effect transistors, microwave and integrated circuit devices. Prerequisite: 383 or equivalent.

E E 486 Fundamentals of Integrated Circuit Technology (3) W *Afromowitz* Processing physics, chemistry, and technology, including evaporation, sputtering, epitaxial growth, diffusion, ion implantation, laser annealing, oxidation, chemical vapor deposition, photoresists. Design considerations for bipolar and MOS devices, material and process characterization. Future trends. Prerequisite: 485 or permission of department.

E E 487 MOS Transistor Physics and Technology (3) Sp Physics and technology of MOS transistors and capacitors; scaling factors and various operating conditions. Development of device parameters and characteristics; CMOS technology. Prerequisite: 383 or equivalent.

E E 497 Design in Electronics Industry (3) Sp The work environment of design engineers in the electronics industry. Product definition, the design process, support of manufacturing. Design for both big systems and commercial products. Most of the instruction is by lecturers from industry. Prerequisite: senior standing in electrical engineering.

E E 498 Control System Components and Measurements (3) Sp Study of control system components and formulation of their mathematical models.

Amplifiers, servomotors, synchros, gyroscopes, and fluid-power devices. Experimental determination of dynamic parameters, and behavior of closed-loop systems. Two three-hour laboratories per week. Prerequisite: 446 or permission of department.

E E 499 Special Projects (2-5, max. 10) AWSpS Assigned construction or design projects carried out under the supervision of the instructor. Prerequisite: permission of department Chairperson.

Courses for Graduates Only

E E 500 Graduate Seminar (1, max. 3) AWSpS Weekly seminars on current topics in electrical engineering. More than one section may be offered in a given quarter. No more than 3 credits can be applied to meet departmental graduation requirements.

E E 505 Introduction to Probability and Random Processes (4) A *Lytle, Ritcey* Foundations for the engineering analysis of random processes: set theoretic fundamentals, basic axioms of probability models, conditional probabilities and independence, discrete and continuous random variables, multiple random variable, sequence of random variables, limit theorems, models of stochastic processes, noise, stationarity and ergodicity, Gaussian processes, power spectral densities. Prerequisite: graduate standing.

E E 506, 507 Communication Theory I, II (3,3) W,Sp *Lytle, Ritcey* Review of stochastic processes. Communication system models. Channel noise and capacity. Optimum detection, modulation and coding, convolutional coders and decoders. Typical channels, random and fading channels. Waveform communication, optimum filters. Prerequisite: 505 or equivalent.

E E 508 Stochastic Processes (3) W *Lytle, Ritcey* Modeling and analysis of random processes encountered in engineering applications. Stationarity and ergodicity. Harmonic analysis, power spectral densities. Karhunen-Loeve expansions. Poisson, Gaussian, and Markov processes. Stochastic integrals and differential equations. Prerequisite: 505 or permission of department Chairperson.

E E 509 Engineering Applications of Linear Graphs (3) W *Andersen* Elementary theory of linear graphs, incidence, cut-set and circuit matrices, matrix formulation of loop, node, and state equations, topological analysis and synthesis of networks, signal flow graphs, applications to switching circuits, automata and communication nets. Prerequisite: graduate standing or permission of department Chairperson.

E E 510 Mathematical Foundations of System Theory (4) A *Damborg, Lytle* Mathematical foundations for system theory are presented from an engineering viewpoint. Topics include set theory, functions and inverse functions, metric spaces, finite dimensional linear spaces, linear operators on finite dimensional spaces. Applications to engineering systems are stressed. Prerequisite: graduate standing or permission of department Chairperson.

E E 511 Principles of Network Synthesis (3) W Network representation in the complex frequency domain, realizability criteria, synthesis of driving point and transfer impedance and coupling networks for prescribed transfer characteristics, canonical forms, and network equivalents, frequency and time domain aspects of approximating response functions. Prerequisite: 411 or permission of department Chairperson.

E E 513 Active Circuit Theory (3) Sp *Andersen* Principles of analysis and synthesis of linear active circuits. Emphasis on general principles, including conservation theorems, invariants, performance limitations in the presence of parasitic elements and realizability conditions. Illustrative applications related to negative resistance amplifiers, feedback amplifiers, and active filters. Prerequisite: 335 or permission of department Chairperson.

E E 517 Introduction to System Optimization (3)
W Hsu Systems engineering and optimization; classical optimization techniques; equality constraints and inequality constraints; Kuhn-Tucker conditions; linear inequalities and linear programming; nonlinear optimization and programming; Fibonacci, Golden-section, and minimax search; gradient search; method of Davidson, Fletcher, and Powell; method of conjugate gradients; elements of quadratic and geometric programming; applications to engineering systems. Prerequisite: 510 or permission of department Chairperson.

E E 518 Digital Signal Processing (4) Sp Digital representation of analog signals. Frequency domain and Z-transforms of digital signals and systems. Design of digital systems; IIR and FIR filter design techniques, fast Fourier transform algorithms. Sources of error in digital systems. Analysis of noise in digital systems. Prerequisites: knowledge of Fourier analysis techniques and graduate standing, or permission of department Chairperson.

E E 519 Stochastic Analysis of Data From Physical Systems (4) W Albrecht Computer systems for acquisition and processing of stochastic signals. Calculation of typical descriptors of such random processes as correlation functions, spectral densities, probability densities. Interpretation of statistical measurements made on a variety of physical systems (e.g., electrical, mechanical, acoustic, nuclear). Lecture plus laboratory. Prerequisite: 505 or equivalent.

E E 520 Spectral Analysis of Time Series (4) A Estimation of spectral densities for single and multiple time series. Basic theory for nonparametric estimation of spectral density, cross-spectral density and coherence for stationary time series, real and complex spectrum techniques. Bispectrum. Digital filtering techniques. Aliasing, prewhitening. Choice of lag windows and data windows. Use of the fast Fourier transform in spectral estimation and computation of correlation functions. The parametric autoregressive spectral density estimate for single and multiple stationary time series. Spectral analysis of nonstationary random processes, and for randomly sampled processes. Techniques of robust spectral analysis. Joint with STAT 520. Prerequisite: 411 or STAT 342, 390, or permission of instructor.

E E 521 Multidimensional Signal Processing (3) A Marks Multidimensional (MD) signals and systems, MD sampling theorem, sample dependence in higher dimensions, MD FIR filter design using windows and the McClellan transform, MD IIR filter stability and design. Current topics in MD signals and systems. Prerequisite: 442 or 518 or equivalent. (Offered odd-numbered years.)

E E 525 Acoustics in Engineering I (3) W Chalupnik, Ishimaru, Merchant, Sigelmann Acoustic wave transmission, reflection, refraction, and diffraction in solids, liquids, and gases. Includes review of continuum mechanics and examples from electromechanical systems. Joint with M E 525. Prerequisite: graduate standing in electrical or mechanical engineering or permission of department Chairperson.

E E 526 Acoustics in Engineering II (3) Sp Chalupnik, Merchant, Sigelmann Continuation of 525. Material differs each year, covering such topics as scattering, moving media, ultrasonics, acoustic holography, optoacoustics, transducer propagation in anisotropic medium, etc. Joint with M E 526. Prerequisite: 525 or permission of department Chairperson.

E E 529 Semiconductor Optics and Optical Devices (3) W Afromowitz Energy states in semiconductors and simple perturbations; absorption processes; optical constants; radiative and nonradiative transitions; processes occurring at p-n junctions; luminescence and stimulated emission; photovoltaic effects; design of practical light-emitting diodes, semiconductor lasers, and photodetectors; bi-stable devices. Prerequisites: 383 and one senior course in semiconductor devices, or permission of instructor.

E E 530 Electromagnetic Properties of Materials (4) A Bjorkstam, Darling, Yee Quantum theory; semiclassical theory of incoherent and coherent interaction between EM radiation and matter, including spontaneous (noise) and stimulated (lasing) emission, super-radiance, photon-echoes, parametric oscillation and amplification; quantum concepts in coherence and detection (photon counting). Prerequisites: 381, 383, and some introductory quantum mechanics or permission of instructor.

E E 532 Power Semiconductor Devices (3) Sp Lauritzen Principles and applications of semiconductor switching devices for electrical energy conversion and control. High injection level, high voltage, and thermal phenomena studied as basis for understanding device transient response, and potential failure modes. Includes diodes, BJTs, FETs, thyristors, and power ICs. Prerequisite: 485 or permission of instructor. (Offered even-numbered years.)

E E 533 Advanced Semiconductor Devices (3) W Darling, Yee Analysis of selected devices with heavy emphasis on extreme operating conditions of bias, temperature, and frequency; includes p-n junctions, Schottky barriers, microwave devices; recent developments from the current literature. Prerequisites: 485, 487, or permission of instructor.

E E 534 Power Electronics (4) W Lauritzen, Sloane Detailed study of DC-to-AC inverters, pulse-width modulated and resonant DC-to-DC converter topologies; drive and protection circuits for efficient switching of semiconductor devices. Computer-aided circuit simulation techniques and integrated circuit controllers. Prerequisite: graduate standing.

E E 535 Digital Integrated Circuits (3) Sp Soma Analysis and design of digital integrated circuits. Emphasis on MOS and bipolar LSI technology and devices including static and dynamic MOS and PL bipolar logic. Circuits include basic logic elements, shift registers, memories, microprocessors, and programmed logic arrays. Prerequisite: graduate standing in electrical engineering.

E E 536 VLSI Layout (3) Sp Helms, Soma VLSI layout methodologies. All MOS design styles and software tools available for layout are taught along with students' project work in the laboratory. Students' projects fabricated and tested in subsequent classes. Minor emphasis on ECL and GaAs layout techniques. Prerequisite: 535 or equivalent.

E E 537 Electronic Amplification Devices and Applications (3) W Helms Present state-of-the-art linear integrated circuits are reviewed and foreseeable future developments anticipated, with the objective of providing a timely introduction to analog circuit design at the graduate level. Focus is on both the internal design and operation of integrated devices to prompt understanding of limitations, and the application of standardized modules to electronic systems design. Prerequisite: graduate standing or permission of department Chairperson.

E E 538 Topics in Electronic Circuit Design (1-5) AW Atlas, Guilford, Helms, Lauritzen, Soma Topics of current interest in electronic circuit and system design. Course content varies from year to year, based on current professional interests of the faculty member in charge. May be repeated for credit by permission. Prerequisite: permission of department Chairperson.

E E 539 Advanced Topics in Solid-State Electronics (1-5, max. 5) AWSp Auth, Bjorkstam, Yee Lectures or discussions of topics of current interest in the field of solid-state electronics for advanced graduate students having adequate preparation in solid-state theory. Subject matter may vary according to the interests of students and faculty. Prerequisite: permission of department Chairperson.

E E 540 VLSI Testing (3) A Soma VLSI testing and design-for-test techniques. Reliability predictions

and characterizations for integrated circuits and systems. Circuits fabricated in 536 are tested as laboratory work. Prerequisites: 535, 536.

E E 546 Advanced Topics in Control System Theory (1-5) AWSp Topics of current interest in control system theory for advanced graduate students with adequate preparation in linear and nonlinear system theory. Prerequisite: permission of department Chairperson. (Offered when adequate enrollment develops prior to close of advance registration.)

E E 547 Neural Communication and Control in Biological Systems (3) W Neural processing of the visual image and communication between levels of the central nervous system. Feedback and its role in movement by organisms. Description and analysis of the means by which electrochemical events generate, modulate, and demodulate neuronal signals, and the parallel interaction between these signals in transduction of images and other information. Prerequisite: advanced graduate standing or permission of instructor.

E E 548 Applied Optimal Control and Estimation I (3) W Review of calculus of variations, definition of the dynamic optimization problem, constraints and Lagrange multipliers, the Pontryagin minimum principle, necessary conditions for optimality, extremal fields and sufficiency conditions, the Hamilton-Jacobi equation, singular arc problems, transformation techniques for singular arc problems. Joint with A A 548. Prerequisite: 584 or equivalent or permission of department Chairperson.

E E 549 Applied Optimal Control and Estimation II (3) Sp Review of continuous random processes, definition of the LQ optimal control/estimation problem for continuous systems in the presence of noise, the certainty-equivalence principle, duality of regulator/follower-filter/smoothing problems, necessary conditions for optimality synthesis of steady-state regulators and filters using eigenvector decomposition techniques, relationship to classical control techniques. Joint with A A 549. Prerequisites: 548 or A A 548, 505 or equivalent or permission of department Chairperson.

E E 550 Applied Optimal Control and Estimation III (3) A Review of discrete random processes, definition of the discrete LQ optimal control/estimation problem, factorization methods for discrete filters, Luenberger observers, reduced order filters, suboptimal filters. Joint with A A 550. Prerequisite: 549 or A A 549 or permission of department Chairperson.

E E 551 Power System Protection (4) The protection of electric power systems from overcurrents and overvoltages. Overcurrents resulting from faults, lightning induced or otherwise, or from excessive loads or power swings. Overvoltages resulting from switching transients or lightning. Principal concern is with relays and lightning arrestors as protection means. Prerequisite: 455 or equivalent.

E E 552 Power Systems Dynamics and Control (4) Sp El-Sharkawi Advanced computer modeling and analysis of power systems. Application of modern systems and control theories to power systems. Prerequisites: 344 and 455 or permission of instructor. (Offered alternate years.)

E E 554 Large Electric Energy Systems Analysis (4) A Venkata Deals with problems whose solution depends upon the inversion of sparse matrices that occur in the planning and operational studies of large interconnected energy systems. Application studies include system model development, state estimation, and load flow. Prerequisite: 456 or permission of instructor. (Offered even-numbered years.)

E E 555 Power Systems Reliability Analysis (4) W Reliability considerations that influence planning and operation of electric power systems. Applications include reliability calculations to determine desired reserves (static and spinning) and reliability of power supply. Required foundation in probability methods is included. Prerequisite: 455 or permission of instructor. (Offered even-numbered years.)

E E 559 Special Topics in Electrical Energy Systems (1-5) AWSpS *Damborg, El-Sharkawi, Liu, Sloane, Venkata* Topics of current interest in electrical power and energy devices and systems. Content varies from year to year, based on current professional interests of faculty member in charge. May be repeated for credit by permission. Prerequisite: permission of instructor.

E E 562 Artificial Intelligence for Engineers (3) W *Holden, Johnson* Covers main areas of artificial intelligence without need for extensive prerequisites. Programming languages for AI; problem solving; representations; control strategies; searching strategies; predicate calculus; rule-based deduction; goal-directed planning; knowledge-based systems. Prerequisites: 370, 374, or equivalents.

E E 563 Fault-Tolerant Computer Architecture (3) W Architectural issues in fault-tolerant computers, redundancy management techniques, system diagnosis and repair. Self-checking and fail-safe circuits. Evaluation criteria and reliability estimation, coding techniques. Fault-tolerant software. Prerequisites: 471 or equivalent, permission of instructor.

E E 564 Parallel Computer Systems (3) W Pipelined and vector processors; interconnection network for parallel processing, array and associative processors; multiprocessors; data-flow machines; systolic arrays and impact of the VLSI technology on parallel processors and processing. Prerequisites: 471, permission of instructor.

E E 565, 566 Computer-Communication Networks I, II (3,3) W,W *Meditch* Computer-communication network concepts and principles; queueing systems and applications; network architectures and protocols; modeling, performance analysis, and design of terrestrial networks; multiaccess techniques; satellite, ground-radio, and local area networks. Prerequisites: 505 or equivalent for 565; 565 for 566.

E E 568 Image Processing Computer Systems (4) All components of digital image-processing computer systems. Two-dimensional filtering and optimal filter design as well as basic image processing operations. Selected advanced image processing topics. Individual student project. Joint with BIOEN 568. Prerequisite: permission of instructor.

E E 570 Antenna Engineering (3) W *Peden* Theory of radiation; impedance characteristics and radiation patterns of thin linear antenna elements; antenna arrays; pattern synthesis; aperture antennas. Prerequisite: graduate standing or permission of department Chairperson.

E E 572 Electromagnetic Theory and Applications I (4) A *Ishimaru, Sigelmann, Tsang* Electromagnetic waves in layered media; complex waves, leaky and slow waves, waves in periodic structures, optical fibers, ionosphere and other guiding structures; transients and dispersive medium; waveguides and cavities; eigenfunctions and eigenvalues. Prerequisite: graduate standing or permission of department Chairperson.

E E 573 Electromagnetic Theory and Applications II (4) W *Ishimaru, Sigelmann, Tsang* Scattering and absorption of electromagnetic waves, Rayleigh scattering, Born approximations, Green's functions, integral equations, numerical techniques and moment method, finite element method, high- and low-frequency approximations, saddle-point method, and variational principle. Prerequisite: 572 or permission of department Chairperson.

E E 574 Electromagnetic Theory and Applications III (4) Sp *Ishimaru, Sigelmann, Tsang* Geometric theory of diffraction, wave fluctuations, antenna noise temperature, data-processing antennas, remote-sensing techniques and tomography applications, diffraction and scattering, discontinuities. Prerequisite: 573 or permission of department Chairperson.

E E 575 Waves in Random Media (4) Sp *Ishimaru, Sigelmann, Tsang* Propagation and scattering of electromagnetic, optical, and acoustic waves in turbulence and random media, and scattering from rough surfaces and randomly distributed particles. Atmospheric turbulence, fog, rain, smog, clear-air turbulence detection, remote sensing, scattering from blood cells and tissues, and scattering by ocean waves. Applications to atmospheric sciences, bioengineering, and ocean engineering. Prerequisite: graduate standing or permission of department Chairperson.

E E 576 Image Understanding (3) Sp Overview of computer vision, emphasizing middle ground between image processing and artificial intelligence. Image formation, preattentive image processing, boundary and region representation, case studies of vision architecture. Joint with C SCI 576. Prerequisites: 562 and C SCI 557 or C SCI 573 or equivalent, or permission of instructor.

E E 578 Inverse Problems in Propagation and Scattering (2) A *Porter* Inverse problems in wave propagation and scattering, holographic shape determination, inverse source problems, diffraction tomography, wave migration and backward propagation. Applications in holography, ultrasound imaging, geophysical inversion, oceanography, optics, medicine. Prerequisite: 572 or equivalent.

E E 579 Advanced Topics in Electromagnetics, Optics, and Acoustics (1-5) AWSp *Ishimaru, Peden, Porter, Sigelmann, Tsang* Topics of current interest in electromagnetics, optics, and acoustics. Content varies from year to year, based on current professional interests of faculty member in charge. May be repeated for credit. Prerequisite: permission of instructor.

E E 580 Volterra and Wiener Nonlinear Systems (3) Sp *Pinter* Methods of the Volterra and Wiener integral series for input-output description of nonlinear systems. Generalization of the linear convolution integral to multiple convolutions, transforms of kernels, derivation of kernels from parametric (differential equation) models. Orthogonalization of series. Applications. Prerequisite: 335.

E E 583 Nonlinear Control Systems (4) Sp *Noges* Dynamic analysis of nonlinear control systems. Analytical, graphical, numerical, and simulation techniques for solving continuous and discontinuous nonlinear control system problems. Phase space. Describing functions, Popov and Lyapunov and contraction mapping methods are employed for stability evaluation of dynamic systems. Prerequisite: 584 or permission of instructor. (Offered odd-numbered years.)

E E 584 Continuous and Discrete State Variable Methods (3) AW *Alexandro, Clark, Hsu* Dynamic analysis of automatic control systems using state variable methods. Vector space concepts, modeling of physical systems in state space format, canonical forms for continuous and discrete time systems, controllability and observability, full-state feedback, state estimators, eigenstructure design. Prerequisite: graduate standing or permission of instructor. Recommended: MATH 303.

E E 585 Digital and Sampled-Data Systems (3) Sp *Alexandro, Hsu* Sampling process and data holds, state variables and state transition equations for sampled-data systems, frequency domain and time domain analysis of sampled-data systems, stability of sampled-data systems, digital compensation of sampled-data systems. Prerequisite: 584.

E E 586 Advanced Computer Applications I (3) A *Holden* Basic analytical methods related to man-machine communication by voice and vision. State-of-the-art review of speech, natural language, and image understanding systems. Each student does a self-chosen project. Prerequisite: graduate standing or permission of department Chairperson.

E E 588 Advanced Logical Design of Digital Computers I (3) Sp *Johnson* Advanced concepts of combinational circuit design, multiple output logics, logical completeness, classes of combinational functions. Advanced concepts of sequential machines, limitations, reduction, state assignment. ROMs and array logics. Bubble memories and logics. Universal logic modules, cellular logics. Prerequisite: 476 or equivalent.

E E 590 Advanced Topics in Digital Computers (2-5, max. 15) AWSp *Haralick, Holden, Johnson, Kim, Lin, Meditch, Shapiro, Somani, Zick* Lectures or discussions of topics of current interest in the field of digital computers. Subject matter may vary from year to year. Prerequisite: permission of department Chairperson.

E E 595 Advanced Topics in Communication Theory (1-5) AWSp *Lytle, Marks, Rittcey* Extension of 507, 508, 518, 519, 520. Material differs each year, covering such topics as: detection theory, decision theory, game theory, adaptive communication systems, nonlinear random processes, etc. May be repeated for credit by permission. Prerequisite: permission of department Chairperson.

E E 599 Selected Topics in Electrical Engineering (*) AWSpS Prerequisite: permission of department Chairperson.

E E 600 Independent Study or Research (*) AWSpS

E E 700 Master's Thesis (*) AWSpS

E E 800 Doctoral Dissertation (*) AWSpS

Industrial Engineering

G7 Mechanical Engineering

Industrial engineering focuses on the science and technology of the industrial environment and on the analysis and design of systems that efficiently produce goods and services. The curriculum pays particular attention to both the physical process involved in manufacturing and the decision-making components of industry. Industrial engineering provides a basic engineering foundation for understanding the interaction between technology and management.

Undergraduate Program

Bachelor of Science in Industrial Engineering Degree

ENGR 123, 124, 130, 141, 170, 210, 220, and 230; MATH 124, 125, 126, 205, 238, 302, and 327; CHEM 140 and 150; and PHYS 121, 122, and 123 are engineering college program requirements and are part of the 111 credits required for the premajor. See the advising guide for courses that have been approved as alternates for ENGR 124 and 130.

The professional program consists of courses listed in the *Industrial Engineering Undergraduate Advising Guide*. Typical courses are statistics, operations research, engineering economy, human factors, workplace and work design, manufacturing processes, planning and scheduling, reliability, simulation quality control, industrial management, computer-integrated production, and robotics and artificial intelligence. The professional component comprises 78 credits. A total of 189 applicable credits is required for graduation, with a grade-point average of at least 2.00 to be maintained in all engineering courses in the program. Courses counting toward the B.S.I.E. degree may not be taken on a satisfactory/not satisfactory basis.

Correspondence and Information

All inquiries concerning the industrial engineering program should be addressed to the Industrial Engineering Undergraduate Adviser, G7 Mechanical Engineering, FU-20.

Graduate Program

A separate graduate program in industrial engineering is not presently offered. Faculty members in the industrial engineering program participate in offering the authorized interengineering degree option within the college-wide Master of Science in Engineering degree program. Exceptionally qualified students may apply to the special individual Ph.D. program. Areas of faculty expertise include manufacturing, operations research, large-scale systems, methodology, experimental statistics, production planning and quality, reliability engineering, integrated manufacturing, artificial intelligence, robotics, human factors, and community health.

A proposal to offer the specific degrees of Master of Science in Industrial Engineering and Doctor of Philosophy in Industrial Engineering is now under development.

Correspondence and Information

Industrial Engineering Director
Industrial Engineering, FU-20

Faculty

Director

Scott C. Iverson

Professor

Montgomery, Douglas C.,* 1984, M.S.I.E., 1967, Ph.D., 1969, Virginia Polytechnic Institute; statistical modeling and analysis, quality and reliability engineering, experiment design.

Associate Professors

Drui, Albert B.,* 1959, M.S.I.E., 1957, Washington (St. Louis); industrial engineering, human factors.

Iverson, Scott C.,* 1983, M.S., 1972, San Jose State; M.Sc., 1979, Trinity (Dublin); Ph.D., 1974, Colorado; operational research and systems theory applied to manufacturing automation, decision making, community health.

Roberts, Norman H.,* 1968, Ph.D., 1958, Washington; reliability and probability theory.

Storch, Richard L.,* 1977, M.S., 1968, Massachusetts Institute of Technology; Ph.D., 1978, Washington; statistical quality control, scheduling, group technology, shipbuilding, marine safety.

Assistant Professors

Barfield, Woodrow, 1987, M.A., 1980, California State; Ph.D., 1988, Purdue; interactive computer graphics, human factors in computer systems.

Chapman, Bruce L., 1986, M.B.A., 1981, South Carolina; Ph.D., 1986, Texas; application of artificial intelligence to manufacturing and computer-aided manufacturing implementation.

Zabinsky, Zeldia B.,* 1985, M.S., 1984, Ph.D., 1985, Michigan; operations research in industrial engineering, optimization with stochastic elements.

Lecturer

Steight, Richard L., 1978, B.A., 1977, Washington.

Course Descriptions

Courses for Undergraduates

Industrial Engineering

IND E 311 Engineering Economy (3) ASp *Drui, Iverson* Introduction to industrial cost analysis. Systems that provide economic and performance data for

management decisions. Evaluation of engineering alternatives. Use of interest computations, valuations, depreciation, and cost estimates to predict the economic result of the application of engineering products or processes.

IND E 315 Statistical Analysis of Engineering Measurements (3) AWSpS *Roberts, Zabinsky* Application of probability theory and statistics to engineering problems, distribution theory and discussion of particular distribution of interest in engineering, statistical estimation and data analysis. Illustrative statistical applications may include quality control, linear regression, analysis of variance, and experimental design. Prerequisite: MATH 238.

IND E 316 Regression Analysis and Design of Experiments (3) W Introduction to the analysis of data from planned experiments. Analysis of variance and regression analysis with applications in engineering. Joint with STAT 316. Prerequisite: 315.

IND E 317 Work Systems Design (4) WSp *Drui* Work design and measurement principles; time utilization, flow and operations studies, principles of motion economy, time study principles and practices, physiological and psychological aspects of work. Lectures and studies in local industry as laboratory.

IND E 324 Engineering Applications of Linear Programming (3) A *Iverson* Optimization of linear systems, mathematical model design, simplex methods, primal-dual algorithms, parametric programming, network theory, integer and goal programming. Design aspects of models with applications involving transportation, allocation, and total industrial systems. Prerequisites: MATH 328, ENGR 141.

IND E 325 Nonlinear Programming and Stochastic Models (3) W *Iverson* Optimization of nonlinear and stochastic systems analysis to industrial engineering problems. Linear approximation methods, geometric and risk programming, inventory, queuing, game and decision theories, simulation, and Markov chains. Prerequisites: 315, 324.

IND E 326 Methodology of Operations Research (3) Sp *Iverson* Fundamental concepts of mathematical systems theory. Application of general systems approach for specification of requirements, analysis, design, implementation of industrial engineering, and information systems. Generalized techniques and applications common to industrial, mechanical engineers, and management scientists. Class project concerning analysis of large-scale systems problem utilizing operational research. Prerequisite: 325.

IND E 351 Human Factors in Design (3) WSp *Barfield* Engineering considerations of the abilities and limitations of the human aspect in the design of operational systems and components. Functional, psychological, physiological, and environmental considerations. Studies with local industry used as laboratory exercises. Prerequisite: 315.

IND E 410 Industrial Organization and Management (3) WS *Drui* Overview of the operations of an industrial organization, interrelationship of functions, and fundamental principles of management that lead toward effective coordination and control. Lectures and case studies from industry.

IND E 419 Work Environment Design (3) WSp *Drui, Storch* Design of new or expanding facilities. Considers layout, heating, ventilation, power, acoustics, sanitation, illumination, protection, and other environmental factors. Lectures and local industry as laboratory.

IND E 420 System Safety and Reliability Engineering (3) Sp *Roberts* Applications of statistical and algebraic techniques to system reliability. Derivation and discussion of failure distributions; quality control; analysis of reliability test data; maintenance policies and Monte Carlo simulation techniques. Prerequisite: 315.

IND E 424 Simulation (4) A *Iverson* Discrete-event simulation methodology emphasizing model formulation and construction, statistical base for simulation modeling, and computer languages. Applications to industrial and manufacturing problems. Laboratory illustrates model architecture, inference, and optimization. Joint with QMETH 424. Prerequisites: 315 or QMETH 201, I S 200, or equivalents.

IND E 443 Inventory and Materials Management (4) *Drui, Iverson* Production and inventory management decisions for manufacturing and distribution firms. Techniques for forecasting demand for finished product items, role of inventories and aggregate planning in production process. Integrated materials requirements planning and capacity planning. Joint with OPMGT 443. Prerequisite: OPMGT 301 or equivalent.

IND E 450 Operations Scheduling (4) WSp *Storch* Continuous flow, intermittent, and project production processes and tools for managing these processes. Assembly-line balancing, job shop scheduling, project planning and control (PERT and CPM), improvement curves, work force scheduling, and vehicle scheduling. Joint with OPMGT 450. Prerequisite: OPMGT 301 or equivalent.

IND E 451 Statistical Quality Control (3) A *Storch* Design of quality-control systems. Use of statistical process controls and acceptance sampling methods. Process capability analysis and methods for establishing specifications and tolerances. Joint with O ENG 451. Prerequisite: 315.

IND E 481 Application of Computer-Aided Manufacturing Techniques (3) A *Chapman* Production management systems, computer control systems, numerical control. Materials requirements planning, computer-based process and quality control, and APT programming for NC machines. Prerequisite: 483.

IND E 482 Robotics and Artificial Intelligence (3) W *Chapman* Application of robots and other flexible manufacturing equipment. Sensors, mechanization of parts handling, automatic production and assembly, types of industrial robots, and industrial implementation. Introduction to artificial intelligence. Prerequisite: 481.

IND E 483 Manufacturing Optimization (3) Sp *Chapman* Design and optimization of manufacturing systems. Computer-assisted manufacture. Sensing and control methods for efficient use of automation. Managing the automated factory. Tool and production planning. Laboratory exercises and applications in local industrial plants. Prerequisite: M E 304 or permission of instructor.

IND E 495 Industrial Engineering Design (3) *Drui* Design seminar laboratory involving identification and synthesis of engineering factors to plan and achieve specific project goals. Current literature and required texts are used as reference sources. Lecture and/or laboratory. Prerequisites: 311, 450, 481.

IND E 498 Special Topics in Industrial Engineering (3) Lecture and/or laboratory. Maximum of 9 credits may be applied toward an undergraduate degree. Prerequisite: permission of instructor.

IND E 499 Special Projects (2-5, max. 9) Prerequisite: permission of department Chairperson.

Materials Science and Engineering

302 Roberts

Materials science and engineering is an interdisciplinary field that addresses the scientific fundamentals of materials, their processing, and their engineering design for technological applications. Basic principles of

chemistry and physics are applied to provide an understanding of the structure of materials and the manner in which the structure determines the properties. Scientific processing is then applied to yield the necessary properties, which then can be integrated with, and designed to accommodate, the needs of modern technology.

Ceramic Engineering

Ceramic materials are high-temperature resistant, chemically durable, strong, and rigid. The ceramic engineering program provides students with an understanding of the chemical, electrical, optical, mechanical, and thermal properties of ceramics; of processing methods and their effects on the structure and properties; and of the feasibility and economics of manufacture of ceramic materials for engineering applications. The study of electronic and optical materials is also available in the program.

Undergraduate Program

Bachelor of Science in Ceramic Engineering Degree

Entrance to the program requires the equivalent of at least 45 credits earned at the University of Washington, or their equivalent, with a 2.00 grade-point average and attainment of 2.0 in specified courses. Entrance requirement details may be obtained from the department or the University's Office of Admissions. Application forms to enter the program are available from the department office. Continuation in the program is subject to the policy defined by the College of Engineering.

Lower-division courses required in addition to the minimum college requirements are: CHEM 150 and ENGR 123, 170, 220; E E 306 and ENGR 331 or equivalent. The upper-division professional program consists of 72 credits or required courses, plus a 4-credit senior problem. 10 credits of free electives also are required, for a total of 190 credits for the B.S.Cer.E. degree.

Other Sources of Information

Planning information for undergraduates is available from the department office.

Metallurgical Engineering

Metallurgical engineering is concerned with the processing, fabrication, and utilization of metals, alloys, and other engineering materials. Extractive metallurgy relates to the processing and refining of metals and their compounds. Physical metallurgy is concerned with the structure and properties of materials, the development of new materials with improved properties, and the application and performance of materials in modern engineering systems and design. The study of electronic and optical materials is also available in the program.

Undergraduate Program

Bachelor of Science in Metallurgical Engineering Degree

Entrance to the program requires the equivalent of at least 45 credits earned at the University of Washington with a 2.00 grade-point average, with attainment of 2.0 in specified courses. Entrance requirement details may be obtained from the department or the University's Office of Admissions. Application forms to enter the program are available from the department office. Continuation in the program is subject to the policy defined by the College of Engineering.

Lower-division courses required for graduation in addition to the minimum college requirements are 3 credits of chemistry or physics laboratories, ENGR 170, 210, 220, and 331 or 332 or equivalent. Remaining lower-division courses are selected with the adviser's ap-

proval from among those recommended. Metallurgy majors must complete a 6-credit, upper-level science requirement, chosen with the adviser's approval. Recommended courses to fulfill this requirement include CHEM 350, 351, 455, 456, and PHYS 224, 225. The technical electives (18 credits) approved by a metallurgical engineering adviser must include a minimum of 9 credits in metallurgical engineering classes at the 400 level. A 4-credit problem-solving course is also required at the senior-level. In addition to the college and departmental requirements specified above, sufficient free electives must be completed to satisfy the minimum graduation requirement of 188 credits.

Other Sources of Information

Planning information for undergraduates is available from the department office.

Graduate Program

Thomas F. Archbold, Graduate Program Coordinator

The Department of Materials Science and Engineering offers programs of study leading to the degree of Master of Science in Materials Science and Engineering with defined options in Ceramic Engineering, Metallurgical Engineering, and Materials Science. The Doctor of Philosophy program is offered with defined pathways in Ceramic Engineering, Metallurgical Engineering, and Materials Science.

Ceramic engineering graduate programs are designed to develop a fundamental understanding of the physical, chemical, and structural relationships that influence the properties and applications of ceramic materials. Processing, the development of microstructure, and the relationships of microstructure to properties are considered from a basic viewpoint that is applicable to a broad range of materials. Special interdisciplinary courses are offered in structural applications of brittle materials that combine mechanics and materials in a practice-oriented engineering design program.

Graduate programs in metallurgical engineering encompass a variety of courses and research programs that are related to the physical and chemical aspects of metals, alloys, and related engineering materials. Programs in the physical metallurgy and materials science areas include the structure and properties of alloys, phase transformations, biomaterials, lattice defects, the optical properties of nonmetallic solids, failure analysis, x-ray diffraction, and the mechanical behavior of materials. Programs in the area of extractive metallurgy and minerals processing include metallurgical thermodynamics, rate phenomena, extractive process design, and carbothermic reduction processes.

The Materials Science option or pathway is a course of study that combines the basic elements of understanding ceramics, metals, polymers, composites and electronic materials. Many specialized courses, including engineering fracture mechanics, semiconductor devices, and polymer chemistry, may be taken in other departments to provide a broad, yet basic, materials study program.

In addition, the department is authorized to supervise an option in Materials Science and Engineering that leads to the College of Engineering Master of Science degree. This degree program is intended to accommodate students who have a strong science background but lack an undergraduate engineering degree. The required courses are the same for all of the above degrees. Students with deficiencies in their intended area of engineering specialization may be required to take undergraduate courses in addition to the normal graduate course requirements.

Master of Science in Materials Science and Engineering and Master of Science Degree

For these master's degrees, a minimum of 30 credits of course work and the satisfactory completion of an M.S.

thesis research problem are required. Fifteen of the course credits are specified to include courses on chemical kinetics, diffusion, crystal structure and imperfections, microstructure and phase transformations, and graduate seminar. Other courses may be required for specific program options. The residence and grading requirements follow those of the Graduate School as presented in this catalog.

Doctor of Philosophy Degree

Students who have completed one year of graduate work must take the Ph.D. qualifying examination the next time it is offered to determine whether the faculty will advise continued study proceeding to the General Examination for the degree of Doctor of Philosophy. A critical examination of the applicant's complete academic record, recommendations, and proposed course of study will be pertinent to this decision. In addition to course work, each student is required to pass the General Examination, which is sufficiently comprehensive to demonstrate the student's ability to deal with broad aspects of materials science, as well as with a specialized subject area. Proficiency in basic research is of paramount importance. Each prospective candidate is required to present a written dissertation that makes an original and independent contribution to knowledge of the student's field of specialization.

Research Facilities

The research laboratories in the Department of Materials Science and Engineering are well equipped for a variety of research endeavors. Facilities include equipment for electron and optical microscopy, x-ray diffraction, high-temperature heat treatment and mechanical testing, specialized processing equipment, including hot and cold isostatic presses, nitrogen reaction furnaces, and automated TGA, DTA analysis systems. Equipment for analyses of particle size, surface area, and pore size is also available. Students have liberal access to the large University mainframe computers, as well as local mini and microcomputers.

Financial Aid

A limited number of teaching assistant and research assistant appointments are available. Early application and direct correspondence or interviews with faculty members who may have open positions on research projects are encouraged. Requests for application forms and financial aid should be directed to the graduate program coordinator.

Correspondence and Information

Graduate Program Coordinator
302 Roberts, FB-10

Faculty

Chairperson

Thomas G. Stoebe

Professors

Aksay, Ilhan A.,* 1983, M.S., 1969, Ph.D., 1973, California (Berkeley); ceramic processing, powder consolidation, ceramic-metal composites, phase equilibria in ceramic systems.

Archbold, Thomas F.,* 1961, M.S., 1957, Ph.D., 1961, Purdue; corrosion, thermal diffusion, substructure characterization, fatigue.

Bradt, Richard C.,* 1983, M.S., 1965, Ph.D., 1967, Rensselaer Polytechnic Institute; mechanical properties of materials, thermal shock and thermal expansion of ceramics, glasses, refractories and ceramic-ceramic composites.

Fischbach, David B.,* 1969, M.S., 1951, Ph.D., 1955, Yale; structure and properties of carbons, graphite, other nonoxide ceramics and composite materials.

Ghose, Subrata,* 1972, ‡(Geological Sciences, Geophysics), M.S., 1959, Ph.D., 1959, Chicago; lattice dynamics, structural and magnetic phase transitions, thermal expansion.

Kikuchi, Ryoichi,* 1985, (Research), Dr.Sci., 1951, Tokyo (Japan); statistical mechanics of solids (equilibrium and irreversible), phase diagrams, diffusion kinetics.

Laine, Richard M., 1987, (Research), Ph.D., 1973, Southern California; inorganic and organometallic precursors, materials chemistry, catalysts.

Polonis, Douglas H.,* 1955, Ph.D., 1955, British Columbia; physical and mechanical metallurgy, phase transformations, strengthening mechanisms, alloy design, structure-property relation in materials.

Rao, Y. Krishna,* 1976, Ph.D., 1965, Pennsylvania; reaction kinetics, catalysis and thermodynamics in materials systems and electronic materials processing.

Scott, William D.,* 1965, M.S., 1959, Ph.D., 1961, California (Berkeley); optical and electron microscopy of high-performance ceramics, alumina and electronic materials.

Stoebe, Thomas G.,* 1966, (Nuclear Engineering), M.S., 1963, Ph.D., 1965, Stanford; lattice defects and luminescence in solids, electronic and optical materials and devices, solid-state radiation dosimetry.

Whittemore, Osgood J.,* 1964, (Emeritus), M.S., 1941, Washington; Cer.E. (Professional), 1950, Iowa State; ceramic processing, sintering, mercury porosimetry, refractories.

Associate Professors

Miller, Alan D.,* 1957, Ph.D., 1967, Washington; chemical bonding, high-temperature equilibria, environmental effects on mechanical properties, high-temperature processing.

Stang, Robert G.,* 1973, M.S., 1965, California (Los Angeles); Ph.D., 1972, Stanford; elastic and plastic deformation of materials, high-temperature creep in metals and ceramics, substructure effects.

Taya, Minoru,* 1987, ‡(Mechanical Engineering), Ph.D., 1977, Northwestern; composite materials, elasticity and plasticity, impact physics, fracture theory.

Assistant Professors

Kaufman, Michael J.,* 1986, Ph.D., 1984, Illinois (Urbana); physical metallurgy, electron microscopy, materials processing, structure-property relations.

Kuhn, Kellin J., 1987, (Research), M.S., 1985, Ph.D., 1985, Stanford; molecular beam epitaxy of AlGaAs/GaAs on GaAs, InGaAs/GaAs on GaAs, and InGaAs/GaAs on InP superlattices and quantum wells.

Sarikaya, Mehmet,* 1984, M.S., 1979, Ph.D., 1982, California (Berkeley); phase transformations; microstructure, crystallography, and spectroscopy of metals, ceramics, and composites by HREM techniques; biocrystallization; structure-property relations.

Viney, Christopher,* 1987, M.A., 1982, Ph.D., 1984, Cambridge (England); microstructure/property relationships in liquid crystalline polymers.

Course Descriptions

Courses for Undergraduates

Ceramic Engineering

CER E 198 Career Planning II (1) ASp Career opportunities in ceramic engineering and the required educational curricular planning. Offered on credit/no credit basis only.

CER E 300 Introduction to Ceramic Raw Materials and Processes (4) A Raw materials, fabrication processes, and process control of interest to ceramic engineers. Natural and synthetic raw materials, forming, drying, firing, temperature measurement, physical measurements.

CER E 303 Ceramic Processing: Methods (5) Sp Technology of ceramic fabrication processes. Material characterization at processing stages for control. Laboratory study of all operations in the manufacture of selected ceramic products.

CER E 308 Ceramic Engineering Excursion (1) Plant inspection trip. Offered on credit/no credit basis only. 2 credits required.

CER E 401 Equipment and Plant Design (3) The design process and its application in ceramic engineering. Design projects. Prerequisite: MSE 302.

CER E 404 Ceramic Process Analysis (3) Sp Case histories of ceramic industrial facilities. Plant visits. Economic factors and overall process integration, including raw materials, processes, fuels, personnel, distribution. Prerequisite: junior standing.

CER E 411 Vitreous State (4) Chemistry and physics of glass, glazes, and porcelain enamels; structure, properties and processing of vitreous materials. Prerequisite: MSE 316 or permission of instructor.

CER E 413 Physical Ceramics: Thermal and Mechanical Properties (4) Physical models for thermal properties of ceramic materials. Mechanical properties, elasticity, strength, thermal shock, and high temperature effects relative to structural design. Prerequisite: ENGR 220.

CER E 414 Electrical Properties of Ceramics (3) W Ionic and electronic conduction in crystalline and non-crystalline inorganic solids. Dielectric and ferroelectric behavior, magnetic properties of ferrimagnetic materials, optical properties of dielectrics. Undergraduate ceramic engineering majors must take 415 concurrently. Prerequisite: 306.

CER E 415 Electrical Properties of Ceramics/Laboratory (1) W Ionic and electronic conduction in crystalline and noncrystalline inorganic solids. Dielectric and ferroelectric behavior, magnetic properties of ferrimagnetic materials, optical properties of dielectrics.

CER E 420 Colloidal Ceramics (3) Properties and surface chemistry of ceramic colloids. Topics include absorption, adsorption, gels and their contributions to cementitious bonding, ion exchange, rheological properties, and analytical techniques applicable to these studies.

CER E 441 Undergraduate Seminar (1, max. 3) AWSp Employment selection, résumé writing and correspondence, personnel contacts, interview planning and job-selection campaign. Individual technical presentations.

CER E 450 Introduction to Carbon Materials (3) Nature and capabilities of crystalline and disordered forms of pure carbon as engineering materials. Influence of structure on behavior. Preparation methods, structure and properties of diamond; synthetic and natural graphites; glassy, coke, pyrolytic, black, and fiber carbons.

CER E 470 Refractories (3) Chemical and mineralogical composition; processing methods; thermal, physical, and chemical properties and tests; application in high-temperature processes.

Materials Science and Engineering

MSE 301 Optical Microscopy (3) A Use of the optical microscope as a tool for the observation and analysis of the microstructure of materials. Light, interaction of light with matter, and principles of image formation and image interpretation using both reflected and transmitted light techniques.

MSE 302 Materials Processing: Transport (3) W Transport in materials processing systems; fluid flow, heat flow, mixing and application to high-temperature processing.

MSE 305 Phase Equilibria (4) Phase equilibria in ceramic and metal systems of one, two, and three components. Use and determination of phase equilibrium diagrams. Prerequisite: 322 or ENGR 260.

MSE 314 Crystal Chemistry and Crystallography (5) A Crystal chemistry of metallic and nonmetallic phases. Principles of crystal symmetry and use of stereographic projections. Applications in design and analysis of materials systems. Prerequisite: ENGR 170.

MSE 315 Kinetic Processes and Transformations in Materials (5) W Applications of thermodynamic and chemical kinetics principles to the study of engineering materials. Reaction rates in solids, liquids, and gases; solid-state diffusion; phase changes, nucleation and growth; microstructure modification, including solidification, recrystallization, precipitation; sintering and vitrification. Prerequisites: 314, ENGR 170.

MSE 316 Mechanical Behavior of Materials III (5) Sp Influence of structure on the mechanical properties of ideal and real solids. Mechanical behavior in metallic and ceramic systems. Prerequisite: 315.

MSE 322 Thermodynamics in Materials Systems (4) Quantitative applications of thermodynamics to systems of interest to metallurgical and ceramic engineers. Detailed review of thermodynamic quantities and equations of state.

MSE 399 Introduction to Research and Design (1) Research planning and design in materials science and engineering introduced by the faculty to facilitate student selection of senior project topic. (Formerly CER E 399.)

MSE 421 Thermodynamics of Solids (3) Applications of thermodynamics to the solid state. Statistical interpretation of entropy. Heterogeneous equilibria. Theories of solutions. Thermodynamics of surfaces and of defects in solids. Prerequisite: 322 or equivalent.

MSE 423 Fiber Composite Materials (3) Theory, properties, and practice in fibrous composite materials. Micromechanics of load transfer from matrix to fiber; properties of individual phases; properties of the interfacial region; elastic and failure properties of composites; composite fabrication. Study of polymer, metal, and ceramic matrix composites with appropriate reinforcement. Prerequisite: ENGR 170 or permission of instructor.

MSE 444 Nuclear Materials (3) Structure, properties, and performance of materials in nuclear reactor applications; engineering requirements and selection of materials for reactors; technology of materials for reactor fuels, moderators, shields, control elements, and structural components; corrosion and oxidation; effects of radiation on the structure and properties of materials. Joint with NUC E 444. Prerequisite: ENGR 170 or equivalent.

MSE 455 Characterization Methods in Materials Science (4) Principles and applications of analytical techniques for materials characterization: X-ray, neutron, and electron diffraction; scanning and transmission electron microscopy; Auger electron spectroscopy. Prerequisite: 314.

MSE 466 Solid-State Electronic Materials (3) Introduction to solid-state concepts in materials. Bonding, free-electron and band theories, semiconductor physics. Applications to metallic conduction, semiconductor devices, magnetic materials.

MSE 467 Electronic Materials Processing (3) Sp Materials and processes used in the manufacture of electronic components. Basic principles of crystal growth, deposition, doping, diffusion, component delineation, and packaging as they apply to hybrid and integrated circuits and devices.

MSE 498 Special Topics (1-5, max. 8) AWSpS Special topics in materials science engineering offered as a course with lectures, conferences, or laboratory. Prerequisite: senior standing or above and permission of faculty member.

MSE 499 Senior Project (*, max. 5) AWSpS Materials science and engineering field or laboratory investigations on independent basis. Prerequisite: 399.

Metallurgical Engineering

MET E 198 Career Planning in Metallurgy (1) Introduction to the field of metallurgical engineering. Includes interdisciplinary aspects of the field, lecture-demonstrations, introduction to laboratory tools and techniques, and discussions of curriculum and career opportunities with current students.

MET E 326 Process Metallurgy (3) Sp Application of transport theory to metal process engineering. Prerequisite: MSE 302.

MET E 423 Corrosion of Engineering Materials (3) Sp Applications of physical chemical principles to the reaction of materials with their environments. Prevention and control of corrosion and oxidation processes. Corrosion problems in materials applications.

MET E 461 Engineering Physical Metallurgy (3) Strengthening mechanisms in ferrous and nonferrous alloys, heat treatment and microstructure control, fracture toughness and strength, microstructure-property relationships and alloy design.

MET E 462 Mechanical Behavior of Materials (4) Theories of elastic and plastic deformation in materials. Application of these theories in design, stress and strain, tensile and compression loading, yielding and plastic deformation, fracture, introduction to fracture mechanics, creep and fatigue.

MET E 463 Reliability and Design in Metallurgical Systems (3) W Metallurgical design problems and failure analysis. Properties of commercially important engineering alloys. Prerequisite: MSE 316 or equivalent.

MET E 464 Extractive Process Analysis (3) Sp Extractive processes analyzed by the methods of material and energy balances, computational thermodynamics, process kinetics and reactor theory. Introduction to process optimization. Prerequisite: MSE 322 or equivalent.

MET E 468 Undergraduate Seminar (1, max. 3) AW

Courses for Graduates Only

Ceramic Engineering

CER E 501 Process Ceramics I (3) W Technology of ceramic fabrication processes. Characterization of ceramic materials at stages of processing. Prerequisite: 303 or equivalent or permission of instructor.

CER E 511 Advanced Physical Ceramics I (3) W Theories and principles of diffusion in solids; phenomenological and atomistic concepts; equilibrium defects; impurity, chemical potential gradient, grain boundary and dislocation effects in metals and nonmetals.

CER E 513 Kinetics and Mechanisms of Reactions and Transformations (3) Kinetics, mechanisms of reactions, and transformations. Homogeneous reactions. Heterogeneous reactions. Reaction rate theory and activation energy. Nucleation and growth. Diffusion controlled reactions. Oxidation. Diffusionless (martensitic) reactions. Thermodynamics of irreversible processes. Capillarity and surface phenomena: grain growth, sintering, Ostwald ripening. Recovery, recrystallization, and grain growth. Polymorphic changes. Spinodal decomposition.

CER E 514 Thermodynamic Topics in Ceramics (3) Applications of thermodynamics to predict behavior of materials at high temperature. Techniques of measurement and estimation of high-temperature thermodynamic properties, use of estimated values for thermodynamic calculations.

CER E 521 Mechanical Behavior of Ceramics (3) Sp Dislocation structures in ceramics; influence of dislocations on the deformation and fracture of single crystals and polycrystalline ceramics; brittle fracture and theoretical strength. Prerequisite: 511 or permission of instructor.

CER E 536 Brittle Material Design Problem (3, max. 9) AWS Interdisciplinary efforts in the solution of design problems involving brittle (ceramic) materials. Student teams of an interdisciplinary mix and team teaching are utilized. Joint with CESM 536 and MET E 536.

CER E 590 Industrial Minerals Research (*) AWSpS

CER E 599 Special Topics in Ceramics (*) AWSpS

CER E 600 Independent Study or Research (*) AWSpS

CER E 700 Master's Thesis (*) AWSpS

CER E 800 Doctoral Dissertation (*) AWSpS

Materials Engineering

MSE 512 Transmission Electron Microscopy (3) Sp Fundamentals of electron optics as applied to microscopy. Applications of contrast theory and electron diffraction with emphasis on defect and multiphase structures in crystalline solids. Prerequisite: MET E 511 or equivalent.

MSE 513 Electron Microscopy Laboratory (2) WSp One four-hour laboratory and one two-hour demonstration/discussion per week. Electron microscopy diffraction, imaging, and spectroscopy techniques in materials characterization. Application to metallic, ceramic, and composite materials. Prerequisite: 512.

MSE 520 Seminar (1, max. 6) AWSpS Review of research problems in recent literature. Registration required for all graduate students. Offered on credit/no credit basis only.

MSE 565 Electron Theory of Materials (3) Solid-state concepts of materials. Atomic bonding, statistical mechanics, Brillouin zone theory. Applications to conduction, optical, and magnetic properties of metals, semiconductors, and insulators. Prerequisite: 466.

MSE 566 Superconductors and Magnetic Materials (3) Theories of magnetic phenomena: dia-, para-, ferri-, and ferromagnetism; theories of superconductivity. Applicants in current technology superconductor materials and magnetic devices. Prerequisite: 466 or equivalent. (Formerly MET E 566.)

MSE 567 Electronic Processes in Materials (3) Lattice dynamics, including vibrational modes and phonon effects. Brillouin zone theory, and Fermi surfaces with applications in the theory of electrical conduction and in the semiconductor theory. Optical properties of solids, including color centers and luminescence. Prerequisite: 466.

MSE 599 Special Topics in Materials Science (1-5, max. 5) AWSpS Studies of special advanced topics in materials science. Prerequisite: permission of instructor.

Metallurgical Engineering

MET E 511 Advanced Theory of X-ray Diffraction (3) W Use of the reciprocal lattice concept and Fourier analysis in the study of atomic arrangements in crystals. Line shape and diffuse scattering analysis. Analytical interpretation of diffraction patterns. Prerequisite: MSE 305 or equivalent.

MET E 523 Advanced Extractive Metallurgy (3) A Physical chemistry of metals, mattes, fused salts, and slags. Discussion of papers from current literature. Prerequisite: basic course in thermodynamics or physical chemistry or permission of instructor.

MET E 524 Applied Rate Phenomena (3) A Application of reaction rate and diffusion theories to metallurgical processes; solid/gas reactions as in calcining, roasting, sintering, and reduction; liquid/gas reactions as in refining and solid/liquid reactions as in leaching. Prerequisite: basic course in transport phenomena or permission of instructor.

MET E 525 Thermodynamic Topics in Metallurgy (3) Sp Selected topics in application of classical and statistical thermodynamics to systems of current metallurgical interest.

MET E 526 Dynamic Behavior of Metallurgical Systems (3) W Interpretation of the behavior of metallurgical systems by application of the methods of process analysis and control theory; modeling of systems, exploration of their characteristics by stimulus-response, and review of current industrial control processes. Prerequisite: graduate standing in engineering or permission of instructor.

MET E 536 Brittle Material Design Problem (3, max. 9) AWSp Interdisciplinary efforts in the solution of design problems involving brittle (ceramic) materials. Student teams of an interdisciplinary mix and team teaching are utilized. Joint with CER E 536 and CESM 536.

MET E 541 Theoretical Structural Metallurgy (3) A Detailed study of the general properties and effects of point, line, and surface defects in crystalline solids. Prerequisite: 462.

MET E 542 Theoretical Structural Metallurgy II (3) Dislocation arrays in crystals and their plastic properties; the elastic and plastic properties of real crystals; cold work, annealing, polygonization, recrystallization and grain boundaries; creep; cleavage. Prerequisite: 541.

MET E 561 Phase Transformations in Metals and Alloys I (3) W Thermodynamics and kinetics of solid-state reactions in metals, phase stability, theories of nucleation and growth, precipitation from solid solutions, applications to specific metal and alloy transformations.

MET E 599 Special Topics in Metallurgy (*) AWSpS

MET E 600 Independent Study or Research (*) AWSpS

MET E 700 Master's Thesis (*) AWSpS

MET E 800 Doctoral Dissertation (*) AWSpS

Mechanical Engineering

143 Mechanical Engineering

Mechanical engineering is the broadest of the engineering professions, encompassing the design, analysis, economics, manufacture, and control of mechanical devices and systems. Major subfields of mechanical engineering include: (1) utilization of thermal energy for motive power and human comfort; (2) design, analysis, and fabrication (cutting, forming, welding) of mechanical devices; (3) analysis of vibration and failure of machines and their components; and (4) the management and control of systems of men and machines, including robots and robotic systems.

The undergraduate program in mechanical engineering requires a sound educational basis in the mathematical, chemical, and physical sciences, and in computational, graphical, and written communication skills.

Undergraduate Program

Bachelor of Science in Mechanical Engineering Degree

Entrance into the department is by application and is limited in number to a quota assigned by the College of Engineering based upon limits set by the state legislature. The minimum entrance requirements are 45 credits in courses applicable to the degree, a minimum grade-point average of 2.50 in specific preparatory courses, and an overall grade-point average of 2.00. Details of the current entrance requirements may be obtained from the department or the Office of Admissions of the University.

In addition to the minimum courses required by the College of Engineering in mathematics and natural sciences, the Department of Mechanical Engineering requires that CHEM 150; ENGL 105, 111, 121, 131, 182, 197, 198, 199, 271, C LIT 240, or ENGR 130 (ENGL 131 is the preferred course); and ENGR 141, 170, 210, 230 be completed prior to applying for admission.

For graduation, the student must complete the remaining requirements in the college preparatory program plus 61 credits of department-required courses and 12 credits of mechanical engineering option courses (400 level). A minimum total of 185 applicable credits are required for graduation. A minimum cumulative grade-point average of 2.00 must be maintained as well as a minimum average of 2.00 in all engineering courses.

Continuation Policy

The department policy on continuation is consistent with the continuation policy of the college. Details may be obtained from the department.

Correspondence and Information

All inquiries concerning the mechanical engineering program should be addressed to the undergraduate program adviser in the Mechanical Engineering Advising Office.

Graduate Program

The Department of Mechanical Engineering offers graduate programs leading to the degrees of Master of Science in Mechanical Engineering and Doctor of Philosophy. The department also provides an authorized option leading to the college-wide Master of Science in Engineering degree. These provide a balanced combination of formal instruction and independent research or design experience. Individual projects may be drawn from a wide spectrum of areas, which include mechanical and energy conservation systems, heat transfer, combustion, fluid mechanics, applied mechanics, including computational mechanics, computer-aided design and manufacturing, production systems, materials behavior, robotics, and applications of mechanical engineering science to a variety of such interdisciplinary fields as bioengineering, ocean engineering, and acoustics. Flexible requirements for course work provide opportunities both for a broad scientific and professional background and for specialty training.

Research Facilities

The department has well-equipped laboratories for pursuing research in various disciplinary fields in mechanical engineering and for constructing specialized research equipment. The former includes experimental stress analysis; materials testing; synthesis and simulation of electromechanical control systems; foundry, welding, and other metal fabrication operations; DEC VAX and PDP, Evans and Sutherland, Tektronix, Hewlett Packard and IBM computer systems for CAD/CAM research; wind tunnels for boundary-layer and high-speed flow analysis; combustion systems performance, air-pollution control, and laser diagnosis; acoustics, vibration, and dynamic testing and mea-

surements and modal analysis; radiation, conduction, and convection (including multiphase) heat transfer analysis, bioengineering flow facility; and forest engineering research.

Financial Aid

Financial aid is offered to full-time graduate students so far as funds permit. This aid may be in the form of a research assistantship for sponsored programs, a fellowship provided by the University or industry, or a teaching assistantship.

Correspondence and Information

Graduate Program Coordinator
141 Mechanical Engineering, FU-10

Faculty

Chairperson

Richard C. Corlett

Professors

Alexander, Daniel E., 1954, M.S., 1954, Washington; Ph.D., 1977, Washington State; engineering design.

Balise, Peter L., 1950, S.M., 1950, Massachusetts Institute of Technology; systems analysis and control.

Chalupnik, James D., 1964, M.S.M.E., 1960, Ph.D., 1964, Texas; sound and vibration, wave propagation.

Childs, Morris E., 1954, (Emeritus), M.S.M.E., 1947, Ph.D., 1954, Illinois; fluid mechanics, gas dynamics, turbulent boundary layers.

Corlett, Richard C., 1964, M.M.E., 1958, Rensselaer Polytechnic Institute; Ph.D., 1963, Harvard; energy systems and combustion.

Daly, Colin H., 1967, (Bioengineering), Ph.D., 1966, Strathclyde (Scotland); bioengineering, materials.

Day, Emmett E., 1947, (Emeritus), M.S., 1947, Massachusetts Institute of Technology; materials, experimental stress analysis.

Depew, Creighton A., 1960, M.S., 1957, Ph.D., 1960, California (Berkeley); heat transfer, fluid mechanics.

Emery, Ashley F., 1961, (Architecture), M.S., 1958, Ph.D., 1961, California (Berkeley); bioengineering, energy conservation in buildings and air conditioning.

Firey, Joseph C., 1954, (Emeritus), M.S.M.E., 1941, Wisconsin; combustion, lubrication.

Galle, Kurt R., 1960, (Emeritus), M.S.M.E., 1949, Ph.D., 1951, Purdue; instrumentation, controls, bioengineering.

Gessner, Fred B., 1967, M.S., 1960, Ph.D., 1964, Purdue; fluid mechanics, turbulence.

Jorgensen, Jens E., 1967, (Forest Resources), M.S., 1963, Sc.D., 1969, Massachusetts Institute of Technology; systems analysis, manufacturing, automation and controls, forest engineering.

Kippenhan, Charles J., 1963, (Architecture), M.S.M.E., 1946, Ph.D., 1948, Iowa; energy conservation in buildings, heating, ventilating, and air conditioning, heat transfer, fluid mechanics.

Kobayashi, Albert S., 1958, M.S., 1952, Washington; Ph.D., 1958, Illinois Institute of Technology; fracture mechanics, bioengineering.

Kosáty, George, 1983, (Nuclear Engineering), Ph.D., 1974, Budapest; reactor dynamics (especially noise), two-phase flow characterization, applications of theory of stochastic processes in physics and engineering.

Love, William J., 1970, (Emeritus), M.S., 1948, Colorado; Ph.D., 1952, Illinois; design, mechanics, power systems.

Maite, Philip C., 1979, M.S.E., 1966, Ph.D., 1971, Michigan; combustion, thermodynamics, fluid mechanics.

McFeron, Dean E., 1958, (Emeritus), M.S.M.E., 1948, Colorado; Ph.D., 1956, Illinois; heat transfer and thermal power processes.

McIntyre, Harry J., 1919, (Emeritus), M.S.M.E., 1915, M.B.A., 1923, Washington; steam power plants.

Mills, Blake D., Jr., 1946, (Emeritus), M.S.M.E., 1935, Massachusetts Institute of Technology; mechanics and materials.

Morrison, James B., 1946, (Emeritus), M.S.M.E., 1954, Washington; design, dynamics.

Murphy, Stanley R., 1968, (Emeritus), Ph.D., 1959, Washington; ocean engineering, acoustics.

Pratt, David T., 1981, M.Sc., 1962, Ph.D., 1968, California (Berkeley); turbulent combustion, computer simulation.

Riley, James J., 1983, (Applied Mathematics), Ph.D., 1971, Johns Hopkins; fluid mechanics, especially turbulence.

Taggart, Raymond, 1959, Ph.D., 1956, Queen's (Bel-fast); mechanical metallurgy.

Vesper, Karl H., 1969, (Management and Organization, Marine Studies), M.B.A., 1960, Harvard; M.S., 1966, Ph.D., 1969, Stanford; design, ocean engineering, entrepreneurship.

Wolack, Jan, 1965, M.S., 1960, Washington (St. Louis); Ph.D., 1965, California (Berkeley); mechanics of materials, manufacturing processes.

Associate Professors

Adee, Bruce H., 1970, (Marine Studies), M.S., 1968, Ph.D., 1972, California (Berkeley); naval architecture, ocean engineering.

Bodoia, John R., 1964, M.S., 1957, Ph.D., 1959, Carnegie Institute of Technology; fluid mechanics, heat transfer, solar energy.

Calkins, Dale E., 1979, M.S., 1969, San Diego State; D.Eng., 1976, California (Berkeley); dynamics of marine systems, marine fluid dynamics.

Chalk, William S., 1957, (Nuclear Engineering), M.S.M.E., 1961, Washington; design graphics.

Ford, Paul W., 1957, (Emeritus), M.S.M.E., 1959, Washington; manufacturing processes, metal casting.

Forster, Fred K., 1979, M.S., 1968, Ph.D., 1972, Stanford; bioengineering, application of ultrasound in medicine physiologic fluid flow, cardiovascular dynamics, large deformation elasticity.

Garbini, Joseph L., 1979, M.S., 1973, Ph.D., 1977, Washington; manufacturing automation, instrumentation, systems and controls.

Guidon, Michael III, 1946, (Emeritus), M.S.M.E., 1952, Washington; internal combustion.

Holt, Richard E., 1954, (Emeritus), M.S.Met.E., 1957, Washington; manufacturing processes, welding.

Hyman, Barry I., 1975, (Public Affairs), M.S., 1961, St. Louis; Ph.D., 1965, Virginia Polytechnic Institute; solar energy, energy conservation, science policy.

Kielling, William C., 1956, (Emeritus), M.S.M.E., 1959, Washington; design, dynamics, and kinematics.

Marshall, Frank R., 1970, (Emeritus), M.A., 1953, Montana; quantitative science.

Messer, Rowland E., 1949, (Emeritus), B.S.M.E., 1935, Washington; graphics.

Sandwith, Colin J., 1966, (Research), Ph.D., 1966, Oregon State; corrosion, material science, design, manufacturing.

Sherrer, Robert E., 1960, (Emeritus), M.S., 1953, Ph.D., 1978, Wisconsin; solid mechanics.

Taya, Minoru, 1986, (Materials Science and Engineering), M.S., 1973, Ph.D., 1977, Northwestern; properties of advanced composites, mechanics and failure analysis.

Assistant Professors

Berg, Martin C.,* 1986, M.S., 1978, Washington; Ph.D., 1986, Stanford; automation and motion control systems (robotics), modern control systems analysis, computer control and manufacturing automation.

Ganter, Mark A.,* 1986, M.S., 1981, Ph.D., 1985, Wisconsin; kinematics, solid modeling, computer graphics, automated manufacturing.

Grigoropoulos, Constantine P.,* 1986, M.S., 1983, Ph.D., 1986, Columbia; interfacial heat transfer, thermal processing of microelectronic materials.

Nevrinceanu, Cornelius, 1987, Dipl.-Eng., 1975, Traian Vula Polytechnic (Romania); Ph.D., 1987, Minnesota; computer-aided engineering, artificial intelligence, design.

Ramulu, Mamidala,* 1982, M.T., 1976, Indian Institute of Technology; Ph.D., 1982, Washington; manufacturing processes, production engineering, applied mechanics, fatigue and fracture mechanics.

Reinhall, Per G.,* 1982, M.S., 1978, Ph.D., 1982, California Institute of Technology; nonlinear dynamics, vibrations.

Storti, Duane W.,* 1983, (Applied Mathematics), M.S., 1981, Ph.D., 1983, Cornell; nonlinear dynamics and vibrations, perturbation theory.

Tuttle, Mark E.,* 1985, M.S.E.M., 1978, Michigan Technical; Ph.D., 1984, Virginia Polytechnic Institute; experimental stress analysis, composite materials, adhesion mechanics.

Course Descriptions**Courses for Undergraduates****Mechanical Engineering**

M E 304 Manufacturing Processes (3) AWSpS Ramulu Study of manufacturing processes, including interrelationships between the properties of the material, the manufacturing process, and the design of component parts. Prerequisite: 343.

M E 323 Thermodynamics (4) AWSp Depew Applications of thermodynamic principles: properties of pure substances from an advanced point of view, non-reactive gas mixtures, energy analysis of reactive mixtures, chemical equilibria, combustion, power, and refrigeration cycle analysis. Prerequisite: ENGR 260.

M E 331 Introduction to Heat Transfer (4) AWSp Corlett Study of heat transfer by conduction, radiation, and convection; elementary heat-exchanger design. Prerequisites: ENGR 260, and 333 or CIVE 342.

M E 333 Introduction to Fluid Mechanics (4) AWSpS Gessner Introduction to the basic fluid laws and their application. Conservation equations, dynamic similarity, potential flow, boundary-layer concepts, effects of friction, compressible flow, fluid machinery, measurement techniques. Prerequisites: ENGR 260, and MATH 238.

M E 343 Behavior of Engineering Materials (4) AWSp Daly Study of the nature, properties, and behavior of engineering materials, involving strength, deformation, fracture, impact, creep, fatigue, and corrosion. Lecture and laboratory. Prerequisite: ENGR 220 or permission of instructor; recommended: ENGR 170.

M E 352 Mechanics of Solids (3) AWSp Kobayashi Development of relationships among loads, stresses, and deformations in the elastic behavior of machine or structural elements in tension, bending, or torsion. Prerequisite: ENGR 220.

M E 353 Machine Design Analysis (4) AWSpS Taggart Analysis, design, and selection of mechanical subsystems and elements, such as gears, linkages, cams, and bearings. Lecture and laboratory. Prerequisites: 343, 352.

M E 373 Introduction to System Dynamics (4) AW Jorgensen Mathematical modeling, analysis and design of physical dynamic systems involving energy storage and transfer by lumped-parameter linear elements. Time-domain response via analytical methods and numeric simulation. Prerequisites: MATH 238, ENGR 230.

M E 374 Systems Dynamic Analysis and Design (4) WSp Jorgensen Extension of 373. Frequency response analysis, generalized impedance concepts and applications, Fourier series analysis and Laplace transform techniques. Laboratory experiments and design projects. Prerequisite: 373.

M E 395 Introduction to Mechanical Design (4) AWSpS Calkins Design process and methodology; decision making; optimization techniques; project planning; engineering economics; probabilistic and statistical aspects of mechanical design; ethical and legal issues. Lecture and laboratory. Prerequisites: 352, 373, ENGR 123, 260, IND E 315.

M E 403 Material-Removal Processes (3) A Wolak Cutting and noncutting processes for material removal in the shaping of manufactured products. Study of forces and of power consumption and relative costs in the various processes. Prerequisites: 304 and 343, or permission of instructor.

M E 405 Introduction to Plastic Metal Forming (3) A Wolak Plastic behavior of metals; energy of deformation; estimates of working loads for wire drawing and extrusion. Introduction to slip-line and velocity fields with applications to indentation, extrusion, and drawing through axisymmetric dies. Principles of tube making; rolling of flat slabs; friction and lubrication in metal working. Prerequisite: 343 or equivalent.

M E 406 Corrosion and Surface Treatment of Materials (3) W Sandwith Corrosion fundamentals and forms (galvanic, crevice, pitting, stress corrosion, erosion, hydrogen and leaching). Principles of design, materials selection, cathodic protection and surface treatments (coatings, carburizing, nitriding and plating) applied to reduce corrosion. Failure analysis applied to case studies.

M E 409 Introduction to Numerical Control and Computer-Aided Manufacturing (3) A Control system fundamentals, numerical control (NC) machine control systems, and the design aspect of NC machine tools, programming methods of NC machines, computer-aided manufacturing, CNC, DNC, and process optimization. Prerequisites: 304, 374, or permission of instructor.

M E 422 Microscopic Thermodynamics (4) W Malte Introduction to kinetic theory and statistical thermodynamics. A preliminary treatment of transport phenomena, mathematical probability statistics and relevant mathematical procedures. Prerequisite: ENGR 260. (Offered odd-numbered years.)

M E 424 Combustion Systems (4) Sp Corlett, Malte, Pratt Flame and combustion theory, including chemical kinetics, mixing/diffusion, and heat transfer. Flame types. Combustion chamber theory, design concepts, and performance. Pollutant control by combustion modification and flame additives. Lectures and laboratory demonstrations. Prerequisite: 323 or permission of instructor.

M E 425 Air Conditioning (4) Sp Depew, Kipphan Air conditioning, heating, and ventilating of buildings. Comfort and health, psychometric processes, load calculations, fluid distribution systems, simultaneous heat and mass transfer devices, controls. Design calculations involving these criteria, devices and systems. Prerequisites: 323, 331.

M E 426 Solar Energy Engineering (4) Sp Bodola Fundamental principles of heat transfer, thermodynamics, and fluid mechanics are directed toward the analysis of devices for the collection and storage of so-

lar energy, and of the syntheses of such devices into energy-delivery systems. Prerequisite: 331 or permission of instructor.

M E 428 Noise Control (3) W Chalupnik Introduction to design for noise control. Includes summary of acoustical phenomena as they pertain to noise control and measurement. Noise rating schemes, particularly in relation to machine noise in the work environment. Prerequisite: junior standing in engineering.

M E 430 Thermal Environmental Engineering (4) W Emery Fundamentals of thermodynamics, heat transfer, fluid mechanics and engineering measurements applied to practical thermal systems. Measurements of temperature, heat fluxes, energy fluxes, psychrometry, solar energy; refrigeration systems; air conditioning; effects of thermal environment on human beings. Prerequisites: 323, 331.

M E 431 Advanced Fluid Mechanics (4) W Gessner, Pratt, Riley Advanced topics in fluid mechanics, including kinematics, potential theory and vortex dynamics, viscous flow, turbulence, experimental and numerical methods, and design. Prerequisite: 333.

M E 432 Gas Dynamics (3) Sp Gessner Dynamic and thermodynamic relationships for the flow of a gas. Application of thermodynamic processes involving nozzles, diffusers, compressors, and turbines. Prerequisites: ENGR 260 and 333 or CIVE 342.

M E 433 Turbomachinery (4) Thermodynamics, gas dynamics, and fluid mechanics of axial and centrifugal compressors, pumps, and turbines. Design and selection of components for engineering applications.

M E 434 Advanced Mechanical Engineering Laboratory (3) AWSpS Chalupnik Introduction to engineering measurement problems and techniques including interpretation of experimental data based upon the theories of probability and statistics. Experiments in all areas of mechanical engineering using single-component and multicomponent systems. Prerequisites: 323, 331, 333, 343, 374, and IND E 315.

M E 436 Friction and Lubrication (3) Sp Wolak Fundamental principles of friction and lubrication with applications to rolling and hydrodynamic bearing design. Prerequisites: 333, 353, or permission of instructor.

M E 440 Mechanical Behavior of Solids (3) W Wolak Mechanics of deformable bodies; transformation of stress and strain; yield criteria; equations of compatibility; elastic constants of crystalline and polycrystalline solids. Application to design and manufacturing. Prerequisite: 343 or permission of instructor.

M E 445 Fracture of Engineering Materials (3) A Taggart Deformation processes leading to fracture, and the basic mechanics of materials fracture from microscopic and macroscopic viewpoints. Principles of design and testing for fracture resistance. Lecture and laboratory. Prerequisite: 343 or permission of instructor.

M E 450 Introduction to Composite Materials and Design (3) A Taya, Tuttle Stress and strain analysis of continuous fiber composite materials. Orthotropic elasticity, lamination theory, failure criteria, design philosophy, and joining techniques, as applied to composites. Prerequisite: 352.

M E 460 Kinematics and Linkage Design (3) AW Ganter Synthesis of linkage-type mechanisms using graphical and computer methods. Prerequisite: senior standing in engineering or permission of instructor.

M E 465 Welding Design (3) Sp Ramulu Theory of joint design, sequence, fixturing, and dimensional control in fusion welding. Prerequisite: senior standing in mechanical engineering or permission of instructor.

M E 468 Air-Pollution Control Equipment Design (3) W Piliat Designs to control air pollutants from stationary sources. Procedures for calculating design

and operating parameters. Fundamental mechanisms and processes of gaseous and particulate control equipment for absorption and adsorption of gaseous pollutants; electrostatic precipitation and filtration of particulate pollutants. Actual case studies. Joint with CH E 468 and CEWA 468. Prerequisite: senior standing or permission of instructor.

M E 469 Applications of Dynamics in Engineering (4) AWSpS Storti Application of the principles of dynamics to selected engineering problems, such as suspension systems, gyroscopes, electromechanical devices. Includes introduction to energy methods, Hamilton's principle and Lagrange equations and the design of dynamic system. Prerequisite: 374, ENGR 230 or permission of instructor.

M E 470 Mechanical Vibrations (3) Sp Reinhall Single-degree-of-freedom linear systems techniques. Matrix techniques for multi-degree-of-freedom linear systems. Applications in vibration isolation, transmission, and absorption problems and instrumentation. Prerequisite: 373 or permission of instructor.

M E 471 Automatic Control (3) ASp Balise Engineering analysis of automatic control systems. Dynamic system modeling; system error; performance and stability analysis by Routh, root locus, and frequency response techniques; computer simulation. Lecture and laboratory. Prerequisite: 374 or permission of instructor.

M E 473 Instrumentation (3) W Garbini Principles and practice of industrial measurement. Dynamics of instrument response; theory of transducers for temperature, pressure, flow, and other measurements. Lecture and laboratory. Prerequisite: 374 or permission of instructor.

M E 474 Systems Modeling and Simulation (3) W Balise Unified approach to modeling of systems, and computer simulation of systems behavior. Selecting system variables; writing state, loop, and node equations; modal response and state transition response; system functions and convolution; analogs. Applications to control, vibrations, and other problems. Prerequisite: 374.

M E 477 Microcomputers in Mechanical Systems (4) WSp Garbini Analysis of electromechanical systems employing microcomputers for control or data acquisition. Microcomputer architecture, memory organization, assembly language programming, interfaces, and communications. Particular emphasis on design of hardware and software interfaces for real-time interaction with mechanical systems. Weekly laboratory. Prerequisites: 373, 374, E E 306, or permission of instructor.

M E 478 Finite Element Analysis (4) ASp Reinhall Development of theory and concepts of finite element analysis. Applications in all areas of mechanical engineering, including mechanics of solids, heat transfer, and design of dynamical systems. Weekly computer exercises. Prerequisites: 352, 374, MATH 205 or 302.

M E 480 Introduction to Computer-Aided Technology (4) AWSp Calkins Principles of computer-aided technology. Computer-aided design, engineering, drafting, and manufacturing; computer-aided design systems, geometry, computer graphics, hardware, computer-aided vehicle/system design synthesis. System demonstrations, laboratories, and site visits. Prerequisites: ENGR 123, 141.

M E 481 Internal Combustion Engines (4 or 5) A Corlett, Malte Spark ignition and diesel engines. Thermodynamic cycles, fuels, carburetion and injection, ignition, combustion, friction, turbocharging, and performance of engines. Lecture (4 credits) and laboratory (1-credit option). Prerequisite: 323 or permission of instructor.

M E 490 Naval Architecture (3) A Adee Theory of naval architecture; ship's lines, hydrostatic curves, intact and damaged stability, launching. Prerequisite: junior standing in engineering or permission of instructor.

M E 491 Naval Architecture (3) W Adee Theory of naval architecture; strength, ABS rules, water waves, ship and platform motions. Prerequisite: junior standing in engineering or permission of instructor.

M E 492 Naval Architecture (3) Sp Adee Theory of naval architecture; dimensional analysis, resistance, model testing, propellers, steering. Prerequisite: junior standing in engineering or permission of instructor.

M E 495 Mechanical Engineering Design (4) AWSpS Alexander, Chalk Design laboratory involving the identification and synthesis of engineering factors to plan and achieve specific project goals. Current literature and prerequisite texts are used as reference sources. Lecture and laboratory. Prerequisites: 331, 353, 374, 395.

M E 498 Special Topics in Mechanical Engineering (1-5, max. 6) AWSp Lecture and/or laboratory. Maximum of 6 credits may be applied toward an undergraduate degree. Prerequisite: permission of instructor.

M E 499 Special Projects (2-5, max. 9) AWSpS Written report required. Prerequisite: permission of department Chairperson.

Courses for Graduates Only

Mechanical Engineering

M E 502 Plastic Metal Forming (3) W Wolak Stress-strain and stress-strain-rate relations in metal forming; plastic instability. Work of deformation. The slip-line field. Load bounding. Applications to frames, drawing, forging, and extrusion. (Offered odd-numbered years.)

M E 506 Friction and Wear (3) Sp Wolak Nature of the processes of friction and wear. Temperature rise at contact surfaces during sliding. Boundary friction. Tribological properties of materials. Prerequisite: graduate standing in engineering or permission of instructor. (Offered even-numbered years.)

M E 518-519-520 Seminar (0-0-1, max. 6) Offered on credit/no credit basis only.

M E 521 Thermodynamics (3) A Depew, Emery, Kippenhan, Malte, Pratt Fundamental concepts of temperature, thermodynamic properties, and systems. The first, second, and combined laws. Development of the relations of classical thermodynamics. Prerequisites: 323 and graduate standing in mechanical engineering or permission of instructor. (Offered even-numbered years.)

M E 522 Thermodynamics (3) W Corlett, Depew, Emery, Malte, Pratt Topics from statistical thermodynamics, including the Boltzmann, Bose-Einstein, and Fermi-Dirac statistics. Solutions of the Schrodinger wave equation and evaluation of the partition function for translation, rotation, and vibration. Prerequisite: 521 or permission of instructor. (Offered odd-numbered years.)

M E 524 Combustion (3) Sp Corlett, Malte, Pratt Chemical and physical processes of combustion with applications to design of combustors, fuel selection, and consideration of environmental effects. Prerequisite: graduate standing in mechanical engineering or permission of instructor. (Offered odd-numbered years.)

M E 525 Acoustics in Engineering I (3) W Chalupnik, Sigelmann Acoustic wave transmission, reflection, refraction, and diffraction. Review of continuum mechanics and examples from electromechanical systems. Joint with E E 525. Prerequisite: graduate standing in mechanical or electrical engineering, or permission of instructor.

M E 526 Acoustics in Engineering II (3) Sp Chalupnik, Sigelmann Continuation of 525. Material differs each year, covering such topics as scattering,

moving media, ultrasonics, acoustic holography, opto-acoustics, transducer design, propagation in anisotropic medium, etc. Joint with E E 526. Prerequisite: 525 or permission of instructor.

M E 530 Radiative Heat Transfer (3) W Corlett, Depew, Emery, Malte Fundamentals of thermal radiation for black, gray, nongray, diffuse, and specular surfaces. Gaseous radiation and special applications of thermal radiation. Prerequisite: graduate standing in mechanical engineering or permission of instructor. (Offered even-numbered years.)

M E 531 Conductive Heat Transfer (3) A Corlett, Depew, Emery Analysis of steady-state and transient heat conduction in single- and multidimensional systems by mathematical, graphical, numerical, and analogical methods. Prerequisite: graduate standing in mechanical engineering or permission of instructor.

M E 532 Convective Heat Transfer (3) Sp Corlett, Depew, Emery Introduction to fluid flow and boundary-layer theory as applicable to forced- and natural-convection heat transfer. Condensation and boiling heat transfer. Prerequisite: graduate standing or permission of instructor.

M E 533, 534 Fluid Mechanics (3,3) W,Sp Corlett, Gessner, Kosály, Riley Basic conservation laws and kinematics of fluid flow, two-dimensional inviscid flow, wave motion and shock waves in inviscid compressible flow, exact solutions and boundary layer analyses of laminar and turbulent viscous flow, analysis of non-Newtonian flow, applications. Prerequisite: 533 or permission of instructor for 534.

M E 535 Computational Techniques in Heat Transfer (3) A Emery, Pratt Advanced heat transfer studies of interest to mechanical engineers. Subject coverage varies from year to year. Prerequisite: permission of instructor.

M E 537 Topics in Fluid Mechanics (3) A Corlett, Emery, Gessner, Pratt, Riley Selected fluid mechanics research topics relevant to current advances in mechanical engineering practice. Topics selected vary with faculty and student interest, but are drawn predominantly from the general areas of energy conversion, energy management, and manufacturing processes. (Offered even-numbered years.)

M E 538 Turbulent Boundary Layer Theory (3) A Gessner, Riley Characteristic features of turbulent boundary layers; development of the turbulent boundary layer equations; equilibrium boundary layers; integral methods of solution based on power law and wall-wake velocity profiles; methods of solution based on higher order constitutive equations; application to diffuser flows and free shear flows; new developments and physical models. (Offered odd-numbered years.)

M E 541 Advanced Engineering Materials (3) W Daly, Taggart Behavior of engineering materials as affected by various conditions of loading and environment. Lecture, laboratory. Prerequisite: graduate standing in mechanical engineering or permission of instructor.

M E 543, 544 Fluid Turbulence (3,3) W,Sp Gessner, Riley, Schleicher Methods of characterizing fluid turbulence; spatial, temporal velocity correlations; energy spectra; probability concepts; isotropic, nonisotropic turbulence; hot-wire measurement techniques; phenomenological turbulence models; higher-order closure models; local equilibrium concepts; recent advances in modeling techniques. Joint with CH E 543, 544. Prerequisite: 6 credits of graduate fluid mechanics or permission of instructor. (Offered even-numbered years.)

M E 551 Applied Elasticity (3) A Kobayashi, Taya General equilibrium and stress-strain relations in homogeneous, isotropic, elastic materials. Elastic stress distributions in machine components; plane-stress and plane-strain problems. Prerequisite: graduate standing in mechanical engineering or permission of instructor.

ME 552 Applied Plasticity and Viscoelasticity (3) *W Daly, Kobayashi, Taya, Tuttle* Elastic-plastic-viscoelastic stress distributions in machine components, stress-strain relations in the plastic and viscoelastic range. Cycle variations of load and temperature. Prerequisite: 551 or permission of instructor. (Offered even-numbered years.)

ME 553 Adhesion Mechanics (3) Sp *Tuttle* Introduction to adhesive systems and test/evaluation techniques. Stress/strain analysis methods used with adhesive joints. Examples of practical applications. Prerequisite: graduate student status or permission of instructor. (Offered even-numbered years.)

ME 555 Thermoelasticity (3) W *Emery* Basic equations of thermoelasticity for isotropic elastic solids. Analysis of disks, cylinders, spheres, beams, and plates under steady temperature and sudden and slow heating and cooling. Introduction to thermoelastic stability. Prerequisite: 551 or permission of instructor. (Offered even-numbered years.)

ME 556 Experimental Stress Analysis (3) A *Tuttle* Theory and practice of experimental techniques including photoelasticity; brittle coatings; birefringent coatings, and interferometry. Lecture and laboratory. Prerequisite: graduate standing or permission of instructor.

ME 557 Experimental Stress Analysis (3) W *Tuttle* Continuation of 556 with extended applications and theory of experimental mechanics techniques. Holography; residual stress analysis methods; moiré; three-dimensional photoelasticity; acoustoelasticity. Lecture and laboratory. Prerequisite: 556 or permission of instructor.

ME 559 Applied Fracture Mechanics (3) WSp *Kobayashi* Applications of linear fracture mechanics to failure analysis and fracture control based on actual case studies. Fracture toughness and fatigue testing techniques, crack initiation and propagation fatigue life prediction of mechanical components subjected to environmental effects.

ME 560 Advanced Theory of Fracture (3) Sp *Kobayashi* Theories of linear fracture mechanics, fracture dynamics, ductile fracture, stable crack growth and mixed mode fracture. Discussion of advanced topics from recent literature. Prerequisite: 559 or permission of instructor.

ME 564 Mechanical Engineering Analysis (3) A *Balise, Berg, Storti* Application of mathematical methods to the description and analysis of systems in mechanical engineering. Analogies in heat transfer, fluid flow, stress distribution, dynamics, and feedback control. Prerequisite: graduate standing in mechanical engineering or permission of instructor.

ME 565 Mechanical Engineering Analysis (3) W *Balise, Emery, Storti* Applications of vectors, matrices, and partial differential equations to mechanical engineering systems, including computational techniques and analogies. Prerequisite: graduate standing in mechanical engineering or permission of instructor.

ME 566 Introduction to Random Processes (3) A *Chalupnik, Kosáry* Probability and random variables. Ensemble averaging, probability density function, auto- and cross-correlation function. Brownian motion, Poisson process. Ergodicity. Frequency domain analysis, auto- and cross-spectrum, transfer function. Fundamentals of digital spectral analysis. Applications in fluid mechanics, acoustics and vibrations. Joint with O ENG 566.

ME 571 Servomechanisms (3) W *Balise, Berg, Garbini, Jorgensen* Linear and introductory nonlinear feedback system analysis and design. Prerequisite: 471 or permission of instructor.

ME 572 Servomechanisms (3) Sp *Balise, Berg, Garbini, Jorgensen* Continuation of 571, to include topics of current importance. Further study of nonlinear

control, statistical analysis of feedback systems, sampled-data methods, self-adaptive systems. Prerequisite: 571 or permission of instructor.

ME 575 Systems Theory (3) Sp *Balise, Garbini* State variable approach as applied to multivariable systems. Continuous and discrete variables, system vectors and matrices, distinct and multiple eigenvalues, controllability and observability, computer algorithms. Geometrical and physical interpretations of the mathematical models. Prerequisite: 474 or permission of instructor.

ME 579 Fluid Power Systems (3) W *Garbini, Jorgensen* Design, analysis, and control of fluid power systems. Steady-state analysis of valves, actuators, and transmissions. Dynamic modeling, response, stability, and control analysis via linear element representation and computer simulation. Prerequisite: graduate standing in mechanical engineering or permission of instructor.

ME 584 Gas Turbine Combustion (3) A *Pratt* Principles of analysis and design of stationary and aircraft gas turbine engine combustors and gas generators, with emphasis on computer simulation. (Offered even-numbered years.)

ME 588 Dynamics and Vibrations (3) A *Chalupnik, Reinhall, Storti* Variational techniques, Hamilton's principle, Lagrange's equations applied to dynamics of particles and rigid bodies. Vibration analysis of multi-degree-of-freedom and continuous systems. Prerequisite: graduate standing in engineering or permission of instructor.

ME 589, 590 Vibrations (3,3) W,Sp *Chalupnik, Reinhall, Storti* Study of systems with nonlinear damping and restoring forces excited by deterministic or random inputs. Applications in measurement, testing, and design of mechanical systems. Nonlinear systems are emphasized in 589 and random inputs in 590. Prerequisite: 588 or permission of instructor. (Offered even-numbered years.)

ME 598 Topics in Research (1) AWSp Doctoral seminar. May be repeated for credit. Offered on credit/no credit basis only.

ME 599 Special Projects (1-5, max. 9) AWSpS Written report required. Prerequisite: permission of department Chairperson.

ME 600 Independent Study or Research (*) *AWSpS* Written report required.

ME 700 Master's Thesis (*) AWSpS

ME 800 Doctoral Dissertation (*) AWSpS

Mechanical Engineering Industrial Engineering

MEIE 511 Management Decision Models (3) Sp *Iverson* A quantitative approach, using decision models, for engineering and management problems in increasing the output per hour of work. Concepts of management decisions, deterministic models, probabilistic models, and in-depth study of an actual work situation. Capacity measures, allocation and scheduling resources, and time-money evaluation of alternatives recognizing risk. Offered on credit/no credit basis only. Prerequisites: IND E 311 and IND E 315, or equivalent, or permission of instructor.

MEIE 513 Advanced Topics in Operations Research (3) A *Iverson, Zabinsky* Revised simplex and decomposition methods for computer management of large-scale linear programming problems; stochastic models in queueing theory and in inventory theory; introduction to methods used in nonlinear programming; simulation modeling. Prerequisite: IND E 313 or equivalent.

MEIE 516 Advanced Topics in Engineering Statistics (3) W *Roberts, Zabinsky* Topics are flexible and tailored to the needs of the particular student group in-

volved. Topics usually considered: regression, correlation, experimental design, Monte Carlo techniques, Markov processes, extreme value theory, time-series analysis. Prerequisite: graduate standing or permission of instructor.

MEIE 599 Special Projects in Industrial Engineering (1-5, max. 9) AWSpS Prerequisite: permission of industrial engineering program director.

Nuclear Engineering

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The Department of Nuclear Engineering offers a program of instruction and research based on applied physics and engineering science, on the controlled release of nuclear energy, and on interactions of radiation with matter, including their present and potential applications. The program has a diverse, multidisciplinary faculty with strength in engineering and applied science. Specific research activities include the design of inherently safe fission reactors, random signal analysis, robotics, biotechnology, fusion technology, plasma physics, laser-plasma interactions, two-phase flow and heat transfer, reacting turbulent flows, reliability and risk analysis, photon and neutron scattering interactions with material, nuclear reactor safety, environmental effects of radiation, and nuclear-waste management.

Undergraduate Program

Bachelor of Science in Engineering Degree

The Department of Nuclear Engineering coordinates programs of study leading to the Bachelor of Science in Engineering degree with an emphasis either in engineering science or in nuclear engineering. Curricular requirements are available in detail at the department, but are outlined below.

Admission Requirements

To be admitted to the Bachelor of Science in Engineering program, a student usually must have a 2.80 grade-point average and have completed at least 42 credits of specific pre-engineering, mathematics, and science courses or their equivalent. These courses are ENGR 141 and 260; MATH 124, 125, 126, and 238; CHEM 140; and PHYS 121, 122, and 123. The college admits students into the B.S.E. program twice each year; application deadlines are July 1 for Autumn Quarter admission and February 1 for Spring Quarter admission.

Department faculty members will gladly advise and assist students in preparing applications for admission and work with them in planning a course of study that meets their objectives.

ENGINEERING SCIENCE EMPHASIS

The B.S.E. degree with an engineering science emphasis provides excellent preparation for engineering practice or for postgraduate study in one of the engineering disciplines, in the natural sciences, or in medicine. The curriculum emphasizes areas where engineering and science meet and are common to several engineering disciplines. Typical areas include plasma processing, applied superconductivity, random processes in engineering, reliability and risk analysis, non-destructive examination of systems and devices, mobile robotics, and detection and use of nuclear radiation. The curriculum also emphasizes a more thorough grounding in mathematics, science, and engineering fundamentals than provided by most departmental curriculums. Fundamental knowledge of this type does not become obsolete when technology changes.

70 upper-division credits in mathematics, physics, and engineering courses is required, with specific require-

ments in various areas: 30 credits minimum in engineering mathematics and natural sciences, 18 credits minimum in a specific area of engineering emphasis, and 22 credits in engineering or science electives that are chosen to complete an integrated program of study.

NUCLEAR ENGINEERING EMPHASIS

The B.S.E. with a nuclear engineering emphasis provides a background in applied mathematics, physics, and engineering science needed for nuclear energy applications. It also provides an introduction to nuclear technology appropriate for either advanced study in nuclear engineering or employment at the baccalaureate degree level and for study in a complementary area of engineering.

Course requirements are similar to those described above for engineering science, except that the 18 credits required in an area of engineering emphasis are in the specific area of nuclear engineering and technology.

Graduate Program

Admission Requirements

The Department of Nuclear Engineering offers graduate programs leading to the Master of Science in Nuclear Engineering and Doctor of Philosophy degrees. Because the department operates under an enrollment quota, admission to the Graduate School as a nuclear engineering major is competitive. Specific requirements for admission will vary from year to year. An applicant must have an undergraduate degree in engineering, physical science, or mathematics (note that an undergraduate degree in nuclear engineering is *not* required); present scores on the quantitative, verbal, and analytical tests of the Graduate Record Examination; and have an undergraduate grade-point average of at least 3.00 or its equivalent. Students from nations where English is not the native language are required to submit scores on the Test Of English As A Foreign Language (TOEFL) or on the Michigan Test. International students applying for teaching assistantships also should present scores on the Test of Spoken English (TSE).

Major Requirements

The M.S.E. is generally completed in four or five quarters (twelve to fifteen months) of full-time study. The required total of 46 quarter credits consists of 9 credits of thesis and 37 credits of acceptable course work and seminars. Required courses or seminars total 22 credits. The remaining 15 course credits are elective and are usually earned in courses chosen to meet specific objectives of individual students. Of the 15 elective credits, 6 must be in advanced nuclear engineering courses.

The Ph.D. degree is primarily a research degree. As such, it has no specific course requirements other than Graduate School requirements for all doctoral degrees, although advanced courses in the area of a student's research are normally recommended. Formal requirements for the degree include passing the departmental qualifying examinations, completing a course of study approved by the student's Supervisory Committee, passing the General Examination, and preparing and defending a doctoral dissertation that must make a significant contribution to knowledge and be based on original research conducted by the Candidate.

Typical research areas include: plasma physics, fusion reactor physics and design, inverse photon and neutron scattering; noise (random signal) analysis of neutron detector signals; development of inherently safe nuclear reactors; development of autonomous mobile robots; analysis of nuclear-waste systems; turbulent reacting systems; and space nuclear systems.

Research Facilities

Fusion reactor research is conducted principally with a three-meter-long, low-density, staged theta-pinch facility,

called the high-beta Q-machine. This is a sophisticated θ system, designed to accommodate various experiments. Other specialized equipment includes a two-meter-by-forty-centimeter coaxial field-reversed configuration device, a large CO_2 pulsed laser, and several smaller pulsed plasma devices for studies of compact toroids and laser-plasma interactions. All systems have computerized data-acquisition equipment.

Fission energy facilities include a one-hundred-kilowatt Argonaut reactor with access ports for irradiation and activation analysis, automatic sample changers, a Harshaw-2080 glow curve analysis system for radiation dosimetry, an array of radiation-sensitive detectors and measuring instruments, and computers appropriate for data processing. An autonomous mobile robotics laboratory is being developed.

Off-campus, the department has access to nuclear engineering experimental facilities at the Hanford laboratory operation near Richland, Washington and to supercomputers at the San Diego Supercomputer Center and the Magnetic Fusion Energy Computation Center at the Lawrence Livermore National Laboratory in Livermore, California.

Financial Aid

The department can offer financial support to well-qualified graduate students. Traineeships, scholarships, fellowships, research assistantships, and teaching assistantships are awarded to aid students in meeting the expenses of study and research. Applications for financial support should be submitted directly to the department.

Correspondence and Information

Chairperson
Department of Nuclear Engineering, BF-20

Faculty

Chairperson

Kermit L. Garlid

Professors

Albrecht, Robert W.,* 1961, (Electrical Engineering),† M.S., 1958, Ph.D., 1961, Michigan; reactor dynamics and stochastic processes, innovative nuclear reactors, reactor instrumentation, robotics.

Babb, Albert L.,* 1952, (Bioengineering), (Chemical Engineering),† M.S., 1949, Ph.D., 1951, Illinois; reactor engineering, bioengineering.

Garlid, Kermit L.,* 1960, (Chemical Engineering),† Ph.D., 1961, Minnesota; nuclear fuel processing, radioactive-waste management, process dynamics.

Kosály, George,* 1983, (Mechanical Engineering),† Ph.D., 1974, Budapest; reactor dynamics (especially noise), two-phase flow characterization, theory of turbulent flow, applications of theory of stochastic processes in physics and engineering.

McCormick, Norman J.,* 1966, M.S., 1961, Illinois; Ph.D., 1965, Michigan; reliability and risk analysis, reactor physics, neutron and photon transport.

Pietrzyk, Z. Adam,* 1973, (Research), M.Sc., 1960, Technical University of Warsaw (Poland); Ph.D., 1966, Polish Academy of Science (Poland); plasma diagnostics, laser plasma interaction, linear thermonuclear reactors.

Ribe, Fred L.,* 1977, Ph.D., 1951, Chicago; experimental and theoretical plasma physics, fusion reactor studies.

Robkin, Maurice A.,* 1967, (Environmental Health),† Ph.D., 1961, Massachusetts Institute of Technology; radiation dosimetry, environmental radioactivity, radioactive-waste management, health physics.

Stoebe, Thomas G.,* 1966, ‡(Materials Science and Engineering), M.S., 1963, Ph.D., 1965, Stanford; physics of solids, electronics, optical properties.

Vlasses, George C.,* 1973, (Physics), M.S., 1959, Ph.D., 1963, California Institute of Technology; plasma physics and controlled fusion, laser-plasma interactions.

Woodruff, Gene L.,* 1965, (Environmental Studies), M.S., 1963, Ph.D., 1966, Massachusetts Institute of Technology; neutronics experiments, fusion reactor technology.

Associate Professors

Chalk, William S., 1957, ‡(Mechanical Engineering), M.S.M.E., 1961, Washington; design graphics.

Lindstrom, Duane G.,* 1982, (Affiliate), M.S.E., 1960, Michigan; Ph.D., 1968, Washington; computing methods applied to nuclear engineering and radiation transport.

Assistant Professors

Brooks, Robert D., 1981, (Research), Ph.D., 1979, Washington; fusion and plasma physics, laser interaction with matter, plasma diagnostics.

Duracz, Thomasz, 1985, (Research), M.Sc., 1972, Warsaw (Poland); Ph.D., 1977, Institute of Nuclear Research (Poland); neutron and photon transport theory, reactor physics.

Course Descriptions

Courses for Undergraduates

NUC E 444 Nuclear Materials (3) Sp Structure, properties, and performance of materials in nuclear reactor applications; engineering requirements and selection of materials for reactors; technology of materials for reactor fuels, moderators, shields, control elements, and structural components; corrosion and oxidation; effects of radiation on the structure and properties of materials. Joint with MSE 444. Prerequisite: ENGR 170 or equivalent or permission of instructor.

NUC E 484 Introduction to Nuclear Engineering (4) A Vlasses Introductory course in nuclear engineering for seniors, graduate students, and practicing engineers. The course is designed to demonstrate the application of the principles of nuclear science to the processes associated with the release, control, and utilization of all forms of energy from nuclear sources, including nuclear reactors; elementary nuclear reactor theory; control of nuclear reactors; thermonuclear reactions. Prerequisite: MATH 238 or permission of instructor.

NUC E 485 Nuclear Instruments (3) W Garlid Principles, measurements, and detection of various types of radiations encountered in nuclear energy systems. Demonstrations include the use of Geiger, proportional, and scintillation detectors; ionization chambers; analog-digital data logging equipment; and multichannel analyzers. Sources of radiation include the University's nuclear reactor and pulsed neutron generators. Joint with RAD S 485. Prerequisite: junior standing.

NUC E 486 Nuclear Power Plants (3) Sp Garlid Applications of nuclear energy to power generation. Various types of nuclear reactor systems, including pressurized water, boiling water, high-temperature gas-cooled, as well as innovative converter and breeder reactors. Problem of world and United States energy resources and the role of nuclear energy. Prerequisite: senior standing; recommended: 484.

NUC E 488 Nuclear Engineering Design (4) Babb Design laboratory involving the identification and synthesis of engineering factors to plan and achieve certain project goals. Design topics may include, but are not limited to, energy producing systems, expert systems, mixed-waste treatment systems, advanced nuclear reactor systems, and space propulsion systems. Prerequisite: 484 or permission of instructor.

NUC E 498 Special Topics in Nuclear Engineering (1-6, max. 6) AWSpS Discussions, conferences, and lectures on topics of current interest in nuclear fission and fusion engineering. Prerequisite: permission of department Chairperson.

NUC E 499 Undergraduate Research Projects (1-6, max. 6) AWSpS Independent research projects in nuclear engineering. Prerequisite: permission of department Chairperson.

Courses for Graduates Only

NUC E 500 Nuclear Reactor Theory (5) A Albrecht, McCormick Nuclear reactor theory covering interactions of neutrons with matter; chain reaction concepts, the angle-dependent transport equation and its reduction to specialized forms; multigroup, multiregion diffusion theory; slowing down theory; solution methods and cell parameter calculations; variational and perturbation methods. Prerequisites: PHYS 327, MATH 238, or equivalent.

NUC E 506 Nuclear Engineering Laboratory (4) Sp Advanced laboratory course in which experimental research is conducted. Selected experiments are performed that involve the use of such equipment as the reactor as a neutron and gamma-ray source, pulsed neutron generator, pile-noise analysis equipment, time-of-flight equipment, and laser interferometry and fusion plasma diagnostic equipment. Prerequisite: 485 or permission of instructor.

NUC E 510 Nuclear Reactor Engineering (3) A Garlid, Rowe Advanced course in engineering analysis of nuclear reactor systems. Utilization of nuclear energy for power production; heat generation and distribution; nuclear fuel performance; thermal-hydraulics; thermal power limits; computer methods of analysis and core design; reactor safety analysis and licensing procedures. Prerequisite: 500, which may be taken concurrently, or permission of instructor.

NUC E 512 Nuclear System Design (4) W Design laboratory involving synthesis of fusion or fission reactor theory, engineering analysis, material specifications, and economics in conceptual and preliminary designs of systems, facilities, or processes associated with nuclear fission and fusion devices. Projects selected from current topics and one is usually engaged by team effort. Prerequisite: 510 or permission of instructor.

NUC E 513, 514 Health Physics I, II (3,3) W,Sp Robkin Physical basis of the quantification of the exposure to ionizing radiation. Includes mathematics and physics of sources, interactions, spectrometry and dosimetry of ionizing radiation. Joint with RAD S 513, 514.

NUC E 521, 522, 523 Graduate Seminar (1,1,1) A,W,Sp Offered on credit/no credit basis only.

NUC E 524 Seminar in Nuclear Systems Analysis (1) AWSp Studies of recent advances in nuclear systems analysis with students, faculty, and visiting scientists and engineers reporting on recent research and publications. Open only to students with a master's degree or equivalent. Offered on credit/no credit basis only.

NUC E 530 Nuclear Reactor Statics (4) Sp McCormick Emphasis on methods for calculation of neutron and gamma-ray distributions in nuclear reactors and shields. Covers the linear Boltzmann equation and the spherical harmonics, discrete ordinate, and Monte Carlo techniques. Prerequisite: 500 or permission of instructor.

NUC E 542 Environmental Impact of Radioactivity (3) A Robkin Dispersion, rate, and environmental significance of radionuclides released into environment. Includes dispersion, deposition, environmental transport, uptake, biological effects, protection from, and regulations relating to, radionuclides released into environment. Examples taken from academic, re-

search, and industrial sources with emphasis on central station nuclear power plants. Joint with RAD S 542.

NUC E 556 Introduction to Plasma Theory (4) W Vlasov Review of electromagnetic theory, dynamics of charged particles in electromagnetic fields, development of plasma fluid equations from kinetic theory, plasma transport theory, with examples drawn principally from the field of controlled nuclear fusion.

NUC E 557 Plasma Theory II (3) Sp Vlasov Magnetohydrodynamic equilibrium and stability, waves in plasmas, heating techniques. Applications primarily to magnetic fusion research. Prerequisite: 556 or permission of instructor.

NUC E 558 Plasma Kinetic Theory (3) A Ribe, Vlasov Collisionless Boltzmann (Vlasov) equations, and instabilities in homogeneous and inhomogeneous plasmas, quasilinear diffusion, wave-particle interactions, collisional Boltzmann (Fokker-Planck) equation, transport problems of fully ionized plasmas. Prerequisites: 556, 557, or permission of instructor. (Offered even-numbered years.)

NUC E 560 Nuclear Reactor Dynamics I (4) W Albrecht Nuclear reactor dynamic equations, delayed neutron representations, response of reactors to various perturbations, nuclear reactor feedback mechanisms and equations, operational techniques of system analysis, stability criteria. Prerequisites: 500, MATH 427, 428, or permission of instructor.

NUC E 565 Fusion Reactor Fundamentals (3) A Ribe, Rowe Introduction to the basic engineering features of fusion power plants. Brief description of basic fusion physics and discussion of power plants for the leading thermonuclear concepts. Engineering problems: blanket, shield neutronics; materials, thermal hydraulics; tritium, superconducting systems; and magnet design considerations. Prerequisite: senior standing or permission of instructor.

NUC E 566 Fusion Reactor Engineering (4) Sp Ribe Physical and technological aspects of large fusion experiments and conceptual reactors based on the Tokamak, magnetic-mirror, pinch, stellarator, and inertial fusion concepts. One hour per week devoted to computer instruction, with application to a significant fusion reactor problem. Prerequisites: 556 or equivalent, 565, or permission of instructor.

NUC E 588 Nuclear Fuel Management (3) Sp Garlid Technical, economic, and environmental aspects of nuclear fuel selection, production, and use. Fuel cycles and costs, separation and purification processes, processing of irradiated fuel, spent-fuel storage and disposal. Prerequisite: 484 or permission of instructor.

NUC E 599 Special Topics in Nuclear Engineering (*) AWSp Discussions and readings of topics of current interest in the field of nuclear engineering research. Subject matter may include reactor fuels and materials, reactor dynamics and control, instrumentation, thermonuclear processes, direct conversion problems. Prerequisite: permission of department Chairperson.

NUC E 600 Independent Study or Research (*) AWSpS

NUC E 700 Master's Thesis (*) AWSpS Offered on credit/no credit basis only.

NUC E 800 Doctoral Dissertation (*) AWSpS Offered on credit/no credit basis only.

Ocean Engineering

326 Mechanical Engineering

Course Descriptions

Courses for Undergraduates

O ENG 401 Introduction to Ocean Engineering (3) A Adee Special design considerations for the ocean environment, including corrosion, biological encrustation, hyperbaric loading, wave, current and tidal forces, as well as various sea floor and coastal conditions. Selected examples of major ocean engineering projects are reviewed with attention given not only to technical function but also to safety and the environmental and social implications of operational failure. Students carry out a project requiring special ocean engineering considerations in design, operation, and maintenance. Prerequisite: MATH 238 or permission of instructor.

O ENG 425 Introduction to Underwater Acoustics (3) A Ehrenberg, Lytle Introduction to acoustic propagation, refraction, and reflection in the ocean. Characteristics of transducers, time and frequency representation of acoustic signals, sources and characteristics of acoustic noise and acoustic signal-processing systems. Prerequisite: senior standing in engineering, MATH 238, or permission of instructor.

O ENG 444 Coastal Engineering I (3) W Yeh Linear theory of water waves, wave transformations due to boundary conditions, sediment motion, elementary tidal theory; applications illustrated by laboratory experiments and selected case histories. Joint with CEWA 444. Prerequisite: CIVE 342.

O ENG 450 Marine Corrosion and Its Prevention (3) Sp Sandwith Causes and prevention of corrosion damage by marine environments (immersed, tidal, atmospheric). Behavior (pitting, rusting, cracking, fatigue, and fracture) of engineering materials (metals, plastics, and ceramics) in the ocean. Case studies are used to understand methods of reducing corrosion damage by design, materials selection, cathodic protection, coatings, and maintenance. Technical report(s) to be prepared. Prerequisites: senior standing in engineering and M E 343 or equivalent materials course.

O ENG 451 Statistical Quality Control (3) Design of quality-control systems. Use of statistical process controls and acceptance sampling methods. Process capability analysis and methods for establishing specifications and tolerances. Joint with IND E 451. Prerequisite: IND E 315.

O ENG 480 Introduction to Computer-Aided Technology (4) AWSp Calkins Principles of computer-aided technology. Computer-aided design, engineering, drafting, and manufacturing; computer-aided design systems, geometry, computer graphics, hardware, computer-aided vehicle/system design synthesis. System demonstrations, laboratories, and site visits. Joint with M E 480. Prerequisites: ENGR 123, 141.

O ENG 498 Special Topics in Ocean Engineering (1-5, max. 6) AWSpS Special topics in ocean engineering offered with lecture and/or laboratory. Prerequisite: permission of ocean engineering adviser.

Courses for Graduates Only

O ENG 531 Advanced Ship Production Technology (3) W Storch Detailed studies of shipyard organization, ship production processes, techniques of production planning and control, and role of the computer in modern shipbuilding. Principles of advanced shipbuilding, product-oriented work breakdown structure, zone construction, and group technology.

O ENG 541 Hydrodynamics in Water Quality (3) W Nee Theoretical, field study, and laboratory model approaches to diffusion and dispersion in problems of concern to water resources engineers. Joint with CEWA 541. Prerequisite: CIVE 342 or permission of instructor.

O ENG 544 Coastal Hydraulics (3) Sp Yeh Theory of water waves. The classical water-wave problem and approximate solution techniques. Evolution equations for wave systems and their solutions. Stability analysis. Random waves analyzed by time series techniques. Joint with CEWA 544. Prerequisite: familiarity with linear wave theory and FORTRAN.

O ENG 560 Fluid Dynamics of Marine Systems (3) A Calkins Theoretical and applied topics as related to ocean engineering. Mathematical models of inviscid (potential) and viscid motions of an incompressible fluid. Linear water waves, water wave exciting forces, damping coefficients, forces on lifting surfaces, components of ship resistance. Prerequisite: M E 333 or CIVE 342.

O ENG 561 Dynamics of Marine Systems (3) W Calkins Dynamic response of offshore structures and vehicles. Equations of motion formulated, including derivation of added-mass and damping terms in the presence of a free surface. Wave forcing functions derived. Various methods of simplifying the equations and computational techniques. Prerequisite: ENGR 230.

O ENG 562 Structural Analysis of Marine Systems (3) Sp Calkins Structural analysis of marine systems, such as ships and offshore platforms. Sections and loading conditions, structural dynamics, plating under lateral and in-plane loads, stress concentrations and temperature effects. Prerequisites: ENGR 220, M E 352.

O ENG 566 Introduction to Random Processes (3) Probability and random variables. Ensemble, ensemble-averaging, probability density function, auto- and cross-correlation function. Brownian motion, Poisson process. Ergodicity. Frequency domain analysis, auto- and cross-spectrum, transfer function. Fundamentals of digital spectral analysis. Applications in fluid mechanics, acoustics and vibrations. Joint with M E 566.

O ENG 599 Special Topics in Ocean Engineering (1-5, max. 9) AWSps Prerequisite: permission of ocean engineering adviser.

Scientific and Technical Communication

The field of scientific and technical communication involves making technology meaningful to people who must use it and making the machines and documents by which they communicate more functional. The scientific and technical communication program trains professionals who will design and prepare manuals, proposals, reports, and many other kinds of documents; design the human interface for computers and other complex equipment; supervise the operations and activities of publications departments; assist in the design and development of communication systems; and perform the research and testing necessary to advance our understanding of each area of the profession.

Undergraduate Program

Students wishing to concentrate in scientific and technical communication may enter the program either through the interdisciplinary B.S./B.S.E. degree program in the College of Engineering or through the Gen-

eral Studies program in the College of Arts and Sciences, which offers both B.S. and B.A. degrees. In either pathway, entering students must meet the admission, distribution, and degree requirements of the college they seek to enter, as well as those established by the scientific and technical communication program. In both college programs, students are required to design a curriculum to achieve their personal career goals rather than to follow a prescribed program.

B.S./B.S.E. Degree, College of Engineering

The interdisciplinary B.S. degree offers the opportunity to combine a strong education in mathematics and science with professional preparation in scientific and technical communication. This preparation consists of the required scientific and technical communication courses and an internship. The degree equips students with a sufficient background in engineering to work comfortably and effectively with engineers and scientists.

In the B.S.E. degree, a student may combine scientific and technical communication program with an engineering degree. In addition to the substantial course work required for the engineering component, the student must add the required program courses and an internship. The B.S.E. degree with a concentration in scientific and technical communication usually requires an extra one or two quarters, but the student has both an engineering degree (non-accredited) and a scientific and technical communication major.

B.A./B.S. Degree in General Studies, Arts and Sciences

Students wishing to bring a different kind of background to the field of scientific and technical communication may choose the General Studies program in the College of Arts and Sciences. Under this interdisciplinary baccalaureate degree program, students can combine a variety of scientific backgrounds with the scientific and technical communication courses and additional electives in other aspects of communication.

Admissions Schedule

Students are admitted into the scientific and technical communication program only in Autumn and Spring quarters.

Deadlines for submission of B.S./B.S.E. applications, to 362 Loew, are July 1 for entry Autumn Quarter and February 1 for entry Spring Quarter. Deadlines for submission of General Studies applications to General Studies, B10 Padelford, are April 15 for entry Autumn Quarter and January 15 for entry Spring Quarter.

Students should apply for admission to the program in the last quarter of their sophomore year or the first quarter of their junior year. Those applying for admission in their senior year will be expected to spend a minimum of four quarters in the scientific and technical communication program.

Course Registration Sequence

Students are expected to follow a pattern of registration through the scientific and technical communication required course sequence and to complete their other courses while they pursue the scientific and technical communication sequence. As a rule, the required sequence takes four or five quarters to complete. It is important that each student have time to grow, to develop the necessary skills, and to integrate the knowledge necessary to enter the profession. As a result, it is recommended that students register for the required scientific and technical communication courses in the following sequence: STC 400 (3) and 401 (3) the first quarter, STC 310 (3) and 402 (4) the second quarter, STC 415 (4) the third quarter, and STC 403 (4) and 495 (3-5) in subsequent quarters.

Graduate Program

Scientific and technical communication offers an option that leads to the College of Engineering Master of Sci-

ence degree program. A total of 45 credits is required for the M.S. degree, including either 9 credits of thesis or 5 credits of internship and 4 credits of graduate project. The 36 credits of course work include 17 credits of required STC courses: STC 501, Theoretical Dimensions of Technical Communication (3); STC 505, Computers and Information Management in Technical Publications (4); STC 510, Document Design (4); STC 515, Human/Machine Communication (3); and STC 520, Publications Management (3); 12-15 credits of technical courses and 4-7 credits of free electives.

In addition to meeting the requirements of the Graduate School, students admitted to the scientific and technical communication M.S. degree pathway must hold a baccalaureate degree in some branch of engineering or related science or in some other way present evidence of adequate preparation for graduate study in technical communication. Students with baccalaureate degrees in fields other than engineering or science may be admitted into the program if they have a minimum of three years of professional technical communication experience and undergraduate training relevant and applicable to the solution of problems in the field of technical communications. A limited number of undergraduate courses may be required.

Research Facilities

Scientific and technical communication students enjoy access to a variety of computer systems and work directly with a state-of-the-art publications facility. They have the opportunity to participate in the development of new document formats, new insights into human information processing, and new publications practices and technologies.

Financial Aid

A limited number of teaching and research assistantships and scholarships are available for the financial support of graduate students in scientific and technical communication. More information and application forms can be obtained by contacting the director of the program.

Correspondence and Information

Program in Scientific and Technical Communication
14 Loew, FH-40

Faculty

Director

Mark P. Haselkom

Professors

Butterfield, Earl C.,* 1981, ‡(Education, Psychology), Ph.D., 1963, George Peabody; cognitive science.

Souther, James W.,* 1948, (Emeritus), M.A., 1948, Washington; communication process and communication in organizations, document design.

White, Myron L., 1947, (Emeritus), Ph.D., 1958, Washington; technical editing and publications management.

Associate Professors

Coney, Mary B.,* 1976, M.A., 1964, Illinois; Ph.D., 1973, Washington; writing and theories of technical discourse.

Farkas, David K.,* 1983, M.A., 1969, Chicago; Ph.D., 1976, Minnesota; document design, publications practices and technologies, information systems.

Haselkom, Mark P.,* 1985, M.A., 1973, Ph.D., 1977, M.A., 1980, Michigan; man/machine interface, natural language processing, computer intertechnical communication.

Ramey, Judith A.,* 1983, M.A., 1971, Ph.D., 1983, Texas; computer documentation, computers and information management.

Assistant Professor

Spyridakis, Jan,* 1977, M.A.T., 1972, Ph.D., 1986, Washington; document design research, comprehension processes, computer-assisted instruction.

Lecturer

Williams, Thomas R., 1977, M.C., 1981, Washington; production editing and document design.

Course Descriptions

STC 300 Practice in Technical Reporting (1-2) Application of the fundamentals of technical reporting to the specific reporting activity of students who are enrolled in a jointly designated engineering, scientific, or technical course.

STC 310 The Computer in Technical Communication (3) AW Haselkorn Functions of, and relationships among, computer applications, systems software, and computer hardware in technical publications and communication. Required of students taking an interdisciplinary degree in scientific and technical communication. Prerequisites: 400 and 401 or permission of instructor.

STC 400 Scientific and Technical Communication (3) ASP Williams Principles and practices of writing to communicate scientific and technical information to a variety of readers, including the expert, general scientific and technical reader, manager, and general public. Required of students taking an interdisciplinary degree in scientific and technical communication. Prerequisite: junior standing or permission of instructor. Entry card required.

STC 401 Style in Scientific and Technical Writing (3) ASP Coney Grammatical structures and stylistic strategies within specific professional contexts. Achieving clarity and conciseness through word choice and placement, using a variety of sentence structures for appropriate emphasis, handling details, establishing effective tone. Required of students taking an interdisciplinary degree in scientific and technical communications. Prerequisite: junior standing or permission of instructor.

STC 402 Scientific and Technical Editing (4) AW Farkas Editorial responsibilities and practice in the communication of scientific and technical information; the editor's role both as editor and as supervisor of publication groups. Required of students taking an interdisciplinary degree in scientific and technical communication. Prerequisite: 401 or permission of instructor.

STC 403 Publication Project Management (4) Sp Ramey Responsibilities and practice in managing publication projects in scientific and technical organizations. Project design, coordination, production, and evaluation, including planning, organizing, staffing, and directing. Required of students taking an interdisciplinary degree in scientific and technical communications. Prerequisite: 402 or permission of instructor; recommended: 415.

STC 406 Research in Technical Writing (3) Sp Spyridakis Provides a basis for integrating skills acquired in other scientific and technical communication courses. Students examine the research of various disciplines that impact technical writing. Structured around theoretical and empirical literature as it relates to different textual issues in technical writing.

STC 407 Computer Documentation (3) ASP Ramey Writing documentation for computer hardware, software, and integrated systems. Examines kinds of documentation needed for computer products; introduces use of the computer in its own documentation and resulting innovations in the field. Prerequisites:

310 or equivalent, upper-division standing. Entry card required.

STC 408 Special Documents: Proposals, EIS, and Manuals (3) W Spyridakis Preparing special documents with emphasis on proposals, EIS, manuals, and questionnaires. Established guidelines and practices, planning, organizing, writing, and submitting the documents. Documents and the decision-making process. Prerequisite: upper-division standing or permission of instructor.

STC 409 Writing for Publication (3) W Coney Writing for professional and trade periodicals in science, engineering, and technology: examination of the publication process, including the roles of author, editor, and reviewer; selecting the appropriate periodical; organizing and writing the article. Prerequisite: upper-division standing or permission of instructor.

STC 415 Production Editing (4) WSP Williams The editorial role in the preparation of text and visual materials for production (typesetting, layout, printing, binding, distribution). The editor's responsibilities and prerogatives as they relate to those of other professionals in the production phase of the publications field. Prerequisite: 402 or permission of the instructor.

STC 495 Professional Practice (3-5, max. 10) AWSps Staff Supervised internship in a publications organization approved by the faculty adviser. A minimum of one internship is required of students taking an interdisciplinary degree in scientific and technical communication. Offered on credit/no credit basis only. Prerequisites: 3.00 average in required STC courses or permission of STC admission and academic standards committee.

STC 498 Special Topics (1-5, max. 10) Special topics in scientific and technical communication to be offered occasionally by permanent or visiting faculty members. May be repeated for credit.

STC 499 Special Projects (2-5, max. 10) AWSps Individual undergraduate projects in scientific and technical communication. Prerequisite: permission of instructor.

Courses for Graduates Only

STC 501 Theoretical Dimension of Technical Communication (3) A Coney Theories and research drawn from a variety of fields that inform such topics as the historical and social context of technical communication, the aims of technical discourse, readability, invention and audience, audience analysis, technical style, and graphics. Prerequisite: admission

to an engineering master's program or permission of instructor.

STC 505 Computers and Information Management in Technical Publications (4) W Ramey Introduction to the concepts of information theory; information management in the larger context of computerized publishing (both procedures and technologies internal to the publishing unit and electronic media for external dissemination of information). Prerequisite: 501 or permission of instructor.

STC 510 Document Design (4) W Farkas Planning, preparing, and testing technical documents following the document design model; standard and innovative document formats; identifying and using empirically verified communication principles; role of document designer and communication analyst in technical organizations. Prerequisite: 501 or permission of instructor.

STC 515 Human/Machine Communication (3) Sp Haselkorn Relationship between formal and natural communication systems. Impact of work in artificial intelligence, natural language processing, computer simulation of cognitive processes, and other formal studies of human communication on the field of scientific and technical communication. Prerequisites: 505, 510 or permission of instructor.

STC 520 Publications Management (3) Sp Souther Management of technical publications and information systems: identifying roles of communication in organizational systems; defining internal, external organizational communication needs; designing a publications unit, including planning, organizing, staffing, directing, controlling, evaluating (performance, product). Industrial, governmental publishing; periodical publishing; consulting and specialized contract services. Prerequisite: 510 or permission of instructor.

STC 598 Special Topics (1-5, max. 6) Prerequisite: permission of instructor.

STC 599 Special Projects (1-4) Written report required. Prerequisite: permission of program director.

STC 600 Independent Study or Research (*) AWSps Written report required. Prerequisite: permission of program director.

STC 601 Internship (3-9, max. 9) AWSps Written report required. Prerequisite: permission of program internship adviser.

STC 700 Master's Thesis (*) Prerequisite: permission of thesis adviser.



College of Forest Resources

Dean

David B. Thorud
102A Anderson

Associate Dean

Dale W. Cole
107B Anderson

Founded in 1907, when professional forestry education was in its infancy, the college holds a position of national and international leadership in both instruction and research. Its location in one of the world's largest forest regions provides unique opportunities for field classes and research, actual management of forested lands, exposure to wood-based industries, and awareness of resource-use issues. Enrolled in the college are approximately two hundred undergraduate and two hundred graduate students, taught by more than fifty faculty members. Thus, students enjoy small classes and close association with faculty, as well as the diversity and superior facilities of a large university.

College Facilities

The college occupies three buildings: Alfred H. Anderson Hall, the Hugo Winkenwerder Forest Sciences Laboratory, and Julius H. Bloedel Hall. In addition, the Center for Urban Horticulture occupies a building complex at Union Bay. Thus, the college has excellent areas and equipment for scientific laboratories, classrooms, seminar rooms, special collections, and administrative offices.

The Forest Resources library, a branch of the University's Suzzallo Library, houses more than twenty-six thousand bound volumes and thirty-three thousand pamphlets, reports, and monographs. It also has an excellent collection of approximately twenty-five hundred periodicals and many indexes to current literature in forestry and supporting sciences. Under the nationwide Farmington Plan, sponsored by the Special Library Association, the Forest Resources library has assumed responsibility for collecting foreign material published in the fields of forestry and pulp and paper technology, providing an unusual opportunity for academic research. The Center for Urban Horticulture also maintains a library. Its herbarium supplements forest resources students' fieldwork in dendrology. Containing representative plant material from all parts of the United States, the collection includes dried, mounted specimens of shrubs, hardwood trees, and conifers. Fruit specimens and a complete cone collection of American conifers are maintained apart from the mounted collection. Another herbarium, complete in range plants and maintained by the Department of Botany, is available for use by forest resources students.

The laboratory facilities of the college represent an extensive array of modern equipment for research. The many available research tools include optical equipment, electronic instrumentation for a wide variety of uses, gas chromatographs, spectrophotometers, and physical test equipment. Specific laboratories are designed to study soil chemistry and soil physics, hydrology, polymer chemistry, meteorology, tree physiology, genetics, wood and extractives chemistry, physics of fibrous composites, applied mechanics, wood process technology, pathology, entomology, recreation, horticultural physiology, and horticultural plant materials. The college computing facilities include a remote input-output connection with the main University computers, microcomputer systems dedicated to a specific research area, and a microcomputer student laboratory.

Institute of Forest Resources

Director

David B. Thorud
102A Anderson

Associate Director

Dale W. Cole
107B Anderson

The Institute of Forest Resources administers the research branch of the college, directing the overall research programs with its related lands and facilities. This includes the McIntire-Stennis Research Program, College Lands (see Field Research Areas and Facilities), Word Processing Unit, Publications, shops and equipment, research and analytical laboratories, computer facilities, external- and internal-funded research, and the production of special reports. The Institute serves to coordinate the submission of research proposals with the faculty, University administration, and federal, state, and private agencies. The employment of graduate and undergraduate students on research is administered by the Institute. Many students earn research and thesis credit toward advanced degrees by working on major forest resources problems supported by grants or contracts.

Present and future research thrusts include forest policy analysis, stand management, riparian zone management, forest ecosystem analysis, international trade in forest products, forest biotechnology, logging engineering, wood science and technology, and pulp and paper science. Topics of study are selected not only to foster the interests of individuals and groups in the region, but also to promote the scientific community at large. In addition, international research programs of interest to the state of Washington are administered within the Institute.

Research projects include both individual studies and highly interdisciplinary programs. Associated groups support and broaden the interdisciplinary direction of the college, including the Center for Urban Horticulture, National Park Service Cooperative Park Studies Unit, Center for Quantitative Sciences, and the Quaternary Research Center. The college has cooperative agreements with the National Park Service and the U.S. Forest Service to promote collaborative efforts among scientists in research.

The college participates with Cooperative Extension of Washington State University to undertake cooperative extension forestry programs. The primary purpose is to provide educational opportunities for citizens of the state, particularly in the nonindustrial forestry area.

The Office of College Publications oversees the publishing needs of the college, including word processing, graphics, editing, printing, distribution, and sales. Publications are distributed to national and international institutes and libraries as well as to the general public.

Field Research Areas and Facilities

The college field facilities include two major forested areas covering more than four thousand acres, an arboretum, a reserve, and several cooperative research centers and stations. These lands offer a wide variety of terrestrial and aquatic characteristics favorable to a full range of scientific investigations. They also provide a general natural science laboratory for the many disciplines in the college specifically related to, or concerned with, the research and teaching of natural resources behavioral patterns and management.

The Charles Lathrop Pack Demonstration Forest of approximately 4,200 acres, is located sixty-five miles south of the University, near Eatonville. This forested property is the focal point for on-the-ground academic work in forest management, resource science, and engineering, both at the undergraduate and graduate levels. Broad forest and soil diversity has led to extensive biological, management, and engineering re-

search, much of which may be characterized as a "pioneering effort." A full-time resident staff manages this facility, harmonizing its demonstration objectives with academic and research objectives. Rustic, but comfortable, facilities which provide housing and support to academic and research programs also are used extensively for conferences both within and outside the University.

The Lee Memorial Forest, of approximately 160 acres, is located about twenty-two miles northeast of the University near Matty. This forested property provides valuable academic and research opportunities near the campus. Characterized by forest types and soils common to western Washington lowlands, Lee Forest is used extensively for part-day trips and for research and demonstration projects especially useful in a land base where long-term study commitments are difficult to achieve.

The Allan H. Thompson Research Center in the Cedar River watershed is maintained by the college in cooperation with the water department of Seattle for studies in forest hydrology and mineral cycling in the forest ecosystem.

The Washington Park Arboretum, a two-hundred-acre collection of trees and shrubs growing in a naturalistic setting, is only a fifteen-minute walk from the University campus. Managed and operated by the Center for Urban Horticulture, under an agreement with the City of Seattle Department of Parks and Recreation, the Arboretum contains some fifty-two hundred different kinds of woody plants that are available for research and academic study. The Arboretum was established in 1934 and many of its original specimens are now approaching maturity. Classes in botany, dendrology, horticulture, and landscape architecture make use of the collections, while the grounds are used for studies in soil science, ecology, and various research projects. The Arboretum also serves as an important public service area to the University, offering various formal and informal classes for the general public and, in addition, serving the community as a public park and as open space.

The Union Bay facility, a fifty-five-acre tract adjacent to Lake Washington and the main campus, is devoted to research and teaching in the Center for Urban Horticulture. It includes a research nursery area, research arboretum, and a large ecological grassland.

A 130-acre property on Bainbridge Island in the middle of Puget Sound, the Bloedel Reserve is managed through the Center for Urban Horticulture for the study of plant/human interactions. Consisting of both landscaped and natural areas, it is a focus for research and teaching programs of the University in landscape architecture, pest management, and urban horticulture.

Forest Resources Management Division

Chairperson

Robert G. Lee
123J Anderson

Courses included in the forest resources management program are basic and applied subject matter in social sciences, management techniques, forest biology, and quantitative sciences for all curricula, as well as specific curricula in forest resources management. Basic subjects in ecology, including plants, animals, climate, and soils, also are included in the teaching responsibility of this program.

The forest resources science curriculum includes course work that provides a background in not only the physical, biological, and social sciences but also areas that prepare students to communicate and operate as professionals in a natural resources specialty. These

specialty areas include ecosystems analysis, forest-stand management, social sciences, quantitative resources management, and wildlife science.

Forest Products and Engineering Division

Chairperson

Gerard F. Schreuder
296 Bloedel

Courses for which the Forest Products and Engineering Division is responsible include those in wood and fiber utilization and their properties, wood chemistry and the engineering principles of harvesting, and working with forest products. It administers three curricula: pulp and paper science and technology, wood science and technology, and logging engineering.

Undergraduate Program

In addition to the University's general admission requirements, students who plan to enter the College of Forest Resources should have completed Algebra III (Intermediate), trigonometry, and at least one unit each of biological and physical science.

The College of Forest Resources offers five undergraduate curricula leading to a Bachelor of Science in Forest Resources degree: forest resources management, forest resources science, logging engineering, pulp and paper science, and wood science and technology.

The first two years of study emphasize general preparation, followed by an upper-division professional program. Each curriculum contains a number of elective credits selected at the student's discretion. Students are encouraged to take a number of these credits outside the college to broaden their preparation. An honors program in each curriculum also is available to qualified students. Information is available from the honors program adviser.

In addition to University regulations concerning requirements and grading, college regulations state that no required course may be taken on a satisfactory/not satisfactory basis. Some classes include field trips, laboratory supplies, or material duplication at extra expense to the students.

Students interested in forest resource management, forest resources science, or logging engineering should note that upper-level course work may be taken only after completion of the required field camp at Pack Forest.

Students planning to enter the college from community colleges or from other universities should check with their advisers to ensure their prior programs of study include the proper prerequisites.

Student advising is the joint responsibility of the College Advising Center, 116 Anderson, and the divisions. Student files are located in the advising center, and the curriculum adviser is available to assist with scheduling and questions.

Pack Forest Residential Field Classes

Students enrolled in the forest resource management, forest resources science, and logging engineering curricula must attend the Pack Forest program at the end of the sophomore year. This program is conducted as a field residential program at the Charles Lathrop Pack Demonstration Forest near LaGrande, sixty-five miles from Seattle. Classes include field measurements, surveying and forest transportation, and silviculture protection.

Students taking course work at Pack Forest must live at the field residential station, paying room-and-board charges in addition to regular tuition. Students may apply for admission to the Pack Forest program approximately two months preceding Spring Quarter. Admission is based on completion of lower-division course work and available space. Application forms and information are available from the curriculum adviser, 116 Anderson.

Scholarships and Financial Aid

Information about undergraduate scholarships and awards that are available specifically to students in the College of Forest Resources may be obtained from the Office of Student Financial Aid, 105 Schmitz, or from the Student Services Office, 116 Anderson. The Washington Pulp and Paper Foundation, Inc., provides scholarships for students preparing for careers in the pulp and paper industry, with awards based on professional promise and scholastic achievement. The foundation is supported by companies of the pulp and paper industry and by supplier companies. Information may be obtained from Prof. William T. McKean, 344 Bloedel.

Accreditation

The curricula in forest resource management and logging engineering are accredited by the Society of American Foresters (SAF). Other curricula include electives that may be used toward qualification for SAF and the Forester rating for the United States Civil Service. Students should consult with advisers in planning their schedules to include the specific class requirements for SAF and civil service qualification.

Employment

The college provides the Office of Professional Opportunities to assist its majors in obtaining summer employment while in school and permanent employment upon graduation. Summer work may be available through federal and state agencies and in the numerous private companies in the wood-using industry of the region. Although field experience is not required for graduation, students are strongly urged to seek summer employment relevant to their major and career goals. As in any applied technical field, practical experience is as important as academics in preparing for a professional career.

In the description of courses of study listed below, explanations for footnotes are found at the end of the curricula listing.

Forest Resources Management Curriculum

LOWER-DIVISION REQUIREMENTS

Forest Resources—FRM 100, Introduction to Forest Resources Management (5 credits). **Computer Science**²—Q SCI 340, Application of Digital Computers to Biological Problems. **Mathematics**¹—Q SCI 291, Analysis for Biologists (4); Q SCI 292, Analysis for Biologists (4); Q SCI 381, Introduction to Probability and Statistics (5). **Humanities**—ENGL 131, Composition: Exposition (5); ENGL 111, Writing About Literature (5); SPCH 220, Introduction to Public Speaking (5). **Physical Sciences**—CHEM 101, General Chemistry (5); CHEM 102, General and Organic Chemistry (5); PHYS 114, General Physics (4); PHYS 117, General Physics Laboratory (1). **Earth Science**—GEOL 101, Introduction to Geological Sciences (5). **Social Sciences**—ECON 200, Introduction to Microeconomics (5); POL S 202, Introduction to American Politics (5). **Biological Sciences**—BIOL 101-, General Biology (5-); BIOL -102, General Biology (-5). **Electives**—(10).

UPPER-DIVISION REQUIREMENTS

At Pack Forest (Spring Quarter, junior year)—FRM 323, Silviculture and Protection (6 credits); FRM 362, Field Measurements (6); FPE 345, Forest Transportation (3). **Core Upper Division**—FRM 370, Social Functions of Forest Ecosystems (3); FRM 321, Forest Biology I (5); FRM 310, Physical Aspects of the Forest Environment (5); STC 300, Practice in Technical Re-

porting (1); FRM 360, Forest Management and Economics I (4); FRM 322, Forest Biology II (4); FRM 361, Forest Measurements (4); FRM 461, Forest Management and Economics II (4); FRM 470, Forest Policy and Law (4); FRM 420, Principles of Forest Biology III (3); FRM 481, Management of Wildland Recreation and Amenities (3); FRM 471, Forest Planning and Project Management (4); STC 300, Practice in Technical Reporting (1); FRM 495, Senior Project (5). **Electives**—(26).

Wildland Recreation Option

Note: As this catalog went to press, the Wildland Recreation Option was undergoing revision. Students may check with the adviser in 116 Anderson.

Student-Specific Option

Students who desire to pursue an option other than those established for the forest resource management curriculum should discuss their interests with faculty members. Upon sponsorship of two faculty members, the student should submit to the Forest Management Division Chairperson a proposed program of study consisting of at least 30 credits of course work. Upon approval, a copy of the approved program is placed in the student's academic file in the College Advising Center. This program is binding as a graduation requirement. All other requirements, including the curriculum core and senior case studies, must be completed.

Forest Resources Science Curriculum

LOWER-DIVISION REQUIREMENTS

Forest Resources—FRM 101, Introduction to Forest Science (1 credit). **Mathematics**¹—Q SCI 291, Analysis for Biologists (4); Q SCI 292, Analysis for Biologists (4); Q SCI 340,² Application of Digital Computers to Biological Problems; Q SCI 381, Introduction to Probability and Statistics (5). **Humanities**³—ENGR 130, Introduction to Technical Writing (5); ENGL 131, Composition: Exposition (5); SPCH 220, Introduction to Public Speaking (5). **Physical Sciences**—CHEM 140, General Chemistry (4); CHEM 150, General Chemistry (4); CHEM 151, General Chemistry Laboratory (2); PHYS 114, General Physics (4); PHYS 115, General Physics (4); PHYS 117, General Physics Laboratory (1); PHYS 118, General Physics Laboratory (1). **Earth Science**—GEOL 205, Physical Geology (5). **Social Sciences**—ECON 200, Introduction to Microeconomics (5); ANTH 302, Plants, Animals, and People (3); POL S 202,⁵ Introduction to American Politics (5). **Biological Sciences**—BIOL 210, Introductory Biology (5); BIOL 211, Introductory Biology (5); BIOL 212, Introductory Biology (5). **Electives**—(6).

UPPER-DIVISION REQUIREMENTS

At Pack Forest—FRM 233, Silviculture and Protection (6 credits); FRM 362, Field Measurements (6); FRM 490, Undergraduate Studies (4); **Core Upper Division**—FRM 310, Physical Aspects of the Environment (5); FRM 321, Principles of Forest Biology I (5); FRM 322, Principles of Forest Biology II (4); FRM 360, Forest Management and Economics (4); FRM 370, Social Functions of the Forest Ecosystems (3); Q SCI 482, Statistical Inference in Applied Research (5); Q SCI 483, Statistical Inference in Applied Research (5); STC 300, Practice in Technical Reporting (1); FRM 495, Senior Project (5). **Electives** (general or specialization)⁶—(32).

Pulp and Paper Science Curriculum

LOWER-DIVISION REQUIREMENTS

Chemistry—CHEM 140, General Chemistry (4 credits); CHEM 150, General Chemistry (4); CHEM 151, General Chemistry Laboratory (2); CHEM 160, General Chemistry (4); CHEM 231, Organic Chemistry (4); CHEM 232, Organic Chemistry (3); CHEM 241, Organic Chemistry Laboratory (3). **Mathematics**—MATH 124, Calculus With Analytic Geometry (5); MATH 125, Calculus With Analytic Geometry (5); MATH 126, Calculus With Analytic Geometry (5); MATH 238, Elements of Differential Equations (3); Q SCI 381, Introduction to Probability and Statistics (5). **Physics**—PHYS 121, Mechanics (4); PHYS 122, Electromagne-

tism and Oscillatory Motion (4); PHYS 123, Waves (4). *Engineering*—ENGR 141, Introductory FORTRAN Programming (4); ENGR 260, Thermodynamics (4). *Forest Resources*—FPE 102, Introduction to Pulp and Paper Manufacture (3); FPE 306, Pulp and Paper Processes Analysis (3). *Social Sciences/Humanities*—ENGL 131, Composition: Exposition³ (5); ECON 200, Introduction to Microeconomics (5). *Electives*⁴—(9).

UPPER-DIVISION REQUIREMENTS

Chemistry—CHEM 350, Elementary Physical Chemistry (3 credits); CHEM 351, Elementary Physical Chemistry (3). *Chemical Engineering*—CH E 310, Material and Energy Balances (4); CH E 330, Transport Processes I (4); CH E 340, Transport Processes II (4); CH E 436, Chemical Engineering Laboratory II (3). *Forest Resources*—FPE 400, Wood and Fiber Structure (5); FPE 403, Fibrous Structure and Rheology I (3); FPE 406, Wood Chemistry I (3); FPE 407, Wood Chemistry I Laboratory (2); FPE 476, Pulping and Bleaching Processes (3); FPE 477, Papermaking Processes (3); FPE 478, Pulp and Paper Laboratory I (2); FPE 479, Pulp and Paper Laboratory II (2); FPE 481, Pulp and Paper Unit Operations (3); FPE 482, Pulp and Paper Process Design and Economics (3); FPE 485, Undergraduate Research (1-1-1); FPE 488, Polymer Chemistry (3); FPE 497, Pulp and Paper Internship I (1); FPE 498, Pulp and Paper Internship II (1); FRM 321, Forest Biology I (5). *Electives*⁴—(10). *Technical electives*—(16).

Logging Engineering Curriculum

LOWER-DIVISION REQUIREMENTS

*Computer Science*²—Q SCI 340, Application of Digital Computers to Biological Problems (5 credits). *Mathematics*—MATH 124, 125, 126, Calculus With Analytic Geometry (5, 5, 5); Q SCI 381, Introduction to Probability and Statistics (5). *Humanities*—SPCH 220, Introduction to Public Speaking (5); ENGL 131,³ Composition: Exposition (5); ENGL 182, The Research Paper (5); humanities elective (5). *Physical Sciences*—CHEM 101, General Chemistry (5); PHYS 114, 115, 116, General Physics (4, 4, 4). PHYS 117, 118, 119, General Physics Laboratory (1, 1, 1). *Social Sciences*—ECON 200, Introduction to Microeconomics (5); ECON 201, Introduction to Macroeconomics (5). *Electives*—(15).

UPPER-DIVISION REQUIREMENTS

Forest Resources—FPE 243, Mechanics in Forestry (4 credits); FPE 377, Materials Science in Forestry (4); FPE 342, Forest Road Engineering (5); FPE 343, Introductory Soil Mechanics (4); FRM 361, Forest Measurement (4); FPE 430, Aerial Photos/Remote Sensing in Natural Resources (3); FPE 344, Hydraulics for Forest Roads (4); FPE 341, Forest Harvesting (5); FRM 461, Forest Management and Economics II (4); FRM 429, Intermediate Operations in Silviculture (3); FRM 490, Undergraduate Studies (2); FPE 441, Forest Access Policy and Planning (5); FPE 440, Construction Management and Administration (5); FPE 446, Senior Forest Engineering Field Studies—Analysis of Social Factors (2); FPE 447, Senior Forest Engineering Field Studies—Multiple Use and Harvest Planning (5); FPE 448, Senior Forest Engineering Field Studies—Road Location and Construction Surveys (5); FPE 449, Senior Forest Engineering Field Studies—Bio-Physical Resources Evaluation (3). *Engineering*—ENGR 123, Introduction to Engineering Graphics (3); CIVE 213, Plane Surveying (3). *Biological Sciences*—BOT 113, Plant Identification and Classification (5). Student-specific studies—(8).

Wood Science and Technology Curriculum

LOWER-DIVISION REQUIREMENTS

Forest Resources—FPE 243, Mechanics in Forestry (4 credits); FPE 377, Materials Science in Forestry (4). *Computer Science*²—Q SCI 340, Application of Digital Computers to Biological Problems (5). *Mathematics*¹—MATH 124, Calculus with Analytic Geometry (5); MATH 125, Calculus with Analytic Geometry (5); MATH 126, Calculus with Analytic Geometry (5); Q SCI 381, Introduction to Probability and Statistics

(5). *Physical Science*—CHEM 101, General Chemistry (5); CHEM 102, General and Organic Chemistry (5); PHYS 114, 115, 116, General Physics (4, 4, 4); PHYS 117, 118, 119, General Physics Laboratory (1, 1, 1); ENGR 123, Introduction to Engineering Graphics (2). *Social Sciences/Humanities*—ENGL 131,³ Composition: Exposition (5); ENGL 182, The Research Paper (5); SPCH 220, Introduction to Public Speaking (5); ECON 200, Introduction to Microeconomics (5); ECON 201, Introduction to Macroeconomics (5). *Electives*—(3).

UPPER-DIVISION REQUIREMENTS

Forest Resources—FPE 302,⁷ Pulp and Paper Technology (4 credits); FPE 400, Wood and Fiber Structure (5); FPE 401, The Physics of Wood and Fiber Composites (4); FPE 406, Wood Chemistry I (3); FPE 407, Wood Chemistry II Laboratory (2); FPE 410,⁷ Specifications and Manufacturing of Solid Wood Products I (4); FPE 411,⁷ Specifications and Manufacturing of Solid Wood Products II (4); FPE 421, Quality and Production Control in Wood Processing (3); FPE 422, Wood Process Models (3); FPE 472,⁷ Wood Manufacturing Operations I (4); FPE 473,⁷ Wood Manufacturing Operations II (4); FPE 474,⁷ Wood Manufacturing Operations III (4); FPE 475, Structural Wood Design (4); FPE 485, Undergraduate Research (1-1-1); FRM 321, Forest Biology I (5); IND E 311, Engineering Economy (3); PSYCH 449, Organizational and Industrial Psychology (3); MKTG 300, Marketing Concepts for Non-Business Majors (4). *Electives*—(11). Professional option—(15).

Explanation of Requirements

1. MATH 124 for Q SCI 291, MATH 125 for Q SCI 292, or equivalent mathematics courses may be substituted.
2. Students may substitute ENGR 141, Q METH 200, FISH 340, FOR M 470, or equivalent course.
3. Or from ENGL 111, 121, or ENGR 130, 331.
4. A minimum of 22 credits must be taken in the humanities or social sciences, or both, as well as 16 credits of approved sciences and engineering electives, of which 6 must be in laboratories.
5. SOC 331 may be substituted for POL S 202.
6. Students must select a committee of two faculty members to provide advice for selecting course work in a forest science specialty or course work leading to a broad perspective in forest science. Specialty course requirements fulfill the upper-division electives (32 credits) and may be obtained from the College Advising Office. The recognized specialties are ecosystem analysis, forest stand management, social sciences, quantitative resources management, and wildlife science.
7. FPE 472, 473, and 474 are offered in even-numbered years, and FPE 302, 410, and 411 are offered in odd-numbered years.

Graduate Programs

Dale W. Cole, Graduate Program Coordinator

Graduate programs in forest resources are designed to accommodate a wide range of education and career objectives. A student may concentrate on development of advanced professional skills and knowledge or on exploration of sciences basic to forest resources.

Graduate programs offered in forest resources lead to degrees of Master of Forest Resources, Master of Science, and Doctor of Philosophy. Graduate students may center their graduate study in one of the college divisions and in the special fields of study and research within the division.

Master of Forest Resources Degree

The Master of Forest Resources degree is a professional degree offered for the student who desires to ac-

quire a greater competence in a specific subject area of forest resources. Course work may be in forest resources and in appropriate natural and social sciences. Both thesis and nonthesis options are available. A foreign language is not required.

Master of Science Degree

The Master of Science degree is a learned degree, often precursory to the Doctor of Philosophy degree. Its requirements include a minor of at least 9 credits in a field outside the major. Both thesis and nonthesis options are available. The nonthesis program requires at least 6 credits of research. A foreign language is not required.

Doctor of Philosophy Degree

The Doctor of Philosophy degree may be preceded by baccalaureate education, in either forest resources or another discipline. The program comprises an appropriate selection of courses in forest resources and in the related natural and social sciences. The program requires passage of the General Examination in forest resources, the necessary research, and completion of the dissertation. A minimum of two years of residence at the University also is required. The time necessary to complete the degree requirements depends upon the thoroughness and applicability of prior course work. Reading proficiency in one foreign language may be required by the Supervisory Committee when the language is essential to the student's program of study.

Midcareer Education

A program has been established in the college for professionals in the field who, on a part- or full-time basis, take graduate work at midcareer to prepare themselves for new or broader responsibilities. Under this program, courses can be taught in a more flexible time arrangement to meet the constraints of participants and can be tailored to specific career needs. Professionals interested in midcareer graduate work should contact the graduate program coordinator.

Program Areas

Graduate education is offered through the academic divisions. The programs cover the following areas: forest industries management, quantitative resource management, forest resource management, forest economics and finance, sociology and leisure studies, land use planning and resource policy, resource and environmental interpretation, outdoor recreation management, silviculture, forest soils, forest genetics, forest entomology, forest pathology, forest ecology, tree physiology, forest hydrology and meteorology, wildlife science, ecosystem analysis, wood science, pulp and paper technology, forest engineering, wood utilization and technology, and urban horticulture.

In all areas of study, the college maintains a close working relationship with faculties of other colleges and schools throughout the University, including service on graduate committees. Students who prefer an interdisciplinary program of graduate study are encouraged to devise, with the assistance of faculty, a program in the appropriate specializations. Such programs are a long-standing tradition in the college.

Admission Qualifications, Background

A student who intends to work toward an advanced degree must apply for admission to the Graduate School and must meet the requirements set forth by the Graduate School and the College of Forest Resources.

Basic requirements for admission to the Graduate School are a baccalaureate degree from an institution of recognized standing, a minimum grade-point average of 3.00 in the junior and senior years of college work, approval of the Dean of the Graduate School, and approval of the college.

In addition to requesting admission forms from the Graduate Admissions Office, an applicant should ob-

tain supplemental admission and reference forms from the College of Forest Resources. The Graduate Record Examination general test is required, and test scores must be submitted by the applicant.

Upon enrollment, the student is assigned a graduate program committee that is responsible for guidance in the early stages of the graduate program, to be followed by more formal committees as the student's program develops.

Applicants for the college are considered quarterly within the enrollment limitations for the college and the available faculty and workload limitations within the specific program area selected. Students with both undergraduate forestry degrees and other related fields are considered, although a prior forestry degree is normally expected of applicants for the professional Master of Forest Resources degree.

Financial Aid

The college has available a limited number of appointments as research assistants. Teaching and research responsibilities allow time to pursue a full academic load. Fellowships and scholarships without teaching or research obligations are also available. Requests for financial aid should be submitted by February 1 for priority consideration for the following academic year.

Correspondence and Information

Graduate Program Coordinator
107 Anderson, AR-10

Center for Quantitative Science in Forestry, Fisheries, and Wildlife

Director

E. David Ford

The Center for Quantitative Science in Forestry, Fisheries, and Wildlife is an intercollege academic unit sponsored by the College of Forest Resources and the School of Fisheries of the College of Ocean and Fishery Sciences. The center offers a comprehensive program of study in applied mathematics and statistical methods applied to problems in ecology and natural resources management. The faculty members of the center are members of The College of Forest Resources or the School of Fisheries, and most are also members of the Biomathematics Group. Students may enroll for study at the center through one of these programs. Areas of specialty include the application of quantitative methods in forest management, biometry, and modeling ecosystems and the physiological response of trees and forests to changing environmental conditions. The center is well equipped with computers for research and graduate instruction and offers a consulting service to biological and ecological graduate students.

Center for Urban Horticulture

Director

Harold B. Tukey, Jr.
13 Merrill

The Center for Urban Horticulture is concerned with the utilization of plants to create, maintain, and enhance the quality of urban environments, and offers research, education, and public service programs. The faculty and students work with such professional groups as landscape architects, municipal arborists, grounds managers, nursery garden center operators, and highway planners, as well as with garden clubs and amateur gardening groups.

The faculty of the center offers competence in horticultural physiology, including plant propagation, nutrition, growth regulation, and tree physiology; stress physiology, especially cold hardness and chilling; horticultural taxonomy and plant materials; and continuing education, especially education techniques and programming and horticultural curriculum development. Research facilities include greenhouses and laboratories, an outdoor growing area and research arboretum at Union Bay, as well as the Washington Park Arboretum, and a world-famous collection of mature woody plants.

Center faculty members interact with faculty members in other divisions within the College of Forest Resources and in other disciplines, especially landscape architecture, botany, and environmental studies.

Center for International Trade in Forest Products

Director

Thomas R. Waggener

CINTRAFOR was established at the University of Washington to respond to opportunities and problems relating to the export and import of wood products. CINTRAFOR programs involve the cooperative effort of the forest products industry, state and federal organizations, and the following colleges and schools at the University of Washington: College of Forest Resources, School of Law, School of Business Administration, and Jackson School of International Studies.

Education: A multidisciplinary graduate program emphasizing international trade in forest products is offered.

Research: Research dealing with specific problems and opportunities in international trade is conducted.

Public Information Center: The center serves as a focal point for dissemination of information on world trade in forest products by means of seminars, conferences, workshops, and publications.

Data management: INTRADATA was developed to maintain a publicly accessible management service for forest products and international trade statistics.

Faculty

Dean

David B. Thorud

Associate Dean

Dale W. Cole

Professors

Adams, Darius M.,* 1984, M.F.S., 1968, Yale; Ph.D., 1972, California (Berkeley); modeling of trade patterns, national and international forest products marketing.

Agee, James K.,* 1978, M.S., 1968, Ph.D., 1973, California (Berkeley); management of natural systems, forest ecology, fire ecology.

Allan, G. Graham,* 1966, (Chemical Engineering),† Ph.D., 1956, Glasgow; D.Sc., 1971, Strathclyde; fiber composites, polymer sciences, creativity.

Bare, B. Bruce,* 1969, M.S., 1965, Minnesota; Ph.D., 1969, Purdue; harvest scheduling, biometry, forest land management, taxation, finance, management science.

Bethel, James S.,* 1962, (Emeritus), M.F., 1939, D.F., 1947, Duke; wood science, wood energy, tropical wood utilization, forest products management, international trade.

Bledsoe, Caroline S.,* 1973, (Research), M.S., 1964, Tennessee; Ph.D., 1970, Colorado State; forest tree nutrition, physiology of mycorrhizal tree roots, nitrogen cycling in forest ecosystems.

Brubaker, Linda B.,* 1973, (Quaternary Research Center), M.S., 1967, Ph.D., 1973, Michigan; dendrochronology, forest ecology, Quaternary paleoecology.

Bryant, Benjamin S.,* 1949, M.S.F., 1948, Washington; D.F., 1951, Yale; wood utilization technology, wood gluing, plywood and board technology.

Cole, Dale W.,* 1960, (Landscape Architecture), M.S., 1957, Wisconsin; Ph.D., 1963, Washington; mineral cycling in a forest ecosystem, forest soils.

Dowdle, Barney,* 1962, (Economics), M.F., 1958, Ph.D., 1962, Yale; development of forest products industries, public forest land management.

Driver, Charles H.,* 1965, M.S.F., 1950, Georgia; Ph.D., 1954, Louisiana State; processes of wood decay, forest diseases, range ecology.

Edmonds, Robert L.,* 1973, M.S.F., 1968, Ph.D., 1971, Washington; forest soil microbiology, biology of forest diseases, aerobiology.

Edward, John S.,* 1967, ‡(Zoology), M.Sc., 1956, Auckland (New Zealand); Ph.D., 1960, Cambridge (England); arthropod neurobiology, insect physiology and development, tundra and alpine biology.

Erickson, Harvey D., 1947, (Emeritus), Ph.D., 1937, Minnesota; wood science and technology.

Ford, E. David,* 1985, (Biostatistics, Statistics), (Fisheries),† Ph.D., 1968, London (England); spacial processes in ecology, forest productivity, and plants' response to environmental change.

Franklin, Jerry F., 1986, M.S., 1961, Oregon State; Ph.D., 1966, Washington State; structure and function of forest ecosystems, ecology of Pacific Northwest trees.

Fritschen, Leo J.,* 1966, (Architecture, Atmospheric Sciences), M.S., 1958, Kansas State; Ph.D., 1960, Iowa State; biometeorology, micrometeorology, measurement and instrumentation of the environment.

Gallucci, Vincent F.,* 1972, ‡(Biostatistics, Fisheries), M.S., 1966, State University of New York (Buffalo); Ph.D., 1971, North Carolina; biomathematics and population dynamics.

Gara, Robert I.,* 1968, M.S., 1962, Ph.D., 1964, Oregon State; bark beetle ecology, forest insect behavior, international forestry.

Gardner, Howard S., 1966, (Emeritus), (Chemical Engineering),† Sc.D., 1946, Massachusetts Institute of Technology; pulp and paper technology.

Gessel, Stanley P.,* 1948, (Emeritus), Ph.D., 1950, California (Berkeley); forest soil classification, mineral cycling, tree nutrition and forest soil fertility, tropical forest soils, forest productivity.

Hatheway, William H.,* 1969, (Emeritus), S.M., 1952, Chicago; M.F., 1954, Ph.D., 1956, Harvard; quantitative ecology, physiological ecology, tropical forestry.

Hinckley, Thomas M.,* 1980, Ph.D., 1971, Washington; forest tree physiology and autecology, forest biotechnology, water stress problems.

Huttford, Bjorn F.,* 1965, Ph.D., 1959, North Carolina; wood extractive chemicals, air and water quality in forest products industries.

Jorgensen, Jens E.,* 1968, ‡(Mechanical Engineering), M.S., 1963, Sc.D., 1969, Massachusetts Institute of Technology; systems analysis, manufacturing, automation and controls, forest engineering.

Lee, Robert G.,* 1978, M.F.S., 1969, Yale; Ph.D., 1973, California (Berkeley); forest sociology, multiple-source management, development and change of forestry institutions.

Leney, Lawrence, 1960, (Emeritus), Ph.D., 1960, New York State; wood anatomy, microtechniques, machining wood, photomicrography, seasoning and preservation of wood.

Leopold, Estella B.,* 1976, (Environmental Studies, Geological Sciences, Quaternary Research Center), (Botany),† M.S., 1950, California (Berkeley); Ph.D., 1955, Yale; paleoecology, forest history, Cenozoic palynology.

Manuwal, David A.,* 1972, M.S., 1968, Montana; Ph.D., 1972, California (Los Angeles); effect of forest management on birds and mammals, characteristics of high-elevation bird communities.

McKean, William T.,* 1979, (Chemical Engineering),† Ph.D., 1967, Washington; pulp and paper technology, chemical engineering.

Oliver, Chadwick D.,* 1975, M.F.S., 1970, Ph.D., 1975, Yale; silviculture and forest ecology, development, manipulation and culture of single-and-mixed-species forest stands.

Pearce, John K., 1934, (Emeritus), B.S.F., 1921, Washington; logging engineering.

Pickford, Stewart G.,* 1976, M.S.F., 1966, Ph.D., 1972, Washington; forest fire science and wildland fire management.

Robertson, James C. H., 1945, (Emeritus), M.S.F., 1933, California; Ph.D., 1947, Duke; forest resources.

Sarkanen, Kyosti V.,* 1961, (Chemical Engineering),† M.Sc., 1952, Ph.D., 1956, State University College of Environmental Science and Forestry (New York); chemistry of lignin, alkaline degradation of cellulose, new pulping processes.

Schaeffer, Walter H., 1952, (Emeritus), Ph.D., 1952, Washington; forestry.

Schreuder, Gerard F.,* 1971, M.S., 1960, Wagenin-gen; M.S., 1967, North Carolina State; Ph.D., 1968, Yale; statistical analysis in resource economics, systems analysis and modeling, use of aerial photos in resource planning and management.

Scott, David R. M.,* 1955, M.F., 1947, Ph.D., 1950; Yale; forest ecology and silviculture.

Sharpe, Grant W.,* 1967, M.F., 1951, Ph.D., 1955, Washington; wildland recreation, interpretation and management of recreation areas.

Stettler, Reinhard F.,* 1963, Ph.D., 1963, California (Berkeley); genetic control of morphogenesis in higher plants, reproductive biology of forest trees, experimental induction of haploidy, biotechnology, poplar fiber production.

Taber, Richard D.,* 1968, (Emeritus), M.S., 1949, Wisconsin; Ph.D., 1951, California (Berkeley); biology and conservation of birds and mammals, wildlife and human culture.

Thomas, David P., 1950, (Emeritus), M.F., 1948, Washington; economics and technology of utilizing forest crops, kiln drying and seasoning of lumber.

Thorud, David B.,* 1981, M.S., 1960, Ph.D., 1964, Minnesota; forest hydrology and watershed management, international trade in forest products, international forest policy and development.

Tukey, Harold B., Jr.,* 1980, M.S., 1956, Ph.D., 1958, Michigan State; urban horticulture, horticultural physiology.

Ugolini, Florenzo C.,* 1966, Ph.D., 1960, Rutgers; soil-forming processes and biogeochemical cycle.

Wagar, J. Alan,* 1986, (Research), M.F., 1956, Ph.D., 1961, Michigan; urban forestry, outdoor recreation.

Waggoner, Thomas R.,* 1966, M.F., 1963, M.A., 1965, Ph.D., 1966, Washington; policy and economics, regional impact analysis, international trade in forest products.

Wott, John A.,* 1981, M.S., 1966, Ph.D., 1968, Cornell; ornamental horticulture, extension programs in urban horticulture.

Associate Professors

Bradley, Gordon A.,* 1972, M.L.A., 1972, California (Berkeley); Ph.D., 1987, Michigan; forest land use planning, recreation site planning and design.

Briggs, David G.,* 1980, M.F., 1968, Yale; Ph.D., 1980, Washington; operations research in forest products industries.

Clark, James R.,* 1981, M.S., 1975, Rutgers; Ph.D., 1978, California (Davis); tree physiology, crown development of deciduous trees, environmental horticulture.

Greulich, Francis E.,* 1977, M.S., 1967, Ph.D., 1976, California (Berkeley); forest engineering statistics, operations research.

Hanley, Donald P.,* 1983, M.S.F., 1973, Montana; Ph.D., 1981, Idaho; extension forestry, small-forest management, forestry continuing education.

Johnson, Jay A.,* 1984, M.S., 1970, State University of New York (Syracuse); Ph.D., 1973, Washington; mechanical and physical properties of wood and wood composite materials, wood quality.

Raedeke, Kenneth J.,* 1979, (Research), Ph.D., 1979, Washington; wildlife biology and conservation, population dynamics.

Rustagi, Krishna P.,* 1973, M.Sc., 1953, Agra (India); M.F., 1971, Ph.D., 1973, Yale; operations research and statistical applications in resource management, forest inventory, growth and yield.

Schless, Peter,* 1975, Ph.D., 1975, Washington; residue transport and utilization, micrometeorology, forest engineering, small-log harvesting, biomass production.

Smith, W. Ramsay,* 1978, M.S., 1975, Ph.D., 1981, California (Berkeley); wood technology, lumber drying, wood physics, energy from biomass, international trade in forest products.

West, Stephen D.,* 1979, M.S., 1974, Alaska; Ph.D., 1979, California (Berkeley); population dynamics, natural history and systematics of mammals, wildlife ecology and management.

Assistant Professors

Cundy, Terrance W.,* 1983, M.S., 1980, Minnesota; Ph.D., 1983, Utah State; hydrology and watershed management.

Gustafson, Richard R.,* 1986, Ph.D., 1982, Washington; process simulation and dynamics, development of high-tensile-carbon fibers.

Hamilton, Clement W., 1985, Ph.D., 1985, Washington (St. Louis); systemics of horticultural plants, plant population biology, tropical biogeography and conservation.

Harrison, Robert B., 1986, M.S., 1980, New Hampshire; Ph.D., 1985, Auburn; forest soil chemistry, acid deposition effects, nutrient cycling.

Maguire, Douglas A., 1986, M.S., 1979, Rutgers; M.S., 1986, Ph.D., 1986, Oregon State; growth and yield modeling, forest biometrics, crown development.

Salazar, Debra J., 1985, Ph.D., 1985, Washington; forest policy and law, natural resource politics.

Smit, Barbara,* 1984, Ph.D., 1983, Minnesota; woody plant physiology, root and environmental stress physiology.

Wang, Deane, 1986, M.S., 1977, Cornell; Ph.D., 1984, Yale; landscape ecology, interactions of landscape plants in urban environments.

Course Descriptions

Forest Products and Engineering

Students taking undergraduate and graduate courses, structured or unstructured, that require field trips, special laboratory supplies, or special material duplications are required to pay appropriate amounts to cover such expenses. If a student fails to pay, the transcript may be withheld and the degree may not be conferred.

Courses for Undergraduates

FPE 102 Introduction to Pulp and Paper Manufacture (3) A *Hrufford* Technology of production of pulp and manufacture of paper. Laboratory study of paper-making.

FPE 243 Mechanics in Forestry (4) A *J. Johnson* Principles of statics with application in forestry. Basic concepts, parallelogram law, Newton's laws, equilibrium diagrams and analysis. Treatment of structural systems and systems with friction. Prerequisite: MATH 125 or Q SCI 292, which may be taken concurrently.

FPE 300 Timber Harvesting Management (3) A *Dowdle* Timber harvesting methods and planning procedures. Logging costs and production. Safety and environmental considerations. For forest managers and other nonengineering majors.

FPE 302 Pulp and Paper Technology (4) A *Hrufford* Sources of pulpwood. Mechanical and chemical pulping processes. Conversion of pulp to paper. Laboratory study of raw material, mechanical pulping and paper making. No credit given if 102 has been taken for credit.

FPE 304 Wood Properties and Products (3) A *Smith* Description of wood as a fibrous material, its properties and variability as influenced by species differences and growth conditions. Physical properties important to common uses. Nature of forest products industries and manufactured products. Present trends and developments in wood conversion. For non-wood science and utilization majors.

FPE 306 Pulp and Paper Processes Analysis (3) W *McKean, Sarkanen* Inorganic chemistry of pulping and bleaching inclusive of sulfur, chlorine, and oxygen-based chemicals, reactivities, and chemical analysis. Wood raw material and conversion to mechanical pulps. Computer-aided material balances on mechanical separation processes.

FPE 309 Creativity and Innovation (2) Sp *Allan* Understanding creativity and creative thinking; its challenges and dynamics through knowledge, judgment, planning, and observation. Techniques of creative thinking. Design and development of creative games. Computer-aided creative thinking. Creation, protection, and exploitation of a useful idea, including bargaining and negotiations. Joint with CH E 309. Prerequisite: junior standing or permission of instructor.

FPE 319 Microclimatology (3) A *Fritschen* Interaction of biological and meteorological processes with applications to forestry, recreation, wildlife, landscape design, and architecture. Surface energy balances in terms of evaporation, radiation exchange, air and soil temperature, wind speed, and humidity in the lower layer of the atmosphere. Joint with ATM S 329. Prerequisite: ATM S 101 or 301; permission of instructor. (Formerly FOR B 329.)

FPE 341 Forest Harvesting (5) Sp *Greulich* Timber harvesting methods and planning procedures. Logging cost and production control. Environmental and safety considerations as related to logging and road construction. Prerequisite: 342.

FPE 342 Forest Road Engineering (5) W *Theory* combined with strong emphasis on field practice. Engineering activities from reconnaissance through construction staking discussed in context of class project involving location, field survey, and design of a forest road. Engineering design theory covered includes horizontal and vertical curves (including spirals), earthwork, minor drainage structures. Prerequisite: CIVE 213.

FPE 343 Introductory Soil Mechanics (4) W *Cundy* Soil mechanics background necessary for the design of logging roads and structures. Soil properties and classification, soil hydraulics, soil strength and failure, soil behavior in structural design, soil modification techniques, and slope stability analysis. Application of

basic laboratory and field testing procedures. Prerequisite: 243.

FPE 344 Hydraulics for Forest Roads (4) W Cundy Fundamentals of fluid mechanics, open- and closed-conduit flow and hydrologic prediction. Analysis and design of drainage ditches and culverts for logging roads. Prerequisites: 10 credits in physics, 8 credits in mathematics.

FPE 345 Forest Transportation (3) Sp Concepts of timber harvesting requirements and road-access planning. Basic elements of road design principles, processes, and practical application of field road location. Review of basic road drainage design, overview of road construction techniques and maintenance principles plus special topics.

FPE 377 Materials Science in Forestry (4) W J. Johnson Introduction to the concepts of stress, deformation, and strain in solid materials, including the unique properties of wood. Development of those equations that relate these variables in structures. Laboratory session emphasizes theory. Prerequisite: 243 or ENGR 210.

FPE 400 Wood and Fiber Structure (5) A Briggs Development, growth, and anatomy of wood and bark. Relationship of anatomy to physical and mechanical properties of wood. Formation and influence of defects on properties. Identification of wood and fibers of commercial North American species. Prerequisite: permission of instructor. Entry card required.

FPE 401 The Physics of Wood and Fiber Composites (4) W Smith Equilibrium physical properties of composite systems. Structure and models, mass density, equilibrium moisture properties and equilibrium thermal properties. Stress, strain, Hooke's law for orthotropic materials. Electrical polarization, axial and bending stress, dielectric heating. Prerequisites: MATH 126, PHYS 116. Entry card required.

FPE 403 Fibrous Structure and Rheology I (3) Allan Review of the synthetic and natural fibers and their chemical, physical, microscopic, and submicroscopic properties. The bonding behavior of fibers in networks. Analysis of the structure of fiber networks with reference to nonwovens and paper.

FPE 404 Fibrous Structure and Rheology II (3) Allan Behavior of fibers in fluid suspensions and properties of webs formed therefrom. Physics and chemistry of fiber-polymer interactions and adhesion. Fiber modification by physical and chemical processes and theory and design of fiber composite materials. Prerequisite: 403. (Offered alternate years.)

FPE 405 Microtechnique (3) The technique of preparing, sectioning, staining, and mounting woody tissues and fibers for microscopic study. Entry card required.

FPE 406 Wood Chemistry I (3) A Hrutford Chemical and physical properties of cellulose, lignin, hemicellulose, and extractives. Wood as a raw material for the chemical industry.

FPE 407 Wood Chemistry I Laboratory (2) W Hrutford Laboratory to supplement 406.

FPE 409 Wood Extractives Chemistry (2) Sp Hrutford Nature, origin, and occurrence of the extraneous components of wood, their influence on pulp and paper preparation, and their utilization. (Offered odd-numbered years.)

FPE 410 Specifications and Manufacturing of Solid Wood Products: I (4) W Briggs, Smith Unit operations of harvesting, lumber manufacturing, and plywood manufacturing industries. Measurement and grading systems for raw materials and finished products. Hardwood and softwood industries in the Pacific Northwest. Laboratory emphasizes visits to representative manufacturers. (Offered odd-numbered years.)

FPE 411 Specifications and Manufacturing of Solid Wood Products: II (4) Sp Briggs, Johnson Unit operations of composite products industries based on chips or fibers as raw materials. Important secondary manufacturing industries, such as prefabricated housing, furniture, laminated beams, pallets. Measurement and grading systems for raw materials and finished products. Laboratory includes visits to representative manufacturers. Prerequisite: 410 or permission of instructor. (Offered odd-numbered years.)

FPE 415 Forest Hydrology (4) W Cundy Introduction to the hydrologic cycle and basic hydrologic methods as applied to wildlands. Effects of forest management activities on hydrologic processes. Case studies in forestry effects on water quality, quantity, and timing.

FPE 416 Snow Hydrology (3) Sp Cundy Snow from formation to melt as it relates to the hydrologic response of watersheds. Measurement of snowpack properties, energy and mass balances, effects of vegetation manipulation on accumulation and melt, role of snowmelt in hydrologic modeling. Prerequisites: one course in hydrology and one course in meteorology. (Offered odd-numbered years.) (Formerly 516.)

FPE 417 Hillslope Stability and Land Use (3) Sp Cundy Effects of land management, especially forest land management, on slope stability. Forest harvesting, road construction, and species conversion. Slope stability analyzed on both large (landscape) and small (hillslope) spatial scales. Prerequisites: 343, 415 or equivalent.

FPE 418 Hillslope Hydrology (3) Sp Cundy Run-off processes from hillslopes and small drainage basins. Processes of infiltration, overland flow, and subsurface flow described mathematically. Solutions to resulting differential equations. Prerequisites: 415, MATH 238 or equivalent. (Offered even-numbered years.)

FPE 421 Quality and Production Control in Wood Processing (3) W Briggs Application of wood science and technology to analysis of the effectiveness of wood-processing facilities. Production control and quality control related to materials and processes. Procurement control problems. Decision making with respect to product mix, equipment modification, analysis of inventory control, and material movement. Prerequisite: Q SCI 381.

FPE 422 Wood Process Models (3) Sp Briggs Factors influencing feasibility judgments with respect to industrial development and factory design. Feasibility of new forest products manufacturing installations with reference to raw material supply, markets, transportation, and labor supply. Analysis of case histories of forest products manufacturing and facility development. Use of operations research methods in feasibility studies. Prerequisite: 421.

FPE 430 Aerial Photos/Remote Sensing Natural Resources (3) Sp Schreuder Principles of photogrammetry, interpretation, and remote sensing; and their application to management of natural resources and wildlands. Uses for watersheds, forest resources, wildlife, point and nonpoint pollution, land-use planning, and outdoor recreation.

FPE 435 Soil Physics (4) Sp Fritschen Physical properties of soil and water. Thermodynamic properties of soil-water mixtures and osmotic effects. Darcy's law and application to the movement of the water table. Horizontal and vertical unsaturated flows: rain infiltration, capillary rise, soil evaporation, water redistribution and hysteresis, heterogeneous soils and instability. Soil-plant-atmosphere continuum: water balance in the root zone; movement through the plant. Prerequisite: integral and differential calculus. (Formerly FOR B 440.)

FPE 440 Construction Management and Administration (5) W Construction engineering as applied to special conditions encountered in mountainous terrain.

Developing relationship between engineering design and construction technology associated with forest structures and roads. Prerequisite: 377.

FPE 441 Forest Access Policy and Planning (5) W Greulich Planning the logging operation: logging methods, route projection, selection of landings and settings, logging cost control. Prerequisites: 341, 342.

FPE 446, 447, 448, 449 Senior Forest Engineering Field Studies (2,5,5,3) Schiess Courses given concurrently in Spring Quarter. 446: Analysis of social factors; 447: multiple use and harvest planning; 448: road location and construction surveys; 449: biophysical resource evaluation. Development of a complete logging plan for a timber tract. Prerequisite: 441.

FPE 472 Wood Manufacturing Operations I (4) A Johnson, Smith Machining, combustion, and energy generation. Analysis of cutting process: orthogonal cutting, peripheral milling, sawing, veneer cutting, chipping, flaking. Combustion and energy section covers wood combustion mechanisms, use of energy in the forest products industry, physical and chemical properties, firing methods, material and energy balances. (Offered odd-numbered years.)

FPE 473 Wood Manufacturing Operations II (4) W Johnson, Smith Wood drying and degradation processes. Analysis of moisture-related degradation mechanisms for wood products and preventive techniques. Fundamentals of moisture removal techniques for lumber, veneer and particles, drying techniques, industrial procedures, and economic considerations. Prerequisite: 472 or permission of instructor. (Offered even-numbered years.)

FPE 474 Wood Manufacturing Operations III (4) Sp Johnson, Smith Gluing, coating, and preservation of wood. Nature of adhesion; factors influencing wood adhesion, types of wood adhesives and binders. Principles of finishing; types of coatings for wood products. Preservatives, fire retardants and their effectiveness. Prerequisite: 473 or permission of instructor. (Offered even-numbered years.)

FPE 475 Structural Wood Design (4) Sp Johnson Principles of design for wood; allowable stresses for structural wood and wood-based components; analysis of beams, columns, panels, trusses, I-beams, and laminated beams; behavior of fasteners and connectors; reliability concepts. Prerequisite: 377 or ENGR 220 or permission of instructor.

FPE 476 Pulping and Bleaching Processes (3) W Sarkanen Conversion of wood to mechanical and chemical pulps. Kraft, sulfite, and semichemical pulping processes. Chemical recovery systems. Bleaching of mechanical and chemical pulps. Joint with CH E 471.

FPE 477 Papermaking Processes (3) W McKean Fiber sources and properties. Secondary fibers. Stock preparation, sheet forming, water removal, finishing. Coating, lamination, and printing. Paper products. Joint with CH E 472.

FPE 478 Pulp and Paper Laboratory (2) Sp Sarkanen Laboratory experiments in chemical and semichemical pulping of wood. Bleaching of chemical and high-yield pulps. Physical and chemical characteristics of pulp fibers. Joint with CH E 473. Prerequisite: 476.

FPE 479 Pulp and Paper Laboratory II (2) Sp McKean Paper testing, paper additives, flocculation, drainage, retention, heat transfer, and fluid dynamics in papermaking. Sensors and process control. Prerequisite: 477.

FPE 480 Pulp and Paper Process Control (3) Sp Boyle Control of pulp and paper processes. Sensors, actuators, interface equipment, and computer control strategies common to this industry. Prerequisites: 476, 477, or permission of instructor.

FPE 481 Pulp and Paper Unit Operations (3) W Gustafson Unit operations of particular interest in the pulp and paper industry in addition to those covered in CH E 330 and 340. Prerequisite: CH E 340.

FPE 482 Pulp and Paper, Process Design and Economics (3) Sp Gustafson Analysis of industrial pulping, bleaching, papermaking, recovery, and steam and power operations, using systems analysis approach. Material and energy balances, process economics, process control, and design calculations. Prerequisites: 406, 476, 477, 481, or permission of instructor.

FPE 483 Paper Coating and Converting (3) Barlow Coatings and their preparation, rheology, process equipment, drying, and product evaluation. Prerequisite: 477.

FPE 485 Undergraduate Research (1-1-1) Undergraduate research or independent study project under the supervision of the faculty; usually one credit per quarter. Prerequisite: senior standing in Wood and Paper Division.

FPE 488 Polymer Chemistry (3) Allan Fundamental review of synthetic and natural polymers, including kinetics of formation, molecular weight distributions, and solid-state and solution properties.

FPE 490, 491, 492 Undergraduate Studies (1-5, 1-5, 1-5) Individual tutorial study of topics for which there is not sufficient demand to warrant the organization of regular classes. The courses are offered in all quarters, and credits can vary from 1 to 5, and, with the permission of the instructor, each course may be repeated for credit. Credits are individually arranged for each course. Entry card required.

FPE 497 Pulp and Paper Internship I (1) McKean Technical and economic analysis of commercial pulp and paper installations. Structured visits to industrial operations to observe technical aspects of pulp and paper curriculum in practice. Preparation of visitation reports and analysis in seminar setting. Prerequisites: 406, 476, 477, 481, or permission of instructor.

FPE 498 Pulp and Paper Internship II (1) McKean Technical and economic analysis of commercial pulp and paper installations. Structured visits to industrial operations to observe technical aspects of pulp and paper curriculum in practice. Preparation of visitation reports and analysis in seminar setting. Continuation of 497. Prerequisite: 497 or permission of instructor.

Courses for Graduates Only

FPE 501 Elasticity of Wood and Fiber Composites (4) W Johnson The concept of stress, strain, and Hooke's law for the orthotropic continuum. Tensor transforms of stress, strain, and the elastic coefficients. The compliance and stiffness tensors. Strain energy. Distribution functions of descriptions of internal geometry of composites. Orthotropic elasticity of the fiber wall. Elasticity and two- and three-dimensional fiber networks. Elasticity of particle composite and laminates. Prerequisite: 401. (Offered even-numbered years.)

FPE 502 Transport Processes in Composite Systems (2) W Johnson Time-dependent and -independent diffusion of moisture and energy in composite materials. Coupled moisture and thermal diffusion. Mechanisms of moisture and thermal transport. Diffusion in particle composites. Solution of the diffusion equation by separation of variables and finite difference methods. Prerequisite: 401. (Offered odd-numbered years.)

FPE 508 Advanced Wood Chemistry (3) A Sarkanen Biogenesis of lignins and isotope labeling methods. Oxidative coupling phenols. Carbonium ion intermediates in acid-catalyzed processes. Protodehydration and reactions with chlorines. Oxidation by inorganic agents and enzymes. Structure of cellulose microfibrils, acid- and enzyme-catalyzed hydrolysis, and alkaline degradation of polysaccharides. Prerequisite: 406. (Offered even-numbered years.)

FPE 517 Soil Plant-Atmospheric Relations (3) Fritschen Principles of mass and energy exchange between the earth and the atmosphere with special emphasis on the state and movement of water in soils, energy balance of the vegetated surface and individual leaves, and methods of evapotranspiration determination. Prerequisites: MATH 126, PHYS 123, ATM S 319. (Offered even-numbered years.)

FPE 518 Environmental Instrumentation (5) W Fritschen Practical aspects of measuring such environmental variables as radiation, temperature, soil heat flux, humidity, precipitation, and wind speed and direction. Fundamentals of measurements and design and function of basic circuits and measuring instruments. Proper instrument use emphasized in laboratory exercises.

FPE 541 Advanced Forest Engineering (5) Logging organization and management; logging cost analysis and budgeting.

FPE 542 Advanced Logging Engineering (3) Detailed consideration of problems of logging planning and truck road engineering, including the preparation and field layout of logging plans; location, design, and construction of logging truck roads.

FPE 571 Advanced Wood Preservation (3) Permeability of wood, theory and factors affecting penetration, liquid movement in wood, chemical effects on wood. Entry card required.

FPE 572 Wood Chemistry and Analysis (3-5) Hrutford Application of instrumental methods of analysis to wood, wood products, and forest products processing effluents. Emphasis on separation systems, including gas and liquid chromatography, and on spectral analysis. Entry card required. (Offered alternate years.)

FPE 573 Wood-Moisture Relations (3) Smith Theories and practice on relationships between wood and moisture over a range of moisture contents; effects of other polar and nonpolar compounds; capillarity, adsorption, and diffusion in wood. Entry card required.

FPE 574 Wood-Resin Relations (3) Technology of synthetic resins as wood adhesives, wood impregnants; binders, overlays, and surface coatings. Entry card required.

FPE 576 Photomicrography of Woody Tissues (3) Theory and method in microscopy and photomicrography of woody tissues. Entry card required.

FPE 577 Wood and Paper Science Seminar (1) Discussion of current topics in the science of wood and its various composites in the form of composition board, laminates, and paper. Offered on credit/no credit basis only.

FPE 579 Specifications for Forest Products in World Trade (3) W Briggs, Johnson, Smith Compares forest product specifications, standards, testing, and quality procedures between countries and evaluates their role as trade barriers. Examines cultural and trading partners to minimize their impact on trade. (Offered odd-numbered years.)

FPE 580 World Woods and Their Utilization (3) Briggs, J. Johnson, Schreuder Principal species, forms, and end-uses of wood in world trade. Evaluation of future demands to identify changes in end-use requirements. Examination of technical utilization issues related to plantations, underutilized species, and tropical forests in meeting these uses. Solid wood, panel, fiber, and wood fuel products. (Offered even-numbered years.)

FPE 581 Pulping and Bleaching Technology and Process Engineering (4) W McKean Principles, process, and equipment configurations and products for chemical and mechanical pulping processes and associated bleaching processes. Review of reaction kinetics, description of solid and fluid transport and of

process flows. Material and energy balance calculations and introduction to control approaches in pulping and bleaching processes. Prerequisites: 406, 476, 481.

FPE 589 Wood Biosynthesis (3) Sp Hrutford Biosynthesis of carbohydrates, phenolic and terpenoid compounds in forest trees, and biochemistry of wood degradation. Prerequisite: 406.

FPE 590 Graduate Studies (1-5) Study in fields for which there is not sufficient demand to warrant the organization of regular courses. Entry card required.

FPE 591 Graduate Teaching Practicum (*, max. 5) AWSp Principles of teaching and learning applied to undergraduate instruction in forest products and engineering. Development, delivery, and evaluation of actual lectures and homework assignments in the student's area of expertise are required. Prerequisite: permission of instructor.

FPE 600 Independent Study or Research (*)

FPE 700 Master's Thesis (*)

FPE 800 Doctoral Dissertation (*)

Tutorial Study

Tutorial study designed to meet individual requirements is available to graduate students in the graduate studies courses listed below. Such study may include literature review and field and laboratory work. The courses are offered in all quarters, and credits can vary from 1 to 5, and, with the permission of the instructor, each course may be repeated for credit. Credits are individually arranged for each course. Prerequisites include graduate standing and permission.

FPE 515 Graduate Studies in Forest Influences (1-5) Cundy, Fritschen

FPE 516 Graduate Studies in Forest Meteorology (1-5) Fritschen

FPE 540 Graduate Studies in Logging Engineering (1-5) Greulich, Schless

FPE 570 Graduate Studies in Forest Products (1-5) Allan, Briggs, Bryant, Hrutford, Sarkanen, Smith

Forest Resources Management

Courses for Undergraduates

Students taking undergraduate and graduate courses, structured or unstructured, that require field trips, special laboratory supplies, or special material duplications are required to pay appropriate amounts to cover such expenses. If a student fails to pay, the transcript may be withheld and the degree may not be conferred.

FRM 100 Introduction to Forest Resources Management (5) ASP Gara Survey of human beings' use of forest resources and the impact of social and cultural institutions on resources management. History and the development of forest conservation and forest utilization practices and policies in the United States. Changing patterns of resource use and methods of resolving conflicts among management alternatives.

FRM 101 Introduction to Forest Science (1) A Manuwal Disciplines composing the field of forest science. Faculty members representing various disciplinary specialties present seminars discussing important basic concepts underlying their research as well as explanations of the application of these concepts to modern forestry.

FRM 200 Trees in Our Environment (5) Sp Brubaker, Stettler Intended for nonscience majors; may not be taken for credit by forest resource majors. Form and function of fifty-sixty tree species; principles and concepts of biology; developing an awareness for science; lectures; laboratory demonstrations, and field studies in the Arboretum.

FRM 210 Introductory Soils (3) A Ugolini Physical, chemical, and biological properties that affect distribution and use patterns of this important ecosystem component. Includes soil morphology and genesis, plant nutrition and nutrient cycling, soil water, microbiology, and application of soil properties to environmental concerns. One Saturday field trip.

FRM 300 Professional Forestry Internship (1-3) AWSpS Driver, Gara, Johnson Comprehensive examination of an acceptable experience in professional forestry within a public or private agency, including operational policies and procedures. Preparation of professional assessment report and presentation of seminar based on internship in forest management in broad aspects. Prerequisites: 323, 362, FPE 345 and permission of instructor.

FRM 301 Forests in the Life of Humans (3) Edmonds Forest ecology, biology, management, economics and utilization of forest products are discussed from global, regional, and local perspectives. Ecosystems of the Pacific Northwest are given particular emphasis. Intended for nonforestry majors.

FRM 304 Biological Concepts for the Forest Manager (6) A Hinckley Aspects and concepts in soils, microclimatology, hydrology, stream ecology, terrestrial ecology, wildlife ecology, and physiology and anatomy related to forests and forest ecosystems. Offered on credit/no credit basis only. Prerequisites: at least five years of experience in natural resource management or equivalent, introductory biology.

FRM 305 Management Concepts for the Forest Land Manager (6) W Oliver Basic managerial concepts and practices in forest management, including problem solving and decision making, communications, forest economics, forest mensuration, and preparation of silvicultural prescriptions for regeneration and stand management offered through intensive training format only. Prerequisites: five years of professional employment in forestry or related sector, introductory economics and statistics.

FRM 310 Physical Aspects of the Forest Environment (5) A Cundy, Fritschen, Harrison, Pickford, Ugolini Micrometeorology (radiation, energy budgets), fire physics, soils (weathering, soil formation, physics, chemistry, water flow), and forest hydrology (watersheds, water budgets, runoff). Relationships to forest productivity. Five laboratories, five field trips.

FRM 311 Soils and Land Use (3) W Harrison Intended for students concerned with environmental problems in the Puget Sound basin; also for those who intend to become professionally involved in land-planning decisions. Focus is on the significance of soils in understanding environmental problems and in promoting intelligent land-use decisions. Basic concepts of soil systems are presented, stressing those aspects important in making land-planning decisions.

FRM 321 Forest Biology I (5) A Brubaker, Stettler Introduction to regional forest biology, taxonomy, life histories, genetics, and physiology of forest trees and shrubs. Classification and life histories of forest insects and other animals.

FRM 322 Forest Biology II (4) W Edmonds Characteristics of consumer populations. Biology of decomposer and disease organisms. Ecosystem processes (energy flow, nutrient cycling, succession, competition, stand structure, animal habitats). Three laboratories, two field trips.

FRM 323 Silviculture and Protection (6) Sp Oliver Silviculture techniques, including nursery practices, clear-cutting, seed trees, shelterwood, selection cut-

ting, site preparation, regeneration methods, thinning, fertilization, chemicals, and regional silviculture in the Northeast, Southeast, Midwest, Rocky Mountains, California, Pacific Northwest, and Alaska. Fire, insects, disease, and wildlife aspects are integrated. Taught at Pack Forest. Multiple-use field trips.

FRM 324 Survey of Forest Biology (3) A Hinckley Systematics, genetics, evolution, and identification of forest trees as related to structure and environment. No credit given if FRM 300 has been taken for credit. (Formerly FOR B 324.)

FRM 326 Range and Wildlife Habitat (3) Sp Driver Theory and practice of range ecology as the basis for studying (1) the effects of domestic animals and wildlife use on plant habitats and (2) human beings' control on these plant community effects from the past, present, and future of natural resources management points of view.

FRM 327 Field Studies in Range and Wildlife Habitats (2) Sp Driver Four weekend field trips related to range and wildlife habitats of Washington with application of materials presented in 326. For majors in wildlife science and forest management only. Prerequisite: permission of instructor.

FRM 350 Wildlife Biology and Conservation (3) W Manuwal, West Wildlife ecology and population biology, and interrelationships between wild animals and human beings, including encouragement of wildlife population growth and productivity, control of pest populations, and preservation of endangered species with emphasis on forest environments and forest faunas. Open to nonmajors. Prerequisite: junior standing.

FRM 360 Forest Management and Economics I (4) A Dowdle, Waggener Basic concepts of production theory, accounting, investment analysis, supply and demand, and their application to the management of forested properties. Prerequisites: ECON 200, Q SCI 292, or equivalent.

FRM 361 Forest Measurements (4) W Pickford, Rustagi Measurement of trees and forest stands; sampling methods for timber, recreation, wildlife and ecological attributes; aerial-photo measurement and interpretation; use of photos in estimation of timber volumes. Prerequisites: Q SCI 381 and Q SCI 340 or equivalent.

FRM 362 Field Measurements (6) Sp Maguire, Pickford, Schless Basic field measurement skills, interpretation of aerial photos, measurement of timber and lesser vegetation, identification and measurement of wildlife, recreation, and streamside uses and habitats. Concentrated field experience course taught at Pack Forest. Prerequisites: Q SCI 340 and Q SCI 381 or equivalent.

FRM 366 Quantitative Methods in Forest Resource Management (3) A Bare, Rustagi Survey, discussion, and critique of the application of quantitative methods to forest resource management, planning, and decision making. Emphasis on methods utilized in management science, econometric, and computer science currently used by resource planners. Topics include introduction to systems analysis, linear programming, computer simulation, goal programming, forecasting, statistical techniques, and computer information systems. Joint with Q SCI 366. Prerequisites: Q SCI 340, Q SCI 381.

FRM 370 Social Functions of Forest Ecosystems (3) A Lee, Salazar Introduction to structure and function of forest ecosystems; resources as social functions; role of social institutions in modifying ecosystem structure and processes; multiresource case studies and field trips.

FRM 377 Environmental Impact Assessment and Regulation in Forest Resource Management (3) W Bradley Current environmental, forest resource, and land-use legislation affecting resource management;

origin and evolution of federal, state, and local legislation and their relationship to forest resource planning and management; environmental impact assessment and its relationship to forest practices. Selected case studies of prepared forest land use plans and environmental impact statements. (Formerly FOR M 307.)

FRM 383 Interpreting the Environment (5) W Sharpe Role of interpretive specialist in heritage and natural resource areas. Increasing visitor enjoyment, encouraging thoughtful use to reduce human impact, and promoting public understanding of agency programs. Interpretive media selection, personal and non-personal services, supporting activities, and professional development. Prerequisite: permission of instructor. (Formerly FOR M 353.)

FRM 387 Wildland Recreation Internship (5) AWSpS Sharpe Comprehensive field examination of a recreation agency policy, procedure and operation. Preparation of professional assessment report and oral presentation based on internship experience in park management, planning and interpretation. Prerequisites: completion of one approved cooperative education work experience, junior standing, permission of instructor. (Formerly FOR M 357.)

FRM 400 Forestry for Teachers (5) S Sharpe The art and science of multipurpose forestry. Hands-on experience for classrooms K-12, utilizing *Project Learning Tree* activity guides. One field trip. Prerequisite: preservice and practicing teachers.

FRM 406 Advanced Forest Management Concepts (6) W Oliver Advanced concepts and practices in forest management, including land management, planning, investment analysis, adaptive management, decision analysis, and public involvement in decision making. Case study emphasizes integration. Offered through intensive training format only. Prerequisites: five years of professional employment in forestry or related sector, managerial experience; courses in silviculture, economics, statistics.

FRM 411 Forest Soil Microbiology (4) Sp Edmonds Role of soil microbes in forest ecosystems; types, numbers, and ecology of microorganisms in forest soils, decomposition processes, nitrogen fixation, nitrification, denitrification; influence of forest management and disturbance on microbial processes. Quantitative methods in soil microbiology, mycorrhizae. Prerequisite: basic soils or permission of instructor.

FRM 412 Soil Genesis (5) W Ugolini Soil, the excited skin of the earth. Processes of soil formation and weathering distribution of major soils in the world. Prerequisites: CHEM 145, GEOG 205.

FRM 414 Forest Soil Fertility and Chemistry (3) Harrison Tree growth depends, in part, on the interaction between chemical and biological activities within a given soil: the biological and chemical parameters that influence the growth; soil solution chemistry and surface reactions; reactions and processes that control essential plant nutrient levels and forms in soil solutions. Prerequisite: 310.

FRM 418 Forest Soil Management (3) Consideration of physical, chemical, and biological properties of forest soils. Forest fertility and fertilization. Use of soil maps to guide land-management activities. Provides a practical and working knowledge of soil in the practice of forestry. Prerequisite: senior standing or permission of instructor.

FRM 420 Forest Biology III (3) A Gara Disturbance effects on forest species, composition, structure, and function on both geologic (glacial epoch) and higher-frequency scales. Biotic (wildlife, insects, diseases) and abiotic (weather, soil movement, fire) disturbances relative to forest management. Occasional field trips.

FRM 421 Dendrochronology (4) W Brubaker Analysis of important physiological and environmental factors controlling annual tree-ring growth and a critical

review of the applications of tree-ring analysis to study forest productivity, watershed hydrology, forest fires, insect epidemics, etc., in relation to yearly weather conditions. Laboratory and field exercises construct tree-ring chronologies to study environmental histories of selected forest stands. Prerequisites: introductory botany and senior or graduate standing. (Offered even-numbered years.)

FRM 422 Concepts and Methods in Paleoecology (4) A Brubaker, Leopold, Tsukada Biological fossils as key evidence in reconstruction of past environments. Conceptual framework and methods of study for interpretation of fossils in sediments, tree rings, sedimentary/geochemical evidence. Past dynamic changes in plant communities and species history evaluated in context of modern ecological theory. Joint with BOT 453 and QUAT 453. Prerequisite: 321 or BOT 354. (Offered even-numbered years.) (Formerly FOR B 453.)

FRM 423 Forest History in Pacific Northwest (4) Sp Franklin, Leopold Reconstructing ecological history of old-growth forests in the Pacific Northwest, including human beings' successive impacts on the pre-mieval forest. Emphasis on use of historical timber-cruise data and burn maps to estimate stand structure, composition, and dynamics of old growth. Joint with BOT 439. Prerequisite: introductory ecology. (Formerly FOR B 460.)

FRM 424 Selected Topics in Silviculture (3) A Oliver Forest stand development and manipulation response. Forest stand dynamics and stand structure in pure and mixed species forests, response to minor and major disturbances, interactive changes with time, and patterns and response to manipulation. Prerequisite: previous course work in ecology.

FRM 425 Reproduction Methods in Silviculture (3) W Oliver Advanced silviculture course that examines the characteristics of natural and artificial methods of regenerating forest stands. Emphasis on methods used in the Pacific Northwest; however, attention is given to problems and techniques of other forested regions. Lectures and weekly field trips. Prerequisite: 322 or equivalent. (Formerly FOR B 422.)

FRM 427 Forest Genetics (3) W Stettler Genetic theory as applied to the biological manipulation of forest trees. Principles of genetics and organic evolution are discussed and related to management strategy and silvicultural practices. Prerequisite: 321.

FRM 429 Intermediate Operations in Silviculture (3) A Oliver For advanced undergraduate and graduate students in silviculture. Includes those operations designed to direct an existing forest into the desired form such as cleaning, weeding, thinning, irrigating, and fertilizing; all-day field trips required. Prerequisite: 322 or equivalent.

FRM 430 Forest Chemicals (3) W Gara Covers all aspects of the use of forest chemicals in forestry: laws, safety, application techniques, and biological effects. Specific chemicals are discussed as to formulations, toxicity, timing, application rates, carriers, and unique safety problems. Prerequisite: junior standing in forest resources curriculum or permission of instructor. (Formerly FOR B 420.)

FRM 435 Forest Entomology (3) A Gara Introduction to general entomology, characteristics, life histories, ecological relations, prevention, and control of forest insects.

FRM 436 Laboratory in Forest Entomology (2) A Gara Introduction to the insect orders; identification of forest insects and their damage. One field trip to study insect problems required. Prerequisite: 435, which may be taken concurrently.

FRM 441 Landscape Ecology (3) W Franklin, Wang Basic landscape ecology concepts, including patches, corridors, networks, spatial dynamics; island

biogeographic principles; landscape analysis methods; landscape models. Applications of landscape ecology in resources management (e.g., cumulative effects, cutting, patterns, anadromous fisheries, management of wildlife populations, and open-space planning). Prerequisites: upper-division ecology courses or permission of instructor.

FRM 445 Landscape Plant Management (4) Sp Clark Principles and practices of plant management in cultivated situations. Landscape design from the horticultural perspective, schedules and budgets, pruning, fertilization, transplanting, and care of specialized plant materials. Term project required. Prerequisite: BOT 331 or equivalent knowledge of woody plants.

FRM 449 Urban Forestry Seminar (1-3, max. 9) AWSp Bradley, Clark, Wagar, Wang Discussion of current practice and research for managing trees in urban and suburban environments and in forested environments with substantial human use. Prerequisite: permission of instructor.

FRM 450 Human Culture and Wildlife Conservation (5) Sp Manuwal Human customs, attitudes, and institutions as they affect wild bird and mammal populations, including relations of range, forest, and farm management to wildlife conservation. Emphasis on Europe and North America. Prerequisite: 350. (Formerly FOR B 402.)

FRM 451 Biology and Conservation of Birds (3) A Manuwal Major principles of avian population biology; reproductive biology and conservation strategies for both game and nongame birds. Emphasis on the Pacific Northwest. Prerequisite: introductory biology. (Formerly FOR B 401.)

FRM 452 Biology and Conservation of Birds, Laboratory (2) A Manuwal Taxonomy and identification of birds. Laboratory and field trips are required, and students may be asked to share travel costs. Prerequisite: introductory biology, which may be taken concurrently. (Formerly FOR B 411.)

FRM 455 Wildlife Seminar (1, max. 4) AW Manuwal, West Discussion of current research and application in wildlife biology and conservation. Offered on credit/no credit basis only. Prerequisite: 350 or equivalent.

FRM 461 Forest Management and Economics II (4) A Bare Basic concepts of timber harvest scheduling, sustained-yield models, contemporary analytical techniques, timber supply, and forest product markets. Prerequisites: 360, Q SCI 340, or equivalent.

FRM 464 Economics of the Forest Use (3) Sp Dowdle, Waggener Application of economic concepts to use of forest lands and the allocation of lands to alternate forest uses, including outdoor recreation and other nonconsumption uses. Consideration of institutional factors as determinants of land allocation in public and private sector. Trends in forest land use and impact of public policy on growth and development of resource-based economic sections. Prerequisite: 360 or ECON 200. (Formerly FOR M 460.)

FRM 465 Forest Finance and Accounting (3) W Dowdle Basic concepts of finance and accounting used in forestry. Introduction to principles of bookkeeping and measurement of income. Essentials of cost accounting and taxation. Treatment of property and income taxes and accounting for fixed assets. Use of ratio analysis and financial statements in decision making. Prerequisite: 360.

FRM 466 Economics of Timber Production (3) Sp Dowdle Application of basic economic concepts to the production of timber as a commercial land use. Analysis of timber investments, alternative management programs, and regulation models. Prerequisite: 360.

FRM 467 Advanced Forest Mensuration (3) W Maguire, Rustagi Forest tree and stand models. Studies of forest tree and stand parameters. Estimation pro-

cesses. Growth and yield analysis. Prerequisites: 361, Q SCI 381 or STAT 311. (Offered odd-numbered years.) (Formerly FOR M 461.)

FRM 470 Forest Policy and Law (4) A Salazar Analysis of forest policy processes and laws. Stages of policy making/problem solving: law and public policy; natural resource politics; public ownership and management; public policy and private forest land; forest products policies; review of current forest laws and regulations. Prerequisites: 100, POL S 202. (Formerly FOR M 370.)

FRM 471 Forest Planning and Project Management (4) W Bradley Review of federal, state, and corporate strategic forest planning processes; tactical planning and problem solving, current project management case studies and role of contracts and legal constraints; planning for senior project (495).

FRM 472 Resource Planning Processes (3) Bradley Related processes in the formulation of forest resource programs; planning process as a systematic method for the identification of goals, information requirements, analytical methods, and implementation techniques in the development and implementation of forest resource plans and policies; evaluation of selected forest resource planning examples. (Formerly FOR M 355.)

FRM 480 Natural Resources Law Enforcement (2) W Butterworth Criminal, administrative, and regulatory law provisions and practices covered from the perspective of the land manager dealing with recreational, environmental, and public concerns. Issues involve federal, state, and private approaches to utilizing available judicial and executive power for decision making and problem resolution. (Offered even-numbered years.) (Formerly FOR M 450.)

FRM 481 Management of Wildland Recreation and Amenities (3) A Sharpe The wildland recreation movement in America. Agency history and objectives. Integrating recreation with other land uses. Water, forestry, wildlife, and wilderness resources for recreation. Role of private enterprise. Topics of current interest. (Formerly FOR M 351.)

FRM 482 Sociology of Leisure and Wildland Recreation (3) Sp D. Johnson Focuses upon an understanding of human behavior in leisure settings. An examination of basic sociological concepts as well as contemporary theories concerning leisure behavior; research techniques and problems of measurement in leisure research. Implications for the management of recreational areas provide an applied orientation and integration of substantive material. Prerequisite: SOC 110. (Formerly FOR M 452.)

FRM 483 Advanced Environmental Interpretation (5) Sp Sharpe Interpretive management and planning. Includes independent study projects in selected park and recreation areas. A practical approach to interpretive inventory, planning, and programming. Prerequisite: 383. (Formerly FOR M 453.)

FRM 484 Advanced Park and Recreation Management (3) Sp Sharpe Examination of the recreation enterprise: its administration, its resource, use and protection. Details of park structure, policy, and politics. The role of the manager in planning, maintenance, law enforcement, vandalism, conflicts, care of visitors, and other managerial details. Prerequisite: 481 or permission of instructor. (Formerly FOR M 454.)

FRM 485 Advanced Wildland Recreation Site Planning and Design (5) A Bradley Integrated consideration of resource base, social factors, and management objectives in providing wildland recreation opportunities. Determining recreational need, development of environmental information systems, and allocation of recreational use, based on user-resource requirements. Case study approach. Prerequisite: permission of instructor. (Offered even-numbered years.) (Formerly FOR M 455.)

FRM 486 Wilderness Preservation and Management (3) Sp Review of American wilderness philosophies, concepts, and values. Development of the Wilderness Act. Examination of current wilderness-management policies, problems, trends in use, issues and controversies, wilderness research, social costs, and benefits of wilderness. Prerequisite: permission of instructor. (Offered even-numbered years.) (Formerly FOR M 456.)

FRM 487 Advanced Wildland Recreation Internship (10) AWSps *Sharpe* Advanced field-related course given in conjunction with a park/recreation agency. Develop proficiency in one of three subject areas: park interpretation, park planning, park management. Preparation of professional assessment report and oral presentation based on field experience. Prerequisites: 387, senior standing in wildland recreation option. (Formerly FOR M 457.)

FRM 488 Case Studies in Wildland Recreation (5) Bradley, Sharpe Consideration of the natural resources bases, social factors, and management objectives in providing regional forest recreation opportunities. Emphasis on the forecasting of recreation demands, the development of environmental information systems, and the allocation of recreational use based on user-resource requirements. Case study approach. Prerequisite: senior standing in wildland recreation option or permission of instructor.

FRM 489 Public Relations and Communications for Natural Resource Managers (2) A *Sharpe* Historical perspective, principles, and tools of public relations. Communication techniques and the various media. Planning for public relations and emergency information services. Strongly aimed toward the natural resource professional. Prerequisites: senior standing and permission of instructor. (Formerly FOR M 459.)

FRM 490, 491, 492 Undergraduate Studies (1-5, 1-5, 1-5) Individual tutorial study of topics for which there is not sufficient demand to warrant the organization of regular classes. The courses are offered in all quarters, and credits can vary from 1 to 5, and, with the permission of the instructor, each course may be repeated for credit. Credits are individually arranged for each course. Entry card required.

FRM 495 Senior Project (5) AWSps Individual study of a forest resources management problem under direction of a faculty member. Prerequisites: 471, approved plan of study and permission of major adviser; generally take in last quarter of residence.

Courses for Graduates Only

FRM 500 Graduate Orientation Seminar (2) A *Lee* Discussion of current issues and problems of graduate study in forestry and forestry research. Offered on credit/no credit basis only.

FRM 501 Forest Ecosystems—Community Ecology (4) A *Brubaker* Community ecology of forest ecosystems. Quantitative methods of community description. Role of limiting factors, competition and disturbance in determining community composition, structure and stability. Introduction to forest ecosystem productivity. History and application of successional theory. Prerequisite: basic ecology course or permission of instructor. (Formerly FOR B 560.)

FRM 502 Structure and Function of Forest Ecosystems (5) Sp *Franklin* Behavior of forest ecosystems: carbon, nutrient, and hydrologic cycling; factors controlling paths and flow rates of materials; contrasts in ecosystem structure and function among forest types.

FRM 504 Research Processes in Forest Resources (4) Lee, Salazar Comprehensive survey of research processes for entering graduate students. Diagnostic and prescriptive evaluation of student research capabilities. Problem and hypothesis formulation, study design, multimethod strategies for gathering

and analyzing data, and interpretation and presentation of results. Prerequisite: graduate standing. (Formerly FOR M 552.)

FRM 505 Forest Statistics I (4) *Maguire, Schreuder* Applications stressed in depth include: growth and yield models, individual tree versus whole-stand models; regeneration survey methods such as stock quadrat and random sampling techniques; sampling for fuels over time and space; concepts of productivity; data collection and analysis techniques used for nonlumber products such as wildlife and recreation; quality-control models for monitoring environmental impacts and forest industry operations. For midcareer students. Prerequisite: Q SCI 381 or equivalent. (Formerly FOR M 540.)

FRM 506 Forest Statistics II (4) *Greulich, Rustagi, Schreuder* Applications stressed in depth include: use of time and motion studies in the logging industry; pencil bucking programs; log quality and defect estimation; industrial experimentation techniques; quality-control techniques in lumber, plywood, and pulp; and paper manufacturing. Prerequisite: Q SCI 483 or equivalent. (Formerly FOR M 541.)

FRM 507 Forest Statistics III (4) *Greulich, Rustagi, Schreuder* Uses of probability distributions, tests of hypothesis, interval estimation, regression analysis, experimental designs, and sampling techniques in forestry. Applications stressed in depth include: lumber recovery studies; detection of knotholes; best opening face experimentation and the glass log concept; experimentation with lumber, plywood, and pulp and paper scanners; sampling for chip quality; sampling for, and handling of, effluents; estimating wood decay roles; data collection for point and nonpoint pollution. Prerequisite: Q SCI 483 or equivalent. (Formerly FOR M 542.)

FRM 508 Silvicultural Prescription Preparation (4) *Oliver* Advanced course in silviculture as applied to purposes other than wood production and in the preparation of silvicultural prescriptions. For midcareer students. (Formerly FOR B 528.)

FRM 509 Review of Forest Autecology (4) *Hinckley, Stettler* Review of concepts of soil formation, soil fertility, microclimate, hydrology, tree anatomy and morphology, physiology, water relations, mineral nutrition, and genetic and evolutionary mechanisms, as they relate to the adaptation and manipulation of forest-tree populations. For midcareer students. (Formerly FOR B 529.)

FRM 512 Soil Geochemistry (3) Sp *Harrison, Ugolini* Examination of soil components, their weathering and reactivity under surface conditions. Mineral stability, phase relations, colloidal chemistry exchange and sorption phenomena solution composition and reactions, and element redistribution in the soil zone are considered. Prerequisites: 412, 414, CEWA 456. (Offered even-numbered years.)

FRM 513 Soil Distribution and Classification (5) *Sp Ugolini* Study of the morphology, distribution, and classification of soils in relation to environmental factors. Soils and survey procedures examined by field trips throughout the unique terrestrial ecosystems of the state of Washington. Emphasis on application to forest land use and planning.

FRM 514 Forest Influences (4) Study of the interacting effects of climate, soil, and plants as a basis for understanding the hydrologic cycle. Places special emphasis on disposition and movement of water in forest ecosystems. Prerequisite: graduate standing.

FRM 519 Forest Soils Seminar (1) *Bledsoe, Harrison, Wang* Discussion by invited speakers on current research related to forest soils, plant nutrition, and mineral cycling. Offered on credit/no credit basis only.

FRM 521 Current Problems in Forest Ecology (2) *Franklin* Consideration of current literature and topics in forest ecology and tree physiology.

FRM 522 Current Problems in Silviculture (3) Sp *Oliver* Detailed study of the literature dealing with recent applications of silviculture in world forestry.

FRM 524 Tree Physiology I: Growth and Development (3) W *Clark* Review of major developmental processes in trees, concentrating on regulatory mechanisms. Role of genetic, hormonal, mechanical, environmental, and ecological mechanisms in regulation of shoot, diameter, root, and reproductive development examined in lecture-discussion format. Seniors in forestry, botany, or related fields may enroll. (Offered even-numbered years.)

FRM 525 Tree Physiology II: Stress (4) Sp *Hinckley, Smit* Review of principles and examples of stress physiology, concentrating on processes impacted and mechanisms of resistance. Stress and stress resistance defined and following examples examined: high, low temperature, radiation, anoxia, and pollutants. Prerequisite: 524.

FRM 527 Advanced Forest Genetics (3) *Stettler* Discussion course relating concepts of quantitative and population genetics to forest-tree populations, both natural and artificial. Offered on credit/no credit basis only. Prerequisite: 427 or equivalent. (Offered even-numbered years.)

FRM 528 International Silviculture (3) A *Oliver* Background of biological, social, and economic basis for silvicultural practices in different areas; case examples of silvicultural practices in different localities; consideration of selected international issues in silviculture. Prerequisite: permission of instructor. (Formerly FOR M 524.)

FRM 529 Ecosystems Seminar (1) A *Bledsoe, Franklin* Discussion by invited speakers on current research related to ecosystems. Offered on credit/no credit basis only.

FRM 531 Forest Fire Science Seminar (2) *Pickford* Presentation and discussion of current issues in forest fire prevention, control, use, and discussion of ongoing fire research. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

FRM 532 Planning, Management, and Analysis of Forest Fire Control Systems (3) *Pickford* The forest fire control system. Study of plans, service, finance, line, and command functions. Forest fire control and production economics, techniques of operations research and computer sciences applicable to planning and analyzing forest fire control systems. Prerequisite: permission of instructor.

FRM 533 Forest Fire Thermophysics (3) *Pickford* Principles of combustion and heat transfer. Basic processes of ignition and flame spread; high-intensity fires. Emphasis is on free-burning fires in cellulose fuels. Offered on credit/no credit basis only. Prerequisites: MATH 105, PHYS 114, 115, or permission. (Offered alternate years.) (Formerly FOR M 538.)

FRM 534 Fire Behavior and Wildland Fuels (5) *Pickford* Estimating wildland fire spread and intensity; influence of fuel bed characteristics, moisture, wind, and slope on ignition, spread, intensity, and control of wildland fires. Modeling fire growth; extreme behavior. Use of fire behavior modeling in fire management fire danger rating; fire hazard appraisal. Fuel modification techniques; evaluating fuel treatment projects.

FRM 535 Fire Ecology (3) Sp *Agee* Fire regime concept as applied to fire ecology. Methodology for fire history research. History and function of forest fire in western United States with emphasis on Pacific Northwest. Two weekend field trips. Prerequisites: 321, 420, or permission of instructor. (Formerly FOR B 531.)

FRM 549 Urban Horticulture Seminar (1, max. 8) *AWSp Clark, Hamilton, Wang, Wott* Discussion by invited speakers on current topics in urban horticulture. (Formerly FOR B 509.)

FRM 550 Advanced Human Culture and Wildlife Conservation (5) Sp *Manuwal* Advanced work in human customs, attitudes, and institutions as they affect wild bird and mammal populations, including relations of range, forest, and farm management to wildlife conservation. Emphasis on Europe and North America. Prerequisites: graduate standing and permission of instructor. (Formerly FOR B 502.)

FRM 551 Birds in the Forest Environment (5) A *Manuwal* Relationships between forests and bird populations. Focus on integrating avian ecology with forest ecology and silviculture. Mandatory field trips. Prerequisite: ZOOL 464 or equivalent. (Offered odd-numbered years.)

FRM 554 Wildlife Seminar (1-2, max. 10) AW *Manuwal, West* Discussion of current research and application in wildlife biology and conservation. Prerequisite: permission of instructor.

FRM 557 Topics in Wildlife Science (2, max. 6) A *West* Graduate seminar on applied and basic topics in wildlife ecology and conservation. Different topics selected each offering.

FRM 558 Theory and Practice of Ecological Research (5) W *West* Processes of scientific investigation. Problem identification, hypothesis testing, sample design, data collection and analysis, scientific writing, review of papers, and symposium participation conducted in a series of class-initiated projects and an individual project. Field trips required. Prerequisite: permission of instructor.

FRM 560 Decision Methods in Natural Resources Management (3) A *Rustagi* Formulation and optimization of management planning and resource allocation in forestry, fisheries, and wildlife. Importance of quantitative data needs in decision making. Solution procedures for both linear and nonlinear formulations. Term project required. Joint with Q SCI 560. Prerequisite: Q SCI 391 or equivalent or permission of instructor. (Formerly FOR M 570.)

FRM 561 Multiobjective Programming in Resource Management (3) W *Rustagi* Concepts and philosophy of goal programming as a tool in the evaluation of resource allocation among multiple, conflicting, often incommensurate objectives (goals). LP and GP computer programs are used to study impact of changes in relative importance of difficult goals. Goal programming applications in natural resource areas are discussed. Joint with Q SCI 561. Prerequisites: familiarity with linear programming and permission of instructor. (Offered even-numbered years.) (Formerly FOR M 576.)

FRM 562 Advanced Forest Resources Management (3) A *Bare, Rustagi* Overview of concepts and procedures involved in managing forested lands for the production of commodity and amenity values. Use of systems analysis techniques for evaluating alternative land-use programs and manipulations of the forest ecosystem. Prerequisites: graduate standing and permission of instructor. (Offered odd-numbered years.)

FRM 564 Advanced Forest Biometry (3 or 5) *Ford, Maguire* Classical problems in analysis of forest populations and growth theory, and principles of parametric analysis and estimation processes in forest biometry.

FRM 567 Forest Products Economics (3) Sp *Adams* Economic analysis of the forest products industries; market structure, regional impact of forest products industries, current problems in forest products economics. (Offered odd-numbered years.) (Formerly FOR M 575.)

FRM 569 Economics of Forest Products Trade (3) Sp *Adams* Structure and trends in world forest products trade, trade barriers, trade policies, and methods

of modeling and forecasting international forest products markets. Prerequisite: permission of instructor.

FRM 571 Forest Policy Analysis (3) Sp *Salazar* Legal and political contexts in which forest management and use take place. Rationales for forest policies, how policies actually develop, and consequences of government actions. Cases related to students' management and/or research interests. Prerequisite: graduate standing. (Formerly FOR M 558.)

FRM 573 Forest Environmental Resource Planning (3) A *Bradley* Origins and evolution of environmental planning in the forest environment. Discussion of the planning process and methodologies for environmental management and planning; selected case studies of environmental resource plans. Prerequisite: graduate standing. (Offered odd-numbered years.) (Formerly FOR M 561.)

FRM 575 Advanced Natural Resources Sociology (3) Sp *Lee* Comparative study of institutional and organizational aspects of natural resources management, with special attention to forest resources. Development, persistence, and change of selected institutions in the context of preindustrial, industrial, and advanced industrial societies. Implications for policy formulation, decision making, and technology transfer. (Formerly FOR M 567.)

FRM 576 Current Topics in Forest Policy and Management (1-2) AWSp *Salazar* Contemporary problems in forest policy and management. Topics vary but focus on the development of specific political or philosophical issues; empirical questions of con-

cern to the forestry profession; or the development of new tools for management, planning, or policy analysis. Prerequisite: permission of instructor.

FRM 581 Current Problems in Outdoor Recreation (3) *Sharpe* Seminar approach to investigating, examining, and discussing contemporary issues and controversies in outdoor recreation. Prerequisites: graduate standing and permission of instructor. (Formerly FOR M 551.)

FRM 590 Graduate Studies (1-5) Study in fields for which there is not sufficient demand to warrant the organization of regular courses. Entry card required.

FRM 600 Independent Study or Research (*)

FRM 700 Master's Thesis (*)

FRM 800 Doctoral Dissertation (*)

Tutorial Study

Tutorial study designed to meet individual requirements is available to graduate students in the graduate studies courses listed below. Such study may include literature review and field and laboratory work. The courses are offered in all quarters, and credits can vary from 1 to 5, and, with the permission of the instructor, each course may be repeated for credit. Credits are individually arranged for each course. Prerequisites include graduate standing and permission.

FRM 510 Graduate Studies in Forest Soils (1-5) *Cole, Harrison, Ugolini*

FRM 520 Graduate Studies in Forest Ecology and Silviculture (1-5) *Franklin, Oliver*

FRM 523 Graduate Studies in Range and Wildlife Habitats (1-5) *Driver, Manuwal* Prerequisite: 326 or permission of instructor.

FRM 526 Graduate Studies in Forest Genetics (1-5) *Stettler*

FRM 530 Graduate Studies in Forest Fire Control (1-5) *Pickford*

FRM 537 Graduate Studies in Forest Entomology (1-5) *Gara* (Formerly FOR B 535.)

FRM 538 Graduate Studies in Forest Pathology (1-5) *Driver, Edmonds* (Formerly FOR B 534.)

FRM 555 Graduate Studies in Wildlife Management (1-5) *Manuwal, West*

FRM 556 Graduate Studies in Forest Zoology (1-5) *West*

FRM 563 Graduate Studies in Forest Mensuration (1-5) *Maguire, Rustagi*

FRM 565 Graduate Studies in Forest Management (1-5) *Adams, Bare, Schreuder, Waggener*

FRM 566 Graduate Studies in Forest Photogrammetry (1-5) *Pickford, Schreuder*

FRM 568 Graduate Studies in Forest Economics (1-5) *Adams, Dowdle, Schreuder, Waggener*

FRM 570 Graduate Studies in Forest Policy Analysis (1-5) *Salazar, Waggener* (Formerly FOR M 560.)

FRM 572 Graduate Studies in Forest Resource Planning (1-5) *Bradley* (Formerly FOR M 559.)

FRM 579 Graduate Studies in Forest Sociology (1-5) AWSpS *Lee* (Formerly FOR M 569.)

FRM 580 Graduate Studies in Forest Recreation (1-5) *R. Clark, Sharpe* (Formerly FOR M 550.)



Interdisciplinary Graduate Degree Programs

These programs are administered by interdisciplinary groups of the Graduate School. Certain courses carrying the particular program prefix appear below; other courses with the same prefix appear elsewhere as indicated. Other courses included in these programs are selected from many disciplines throughout the University and carry the prefix of the respective discipline.

Biology Teaching

John S. Edwards, Graduate Program Coordinator

The Graduate School Biology Teaching Group offers an interdisciplinary program that leads to the degree of Master of Arts for Teachers in the field of biological science. Designed specifically for biology teachers in secondary schools and community colleges, the program emphasizes broadening the student's understanding of the various fields of biological science, with improvement of the student's effectiveness as a teacher as the primary goal. The program offers opportunities for course work within the departments of the University in biological science and science education. Each student is asked to perform an in-depth study of a biological problem in the context of its relevance to the teaching of biological science. Facilities and guidance are provided by a sponsoring professor and advisory committee drawn from the Biology Teaching Group and the several biological science departments of the University.

Special Requirements

Prospective candidates for the degree must have a provisional or permanent certificate for teaching biology at the secondary level.

Assistantships and fellowships are not provided under the aegis of this program.

Correspondence and Information

Graduate Program Coordinator
Department of Biology, KB-05

Faculty

Chairperson

John S. Edwards

Professors

Deyrup-Olsen, Ingrith J.,* 1964, (Women Studies, Zoology), Ph.D., 1944, Columbia.

Edwards, John S.,* 1967, (Forest Resources, Zoology), M.Sc., 1956, Auckland (New Zealand); Ph.D., 1960, Cambridge (England).

Kohn, Alan J.,* 1961, (Zoology), Ph.D., 1957, Yale.

Laird, Charles D.,* 1971, (Genetics, Zoology), Ph.D., 1966, Stanford.

Meeuse, Bastiaan J. D.,* 1952, (Emeritus), (Botany), M.S., 1939, Leiden (Holland); Ph.D., 1943, Delft (Holland).

Nester, Eugene W.,* 1962, (Microbiology), Ph.D., 1959, Western Reserve.

Olstad, Roger G.,* 1964, (Education, Environmental Studies), M.A., 1959, Ph.D., 1963, Minnesota.

Stettler, Reinhard F.,* 1963, (Forest Resources), Ph.D., 1963, California (Berkeley).

Whisler, Howard C.,* 1963, (Botany), Ph.D., 1961, California (Berkeley).

Associate Professor

Halperin, Walter,* 1968, (Botany), M.S., 1961, Southern Connecticut State; Ph.D., 1965, Connecticut.

Health Services Administration

Douglas A. Conrad, Graduate Program Coordinator

The Health Services Administration group offers a two-year program of studies leading to the degree of Master of Health Administration. It provides preparation for careers in management, planning, and policy analysis, and similar roles in ambulatory-care organizations, hospitals, long-term-care facilities, mental-health-care organizations, government agencies, planning agencies, and other organizational settings in the health field. The curriculum is designed to be interdisciplinary, with a faculty drawn not only from the School of Public Health and Community Medicine, but also from the graduate schools of Business Administration and Public Affairs, School of Social Work, and the departments of Urban Planning, Economics, and Sociology. Each student's curriculum is drawn from these academic units according to distributional requirements set by the program. A student's program of studies may vary according to his or her concentration of study and career objectives. In addition to academic work, students are required to participate in an internship experience in a health facility or agency under the preceptorship of the administrator or director of that organization. Also, a two-quarter analytical project under the supervision of a faculty adviser is required in the second year.

The program is developing a distinctive competency in the area of graduate education for vertically integrated (managed health-care) systems. New courses and case materials directly germane to the management of integrated health-care system of the future are being produced in the areas of finance, organization behavior, policy analysis, and strategic planning and marketing.

A concurrent degree program combining the M.H.A. and M.B.A. degrees also is offered. This curriculum requires three degrees of intensive academic study and culminates in a joint M.B.A.-M.H.A. degree.

Course listings may be found under the School of Public Health and Community Medicine, Department of Health Services.

Special Requirements

Applicants must submit, in addition to Graduate School admission requirements, at least three letters of recommendation and scores from either the Graduate Record Examination or Graduate Management Admission Test. A narrative statement of objectives is also required, and interviews by members of the program faculty may be required. Relevant health field experience is preferred. In general, applicants are accepted only for Autumn Quarter of each year. The application deadline is March 31.

Financial Aid

A number of fellowships, assistantships, scholarships and loans are available each year. The M.H.A. Alumni Association sponsors a fund-raising phonathon from which some of the proceeds go toward program scholarships. The Foster G. McGaw Scholarship, administered by the Association of University Programs in Health Administration, may be awarded. A competi-

tive scholarship from the Federation of American Hospitals is available. A scholarship sponsored by the Association of Medical Group Administrators is available for students concentrating in ambulatory care management. Group Health Cooperative of Puget Sound sponsors a Graduate Research Association position for an under-represented minority student (particularly Black, hispanic, or Native American). However, students admitted should be prepared to utilize their own resources to finance their graduate education.

Research Facilities

In addition to utilizing University facilities, the program makes extensive use of community health facilities and agencies for research and training.

Correspondence and Information

Graduate Program Coordinator
F361 Health Sciences, SC-37

Faculty

Director

Douglas A. Conrad

Professors

Conrad, Douglas A.,* 1977, (Health Services), (Community Dentistry, Finance, Business Economics, and Quantitative Methods),† M.H.A., 1973, Washington; M.B.A., 1976, Ph.D., 1978, Chicago; economic regulation in hospitals, health-care finance, cost effectiveness of dental treatment.

Diehr, Paula,* 1970, (Biostatistics), M.S., 1967, Ph.D., 1970, California (Los Angeles); application of statistics to health services research, multiple regression.

Gross, Edward,* 1967, (Sociology), M.A., 1945, Toronto; Ph.D., 1949, Chicago; formal organizational, industrial sociology.

Higgins, Robert C.,* 1967, (Finance and Business Economics), M.B.A., 1965, Harvard; Ph.D., 1968, Stanford; finance.

Horn, Barbara J.,* 1977, (Nursing), M.S., 1957, Indiana; Ph.D., 1971, Michigan; effective organization of nursing resources.

Lyden, Fremont J.,* 1962, (Public Affairs), M.P.A., 1952, Ph.D., 1960, Washington; public management, social theory and the public policy process, administration of medical programs.

Miller, Donald H.,* 1970, (Urban Planning), M.C.P., 1960, Ph.D., 1973, California (Berkeley); urban planning, planning theory, urban spatial structure, planning evaluation, public service planning.

Morrill, Richard L.,* 1961, (Geography), (Environmental Studies),† M.A., 1957, Ph.D., 1959, Washington; spatial organization, migration, diffusion and population, regional planning and development, inequality.

Patti, Rino J.,* 1967, (Social Work), M.S.W., 1967, D.S.W., 1967, Southern California; social welfare policy, community and organizational development.

Perrin, Edward B.,* 1962, (Health Services), (Biostatistics),† M.A., 1956, Southern California; Ph.D., 1960, Stanford; health-information systems, stochastic modeling, health-manpower analysis, health-care outcomes.

Rosenzweig, James E.,* 1956, (Management and Organization), M.B.A., 1954, Washington; Ph.D., 1956, Illinois; administrative theory and business policy.

Saxberg, Borje O.,* 1957, (Management and Organization), M.S., 1953, Ph.D., 1958, Illinois; administrative theory and organizational behavior.

Associate Professors

Klasterin, Theodore D.,* 1974, (Management and Organization), Ph.D., 1973, Texas (Austin); operations management.

Koepsell, Thomas D.,* 1979, (Epidemiology), M.D., 1972, Harvard; M.P.H., 1979, Washington; M.D., 1972, Harvard; epidemiology of chronic diseases, applications of epidemiologic concepts to medical practice, epidemiology approaches to health services research.

LoGerfo, James P.,* 1974, (Health Services), (Medicine),† M.D., 1968, Rochester; Ph.D., 1974, Washington; quality-of-care assessment.

Madden, Carolyn A. Watts,* 1975, (Economics, Public Affairs),† M.A., 1974, Ph.D., 1974, Johns Hopkins; regulation insurance, health policy.

Rice, Edward M.,* 1979, (Finance, Business Economics, and Quantitative Methods), M.B.A., 1973, Rochester; Ph.D., 1978, California (Los Angeles); finance and business economics.

Trivedi, Vandan M.,* 1974, (Health Services), (Finance, Business Economics, and Quantitative Methods),† M.S.E., 1969, Ph.D., 1974, Michigan; operations research models for hospitals and health-care systems.

Assistant Professor

Hoare, Geoffrey A., 1986, Ph.D., 1984, Pennsylvania; organization and management in health-care organizations.

Nutritional Sciences

Bonnie Worthington-Roberts,
Graduate Program Coordinator

The Nutritional Sciences Program offers an interdisciplinary graduate program leading to the Master of Science degree in Nutritional Sciences. Training is provided in advanced nutrition, foods, and application of these sciences to the field of clinical dietetics through both didactic and clinical experiences. Three types of students are best served by this program: (1) the individual with a strong science background who wishes to pursue advanced training in nutritional sciences; (2) the individual with an undergraduate background in nutrition, dietetics, and foods who wishes to pursue additional training in nutritional sciences while obtaining the supervised clinical experience applicable to meeting requirements for registration in the American Dietetic Association; and (3) the individual who already has become a registered dietitian but wishes to pursue advanced training in nutritional sciences with or without participation in a supervised clinical experience leading to specialization.

Principal areas of study include clinical nutrition, community nutrition, maternal and child nutrition, nutritional biochemistry, and experimental foods. Supportive course work in related fields is provided through the schools of Medicine, Public Health, Pharmacy, and Nursing and the Department of Food Science in the College of Ocean and Fishery Sciences. Relevant courses are also provided by the departments of Anthropology, Genetics, Psychology, and Zoology in the College of Arts and Sciences.

Each individual program of study is designed by the student in consultation with, and with the approval of, a supervisory committee. Not only will appropriate course work be carefully defined, but collaboration between student and faculty in appropriate thesis research will begin as early in the graduate experience as possible. Those students receiving supervised clinical experience will work closely with the coordinator of clinical activities, so an individual program of clinical experiences can be designed to fit with the career goals of the student.

Research Facilities

Support facilities are available in the form of libraries, laboratories, a nutrient data base, computer facilities, a human metabolic unit, a vivarium, and a sensory evaluation complex. Additional support is available through

the Clinical Research Center, the Clinical Nutrition Research Unit, the Northwest Lipid Research Center, and the Nutrition Division of the Department of Laboratory Medicine in the School of Medicine. Clinical facilities available for supervised clinical experience include University Hospital, Harborview Medical Center, Fred Hutchinson Cancer Research Center, Northwest Kidney Center, Children's Orthopedic Hospital, Pacific Medical Center, and the Child Development and Mental Retardation Center.

Admission Requirements

Students may enter the program from an undergraduate major in the biological sciences; background in human physiology and biochemistry is especially desirable. Those students who wish to pursue supervised clinical experience must have undergraduate experience in nutrition, foods, and dietetics. Applicants who are not registered dietitians but wish to gain clinical experience must provide evidence that the Plan 4 requirements of the American Dietetic Association have been met.

Correspondence and Information

Director
Nutritional Sciences Group
305D Raitt, DL-10

Faculty

Chairperson

Bonnie S. Worthington-Roberts

Professors

Albers, John J.,* 1971, (Research), (Medicine, Pathology), M.S., 1967, Ph.D., 1969, Illinois; research in lipids and lipoproteins.

Blerman, Edwin L.,* 1962, (Medicine), M.D., 1955, Cornell; metabolism and endocrinology, clinical nutrition.

Brunzell, John D.,* 1969, (Medicine), M.D., 1963, Washington; metabolism and endocrinology, clinical nutrition.

Chait, Alan,* 1977, (Medicine), M.B.Ch.B., 1967, Capetown (South Africa); M.Sc., 1973, London (England); M.D., 1974, Cape Town (South Africa); metabolism and endocrinology, clinical nutrition.

Chesnut, Charles H. III,* 1973, (Medicine, Radiology), M.D., 1966, Florida; nuclear medicine, bone disease.

Emanuel, Irvin,* 1966, (Epidemiology, Pediatrics), M.A., 1956, Arizona; M.D., 1960, Rochester; M.S.P.M., 1966, Washington; child development and mental retardation.

Enslnck, John W.,* 1960, (Medicine), M.D.C.M., 1956, McGill; metabolism and endocrinology.

Fugimoto, Wilfred Y.,* 1970, (Medicine), M.D., 1965, Johns Hopkins; metabolism and endocrinology.

Halver, John E.,* 1958, (Fisheries), M.S., 1948, Washington State; Ph.D., 1953, Washington; fish nutrition and comparative nutrition.

Henderson, Maureen M.,* 1975, (Epidemiology, Medicine), M.B.B.S., 1949, D.P.H., 1956, Durham (England); epidemiology of chronic diseases.

Knopp, Robert H.,* 1974, (Medicine, Obstetrics and Gynecology), M.D., 1964, Cornell; obstetrics and gynecology, clinical nutrition.

Kronmal, Richard A.,* 1964, (Biostatistics), Ph.D., 1964, California (Los Angeles); nonparametric density estimation, computer algorithms, cardiovascular data analysis.

Labbe, Robert F.,* 1957, (Laboratory Medicine, Pediatrics), M.S., 1949, Ph.D., 1951, Oregon State; nutritional biochemistry.

Liston, John,* 1957, (Fisheries), Ph.D., 1955, Aberdeen (Scotland); food science, marine microbiology.

Monsen, Elaine R.,* 1963, (Medicine), M.S., 1959, Ph.D., 1961, California (Berkeley); nutrition, dietetics.

Pigott, George M.,* 1963, (Fisheries), M.S., 1955, Ph.D., 1963, Washington; food engineering.

Porte, Daniel, Jr., 1963, (Medicine), M.D., 1957, Chicago; metabolism and endocrinology.

Saunders, David R.,* 1965, (Medicine), M.D., 1957, McGill; gastroenterology.

Scott, C. Ronald,* 1965, (Pediatrics), M.D., 1959, Washington; pediatric genetics.

Whorton, James C.,* 1970, (Biomedical History), Ph.D., 1969, Wisconsin; history of American medicine, public health, alternative healing, pharmacy, biochemistry.

Woods, Stephen C.,* 1972, (Medicine, Psychology), Ph.D., 1970, Washington; appetite regulation, obesity.

Worthington-Roberts, Bonnie S.,* 1971, (Epidemiology, Pediatrics), M.S., 1967, Ph.D., 1971, Washington; maternal and child nutrition.

Associate Professors

Benedetti, Thomas J.,* 1979, (Obstetrics and Gynecology), M.D., 1973, Washington; perinatal medicine.

Brown, Zane A.,* 1977, (Obstetrics and Gynecology), M.D., 1966, Temple; perinatal medicine.

Childs, Marian T.,* 1968, (Medicine), Ph.D., 1950, California (Berkeley); nutrition.

Dellinger, E. Patchen,* 1977, (Surgery), M.D., 1970, Harvard; general surgery.

Elmer, Gary W.,* 1971, (Medicinal Chemistry), M.S., 1967, Connecticut; Ph.D., 1970, Rutgers; pharmacognosy.

Kiyak, Asuman H.,* 1977, (Architecture, Oral and Maxillofacial Surgery, Psychology), M.A., 1974, Ph.D., 1977, Wayne State; geriatric dentistry, behavioral aspects of health care.

Martinsen, Charlene S.,* 1969, (Fisheries), M.S., 1966, Iowa State; Ph.D., 1974, Washington; foods, sensory evaluation.

Samson, Herman H.,* 1977, (Psychiatry and Behavioral Sciences, Psychology), M.A., 1965, McMaster; Ph.D., 1968, Waterloo; behavioral pharmacology, addictive processes.

Schwartz, Robert S.,* 1982, (Medicine), M.D., 1974, Ohio State; internal medicine and geriatrics.

Wood, Francis C., Jr.,* 1961, (Medicine), M.D., 1954, Harvard; metabolism and endocrinology.

Yamanaka, William K.,* 1974, (Epidemiology), Ph.D., 1969, California (Berkeley); nutrition.

Assistant Professors

Lipkin, Edward W.,* 1985, (Medicine), Ph.D., 1977, M.D., 1978, Case Western Reserve; metabolism and clinical nutrition.

Pearlman, Robert A.,* 1981, (Medicine), M.D., 1975, Boston; M.P.H., 1980, Washington; gerontology.

Lecturers

Faine, Mary P., 1982, (Prosthodontics), M.S., 1975, Washington; nutrition.

Karckek, Joan, 1979, M.A., M.S., 1970, Case Western Reserve; nutrition and dietetics.

Lucas, Betty L., 1974, (Parent and Child Nursing), M.P.H., 1969, California (Berkeley); maternal and child nutrition.

O'Leary, Mary, 1982, (Pediatrics), M.S., 1979, Minnesota; neonatal nutrition.

Pipes, Peggy L., 1984, (Parent and Child Nursing), M.A., 1952, Columbia; M.P.H., 1966, Michigan; maternal and child nutrition.

Rees, Jane M., 1973, (Pediatrics), M.S., 1972, Washington; maternal and child nutrition.

Trahms, Cristine M., 1973, (Pediatrics), M.S., 1972, Washington; maternal and child nutrition.

Valerio, Nina L., 1974, M.S., 1971, State University of Iowa; nutrition education and clinical dietetics.

Course Descriptions

Courses for Undergraduates

NUTR 300 Nutrition for Today (3) Basic and applied nutrition and food science. Includes identification and physiological roles of nutrients, nutritional requirements, problems with over- and undernutrition, and nutritional and food-related diseases. Food additives, processing, safety, and their effects on overall nutrition. Current issues of public significance. Joint with FD SC 300.

NUTR 301 Nutrition and Nursing (3) Basic principles of nutrition and their relationship to health problems. Normal nutrition needs of individuals at various age levels; environmental influences on nutrition; assessment of nutritional status; nutritional values of foods; dietary modifications as appropriate in the nutritional component of medical treatment. Prerequisite: organic chemistry.

NUTR 421 Human Nutrition (5) Basic principles of normal human nutrition, emphasizing chemistry, metabolism, deficiency diseases, and requirements for proteins, lipids, carbohydrates, vitamins, and minerals. Consideration of energy metabolism, nutritional status, nutrition for the life cycle, nutritive value of foods and food additives. Prerequisites: general and organic chemistry, biochemistry, human physiology.

Courses for Graduates Only

NUTR 500 Graduate Seminar in Human Nutrition, Diet, and Foods (1, max. 3) Current literature and recent symposiums in the field of human nutrition, dietetics, and foods.

NUTR 520 Protein and Carbohydrate Nutrition (3) Metabolic and physiologic concepts related to protein and carbohydrate nutrition. Areas addressed include composition of foods, requirements through the life cycle, quality of protein, vegetarianism, protein deficiency, low carbohydrates, glycemic response to foods, carbohydrates and dental caries, inborn errors in carbohydrate and protein metabolism.

NUTR 521 Lipid Nutrition (3) Normal lipid components of animal fluids and tissues, with review of their metabolism and physiological functions. Effect of diet and the normal development during the life span on these lipids. Changes of lipids with various types of disease states and means of nutritional modification of these changes.

NUTR 522 Nutrition of the Biologically Essential Minerals (3) Special emphasis on trace minerals. Consideration of the intestinal absorption of metals, their transport, function, storage, and excretion; mineral competition and imbalance; dietary sources, including foods, food additives, and medications; dietary implications drawn and clinical application made.

NUTR 523 Vitamin Nutrition (3) Dietary compounds presently considered to be essential for humans and called vitamins. General topics are whether the vitamin is fat soluble or water soluble; reviewing basic material and seeking increasing depth of understanding; relation of vitamins to other nutrients and to varying physiological conditions.

NUTR 525 Evaluation of Nutritional Status (3) Dietary, clinical, and biochemical-biophysical components in the assessment of nutritional status. Interrelationships of nutrients and effects of varying levels of nutrient intake. Critical appraisal of nutritional status surveys. Experimental design and dietary methodology. Prerequisites: human nutrition and biochemistry.

NUTR 526 Maternal and Infant Nutrition (3) Influence of nutrition on fertility and on the course and outcome of pregnancy. Nutritional management of high-risk pregnancy. Nutritional needs during lactation and effect of maternal diet on milk composition. Breast-

feeding versus bottle-feeding; fundamentals of infant nutrition. Nutritional management of high-risk infants. Prerequisites: human nutrition and human physiology.

NUTR 527 Nutrition: Childhood Through Adolescence (3) Influence of nourishment on growth, development, and behavior of children, toddlers through adolescents. Critical evaluation of normative data, special problems, and intervention strategies. Prerequisites: human nutrition and human physiology.

NUTR 528 Nutrition in Aging (3) Physiological, psychological, social, cultural, and economic factors affecting nutrition in the middle and later years. Prerequisites: human nutrition and human physiology.

NUTR 531 National and International Nutrition (3) Nutritional problems in United States, surveillance strategies and nutrition programs designed to improve status of high-risk populations. Review of major nutritional problems in developing countries, causes of malnutrition, international agencies on food and nutrition, prospects and probable solutions to major nutrition problems. Prerequisite: course in general nutrition.

NUTR 532 Fieldwork in Public Health Nutrition (2-12, max. 12) Observation and participation in community agency nutrition programs.

NUTR 535 Laboratory Methods in Nutrition (3) *Childs, Yamanaka* Techniques used in nutrition research. Spectroscopy, isotopes, ultracentrifugation, chromatography; vitamin, lipid, and mineral analysis; methods for animal and human research. Prerequisites: laboratory classes in chemistry, biochemistry.

NUTR 539 Seminar in Nutrition (1-3, max. 9) Library research and seminar on selected topics in recent developments in the field of nutrition. Prerequisite: 421.

NUTR 540 Recent Developments in Foods (3) Development of new technology in food production and product development. Design of low-sodium, caffeine-free, and low-calorie food products and other special types. A review of government regulations concerning new developments in foods, including food contamination and food additives. Prerequisites: basic foods and nutrition.

NUTR 541 Experimental Foods (3) Study of sensory evaluation techniques, including threshold tests, difference tests, and descriptive tests. Techniques of food product development and an evaluation of rheological properties of foods. Updates on performance of lipids, carbohydrates, and proteins in foods. Prerequisites: organic chemistry, basic course work in foods or food science.

NUTR 560 Practicum in Dietetic Education (1-5) AWSps Supervised instructional experiences for dietetic education in both classroom and clinical situations. Individually arranged.

NUTR 561 Advanced Clinical Nutrition Fieldwork (1-3, max. 9) Participation in a health-care team assessing nutrition status and needs, designing care plans to optimize nutritional support of patients, and establishing appropriate criteria for the evaluation of the nutrition care provided. Supervised clinical experiences provided in a variety of local health-care institutions. Prerequisite: permission of instructor.

NUTR 562 Advanced Clinical Nutrition I (4) Assessment of the nutritional demands and hypermetabolic responses of trauma, surgery, acute and neoplastic diseases; determination of the appropriate amounts and sources of nutrients supplied through enteral and/or parenteral routes. Prerequisite: diet therapy.

NUTR 563 Advanced Clinical Nutrition II (4) Epidemiology and pathophysiology of acute and chronic diseases related to nutrition (e.g., cardiovascular, endocrinologic, and hematologic diseases). Nutritional interventions and their relationship to medical, surgical, and pharmacologic treatment. Prerequisite: diet therapy.

NUTR 564 Nutrition Support Management (3) Administrative processes affecting health care, specific focus on management of nutritional support. Includes productivity and cost effectiveness of nutrition care, establishing and achieving quality of care, peer review, budgeting, working with other health-care professionals and varying health-care systems. For clinical nutritionists working in standard health-care systems.

NUTR 565 Seminar in Clinical Nutrition Practice (1-3) *Valerio* Selected topics and learning experiences in nutritional care delivery. Prepares students for practical application of nutritional concepts in diverse clinical settings. Prerequisites: concurrent registration in 561 and permission of instructor. Entry card required.

NUTR 600 Independent Study or Research (*)

NUTR 700 Master's Thesis (*)

Physiology-Psychology

John B. Simpson, Director
Moncrieff Smith, Graduate Program Coordinator

This interdisciplinary Doctor of Philosophy degree program administered by the Physiology-Psychology Group of the Graduate School was initiated in 1959 and provides intensive training in the overlapping areas of behavioral and physiological sciences. Graduates of the program are employed in University departments of Psychology, Physiology, and Zoology, and in various School of Medicine departments.

The program is small, accepting only one or two students a year. Financial assistance to those requesting it is offered in the form of a National Institutes of Health predoctoral traineeship and teaching or research assistantships. A dual set of course requirements makes four years of postbaccalaureate work a minimum for the Ph.D. degree. A master's degree program is not offered.

Training is research oriented, and students are expected to undertake individual research projects in their first year of graduate study. Research in both of the parent departments is required. Each student spends approximately a year in course work in each discipline, then engages in seminars in either discipline, elective relevant course work in other University departments, and doctoral research.

Because physiological psychology and neurophysiology are strongly developed at the University, the graduate student finds the latest in instrumentation and research techniques in both fields. In addition to the research facilities of the two parent departments, students have the opportunity of working with laboratory primates at the Regional Primate Center located on campus. The center has facilities for a wide variety of behavioral and physiological studies of a number of primate species and is a valuable adjunct to the resources of the training program.

Correspondence and Information

Leonore Rubey
Graduate Program Coordinator
333A Guthrie, NI-25

Faculty

Director

John B. Simpson

Professors

Bernstein, Ilene L., 1972, (Psychology), M.A., 1967, Columbia; Ph.D., 1972, California (Los Angeles); biological basis of development, physiological and conditioning factors affecting regulation of food intake.

Bolles, Robert C.,* 1966, (Psychology), M.S., 1949, Stanford; Ph.D., 1956, California (Berkeley); motivation.

Crill, Wayne E.,* 1967, (Physiology and Biophysics, Medicine), M.D., 1962, Washington; excitable properties of mammalian central nervous system neurons.

Fetz, Eberhard E.,* 1969, (Physiology and Biophysics), Ph.D., 1966, Massachusetts Institute of Technology; neurophysiology.

Fuchs, Albert F.,* 1969, (Physiology and Biophysics), M.S., 1961, Drexel; Ph.D., 1966, Johns Hopkins; oculomotor physiology, vision.

Schwartzkroin, Philip A.,* 1978, (Neurological Surgery, Physiology and Biophysics), Ph.D., 1972, Stanford; properties of hippocampal neurons.

Simpson, John B.,* 1975, (Psychology), M.A., 1972, Ph.D., 1973, Northwestern; behavioral endocrinology.

Smith, Moncrieff H.,* 1949, (Psychology), M.A., 1941, Missouri; Ph.D., 1947, Stanford; memory.

Smith, Orville A., Jr.,* 1959, (Physiology and Biophysics), M.A., 1950, Ph.D., 1953, Michigan State; central nervous control of autonomic function.

Steiner, Robert A.,* 1977, (Obstetrics and Gynecology, Physiology and Biophysics, Zoology), Ph.D., 1975, Oregon; reproductive neuroendocrinology.

Towe, Arnold L.,* 1957, (Physiology and Biophysics), Ph.D., 1953; Washington; neurophysiology of somatic sensation.

Woods, Stephen C.,* 1972, (Medicine, Psychology), Ph.D., 1970, Washington; neural control of endocrine systems.

Associate Professors

Diaz, Jaime,* 1978, (Psychology), M.A., 1972, Ph.D., 1975, California (Los Angeles); brain development, developmental psychopharmacology.

Kenney, Nancy J.,* 1976, (Psychology, Women Studies), M.A., 1972, Ph.D., 1975, Virginia; neuroendocrine basis of regulatory behavior.

Rose, Richard M.,* 1966, (Psychology), M.A., 1961, Ph.D., 1964, Pennsylvania; mathematical psychology, psychophysics.

Course Description

PPSY 800 Doctoral Dissertation (*)

Radiological Sciences

Kenneth L. Jackson, Graduate Program Coordinator
E179 Health Sciences

Master of Science in Radiological Sciences Degree

A Western Interstate Commission for Higher Education Regional Graduate Program. The program leading to the degree of Master of Science in Radiological Sciences is offered by the Radiological Sciences Group of the Graduate School. Study for this degree is open to students with a baccalaureate degree in a physical or biological science or in engineering, depending on the option selected. Several curriculum options are offered to satisfy different requirements and interests of biological scientists, physical scientists, or engineers. The various options described below prepare students for careers in health physics, radiological health, radiological physics, or radiation biology.

Thesis topics include studies in radiation biology, radiocology, nuclear medicine, radiochemistry, radiation physics, or nuclear engineering. The above program options also are offered at the Tri-Cities University Center in Richland, making available for thesis research the extensive government laboratories there. Research facilities on campus include radioisotope and radiochemistry laboratories, a research reactor, a cyclotron, a large cobalt-60 irradiation facility, and a cesium-137 source.

A student with a deficiency in one area of the prerequisites may be accepted for the program, provided the deficiency is removed during the first year of graduate study. Credit toward the degree is not ordinarily granted for a course used to remove a deficiency.

Physical Science Option

Prerequisites for this option include a baccalaureate degree in a physical science or in engineering, and a year of general biology at the college level.

COURSES	CREDITS
NUC E 484 Introduction to Nuclear Engineering	4
NUC E 485 Nuclear Instruments	3
NUC E 486 Nuclear Power Plants	3
PHYS 431, 433 Modern Physics Laboratory	3, 3
RAD S 501, 502 Biological Effects of Ionizing Radiation	2, 2
RAD S 504 Laboratory in Radiation Biology	1
RAD S 507 Radiation Hazards Analysis and Control	1
RAD S 513, 514 Health Physics I, II	3, 3
RAD S 520 Radiological Sciences Seminar	1, 1
RAD S 542 Environmental Impact of Radioactivity	3
RAD S 700 Thesis	9

Biological Science Option

Prerequisites for this option include a baccalaureate degree in a biological science, courses in mathematics through differential and integral calculus and statistics, and chemistry through quantitative analysis and organic chemistry.

COURSES	CREDITS
CHEM 350, 351 Elementary Physical Chemistry	3, 3
Graduate-level biology course	3
NUC E 485 Nuclear Instruments	3
PHYS 225 Modern Physics	3
PHYS 327 Introduction to Nuclear Physics	3
RAD S 501, 502 Biological Effects of Ionizing Radiation	2, 2
RAD S 504 Laboratory in Radiation Biology	1
RAD S 507 Radiation Hazards Analysis and Control	1
RAD S 513, 514 Health Physics I, II	3, 3
RAD S 520 Radiological Sciences Seminar	1, 1
RAD S 542 Environmental Impact of Radioactivity	3
RAD S 700 Thesis	9

Environmental Science Option

An applicant with a baccalaureate degree in a physical science or engineering and a year of general biology at the college level generally is prepared to pursue this curriculum.

COURSES	CREDITS
CEWA 434 Ecological Effects of Wastewater	3 or 5
CEWA 461 Air Pollution Control	3
NUC E 484 Introduction to Nuclear Engineering	4
NUC E 485 Nuclear Instruments	3
NUC E 486 Nuclear Power Plants	3
RAD S 501, 502 Biological Effects of Ionizing Radiation	2, 2
RAD S 504 Laboratory in Radiation Biology	1
RAD S 507 Radiation Hazards Analysis and Control	1
RAD S 513, 514 Health Physics I, II	3, 3
RAD S 520 Radiological Sciences Seminar	1, 1
RAD S 542 Environmental Impact of Radioactivity	3
RAD S 700 Thesis	9

Correspondence and Information

Graduate Program Coordinator
E179 Health Sciences, SB-75

Faculty

Chairperson

Kenneth L. Jackson

Professors

Bodansky, David,* 1954, (Physics), M.A., 1948, Ph.D., 1950, Harvard; experimental nuclear physics.

Jackson, Kenneth L.,* 1963, (Environmental Health, Radiology), Ph.D., 1954, California (Berkeley); physiological and biochemical mechanisms in radiation biology.

Lee, John A. H.,* 1966, (Epidemiology), M.B.Ch.B., 1949, M.D., 1955, Edinburgh (Scotland); epidemiology of neoplastic disease.

Moulton, R. Wells, 1941, (Emeritus), (Chemical Engineering), M.S., 1934, Ph.D., 1938, Washington; chemical engineering.

Nelp, Wil B.,* 1962, (Radiology, Medicine), M.D., 1955, Johns Hopkins; nuclear medicine.

Robkin, Maurice A.,* 1967, (Environmental Health, Nuclear Engineering), Ph.D., 1961, Massachusetts Institute of Technology; nuclear engineering, neutron activation analysis, neutron radiography, radiation dosimetry.

Stadler, David R.,* 1956, (Genetics), M.A., 1950, Ph.D., 1952, Princeton; mutation in *neurospora* and DNA repair mechanisms.

Stoebe, Thomas G.,* 1966, (Materials Science and Engineering), M.S., 1963, Ph.D., 1965, Stanford; physics of solids, diffusion in solids, mechanical behavior of ionic solids, thermoluminescent dosimetry.

Wootton, Peter,* 1964, (Radiation Oncology), B.Sc. (Hon.), 1944, Birmingham (England); medical radiation physics, radiation dosimetry.

Associate Professors

Eenmaa, Juli,* 1971, (Radiation Oncology), M.S., 1966, Southern California; Ph.D., 1971, Washington; medical radiation physics, neutron therapy dosimetry.

Geraci, Joseph P.,* 1973, (Environmental Health), M.S., 1969, Ph.D., 1972, Washington; neutron radiobiology, biochemical mechanisms of radiation injury.

Nevisi, Ahmad E.,* 1973, (Research), (Fisheries), M.S., 1966, Technische Hochschule (West Germany); Ph.D., 1973, Arkansas; environmental radioactivity and radiochemistry.

Wolf, Norman S.,* 1968, (Animal Medicine, Pathology), D.V.M., 1953, Kansas State; Ph.D., 1960, Northwestern; hematopoietic stem cell dynamics and transplantation in radiation biology.

Assistant Professors

Goodsitt, Mitchell M.,* 1986, (Radiology), M.S., 1976, Ph.D., 1982, Wisconsin (Madison); computed tomography, ultrasound and digital radiography image analysis.

Sibley, Thomas,* 1978, (Research), (Fisheries), M.S., 1968, State University of New York (Buffalo); Ph.D., 1976, California (Davis); biogeochemical cycling of radionuclides.

Lecturer

O'Brien, Michael J., 1983, (Environmental Health), M.S., 1973, Pittsburgh; operational radiation safety, internal radiation dosimetry, instrument calibration.

Course Descriptions

RAD S 485 Nuclear Instruments (3) W Principles, measurements, and detection of various types of radiation encountered in nuclear energy systems. Use of Geiger, proportional, and scintillation detectors; ioniza-

tion chambers; analog-digital data-logging equipment; multichannel analyzers. Sources of radiation include the University's nuclear reactor and pulsed neutron generators. Joint with NUC E 485. Prerequisite: junior standing.

RAD S 501, 502 Biological Effects of Ionizing Radiation (2,2) A,W Jackson Effects of ionizing radiation at the molecular, cellular, organ, and organism levels with emphasis on mammalian systems. Prerequisite: permission of instructor.

RAD S 503, 504 Laboratory in Radiation Biology (1,1) A,W Geraci Laboratory study of the biological effects of ionizing radiation. Prerequisite: permission of instructor.

RAD S 507 Radiation Hazards Analysis and Control (1) Sp O'Brien Emphasizes methods and procedures rather than facility or equipment design.

RAD S 508 Physical Aspects of Medical Imaging (2) Sp Goodsitt

RAD S 509 Biological Effects of Nuclear Explosions (2) Sp Geraci Biological effects of blast, thermal radiation, and nuclear radiation, or combination thereof, from nuclear weapons. Physical description of nuclear weapons and their effects, biomedical effects, protection, and possible treatments. Prerequisite: permission of instructor.

RAD S 513, 514 Health Physics I, II (3,3) W,Sp Robkin Physical basis of the quantification of the exposure to ionizing radiation. Includes the mathematics and physics of sources, interactions, spectrometry,

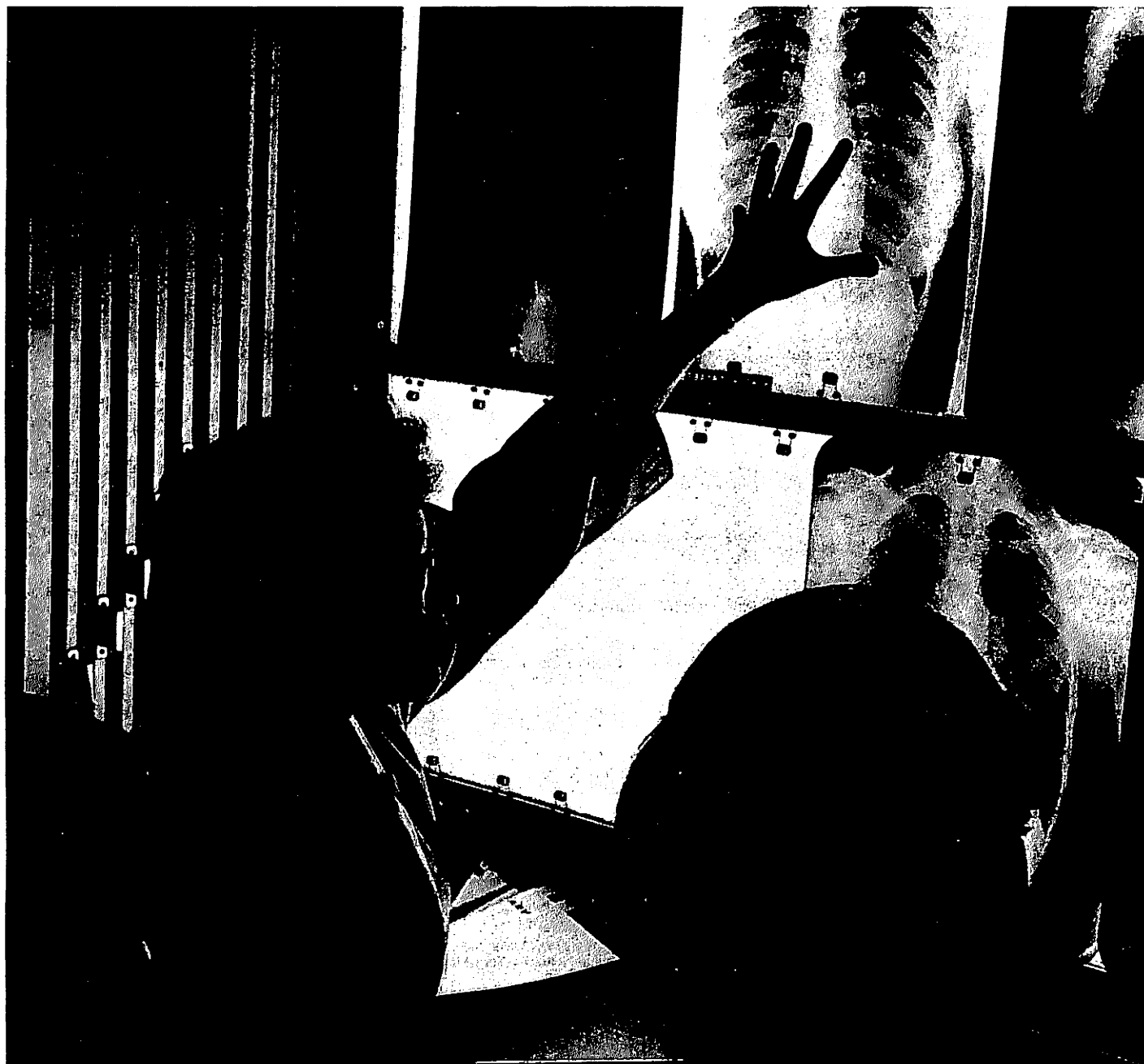
and dosimetry of ionizing radiation. Joint with NUC E 513, 514.

RAD S 520 Radiological Sciences Seminar (1, max. 6) W

RAD S 542 Environmental Impact of Radioactivity (3) Robkin Dispersion, fate, and environmental significance of radionuclides released into environment. Includes dispersion, deposition, environmental transport, uptake, biological effects, protection from, and regulations relating to, radionuclides released into environment. Examples taken from academic, research, and industrial sources with emphasis on central station nuclear power plants. Joint with NUC E 542.

RAD S 600 Independent Study or Research (*) AWSpS

RAD S 700 Master's Thesis (*) AWSpS



Interschool or Intercollege Programs

Bioengineering

309 Harris Hydraulics Laboratory

The Center for Bioengineering provides a comprehensive, multidisciplinary program of education and research. The concepts and techniques of engineering are applied to the challenges in biology and medicine. Major areas of current bioengineering research include biomaterials, biomathematics, biomechanics, cochlear prosthesis, controlled drug-release systems, imaging, laser applications, mechanics of mucociliary transport, microanalysis of subcellular structures, microcirculatory exchanges and blood flow, muscle analysis, sensor development, and ultrasonic instrumentation.

Undergraduate Program

Programs of study for engineering students are individually tailored to career objectives and may be accomplished by either of two pathways: (1) adherence to a traditional engineering department program using electives to cover bioengineering and health sciences courses; (2) adherence to a Bachelor of Science in Engineering degree program providing wider latitude in course requirements as approved by the Interdisciplinary Engineering Studies Group and the student's advisory committee. This program is limited mainly to outstanding students who are planning to enter medical school.

Graduate Program

Two master's degree programs are offered in bioengineering. The Master of Science in Engineering degree provides essential training in the life sciences that allows students with sound engineering backgrounds to prepare for careers in academic, industrial, or hospital environments. The Master of Science degree provides essential training in the engineering sciences, allowing students with strong backgrounds in the biological sciences to prepare for careers in research and development in either basic medical sciences or clinical investigations. Both master's degree programs have a thesis requirement.

The objective of the Ph.D. program is to train qualified individuals for careers in bioengineering research and teaching. The training has three major components: First, students acquire a breadth of knowledge about engineering and medicine and about the interdisciplinary interface between these quite disparate fields. Second, a depth of knowledge and expertise is developed in a particular scientific specialty. Finally, each student develops and demonstrates his or her potential for independent research. Although it has rigorous expectations about student performance, the program maintains sufficient flexibility regarding specific requirements to accommodate qualified students with diverse backgrounds.

Offices and laboratories are located in the College of Engineering and the School of Medicine. Students have access to the University Hospital, vivarium, primate center, computer center, and libraries, as well as to all engineering and health science departments and facilities. Excellent machine and electronics shops are available in the Center for Bioengineering.

Admission Requirements

Applicants for the M.S.E. degree should have a baccalaureate degree in engineering or the equivalent; applicants for the M.S. degree should have a baccalaureate degree in a science or the equivalent. One year each of calculus, physics, and chemistry is required.

In addition to completing the application requirements for the Graduate School, an applicant should also forward the following items to the Graduate Secretary, Center for Bioengineering, WD-12, University of Washington, Seattle, WA 98195:

- 1) A written statement outlining academic and professional goals.
- 2) Official copies of Graduate Record Examination scores from the general tests.
- 3) Three letters of recommendation from persons acquainted with the applicant's background (no specific form required).

Financial aid is available to qualified graduate students in the form of traineeships, fellowships, and assistantships. Funding is derived from federal research and training programs, the Graduate School Research Fund, and programs sponsored by private agencies. Information concerning these fellowships is available from the Center for Bioengineering.

Faculty

Director

Lee L. Huntsman

Professors

Babb, Albert L.,* 1952, ‡(Chemical Engineering, Nuclear Engineering), M.S., 1949, Ph.D., 1951, Illinois; hemodialysis engineering, respiratory heat and mass transport, computer simulation and experimental modeling.

Bassingthwaite, James B.,* 1975, (Radiology), M.D., 1955, Toronto; Ph.D., 1964, Minnesota; cardiovascular mass transport and ion exchanges, simulation analysis of integrated systems.

Callis, James B.,* 1972, ‡(Chemistry), Ph.D., 1970, Washington; instrumentation development, process analytical chemistry, noninvasive clinical chemistry.

Cheung, Peter W.,* 1984, (Electrical Engineering), ‡ M.S., 1969, Puget Sound; Ph.D., 1973, Washington; semiconductor materials and devices, microcircuit design, processing and fabrication, microsensors for clinical applications.

Daly, Colin H.,* 1967, ‡(Mechanical Engineering), Ph.D., 1966, Strathclyde (Scotland); bioengineering materials.

Guy, Arthur W.,* 1965, (Electrical Engineering), (Rehabilitation Medicine), ‡ M.S.E.E., 1957, Ph.D., 1966, Washington; biological effects and medical applications of electromagnetic fields.

Heideger, William J.,* 1957, ‡(Chemical Engineering), M.S.E., 1956, Ph.D., 1959, Princeton; biomedical transport phenomena.

Hlastala, Michael P.,* 1970, ‡(Medicine, Physiology and Biophysics), Ph.D., 1960, State University of New York (Buffalo); respiratory physiology, inert gas analysis of respiratory function.

Hoffman, Allan S.,* 1970, (Chemical Engineering), ‡ M.S.Ch.E., 1955, Sc.D., 1957, Massachusetts Institute of Technology; synthesis, characterization, and biological interaction of biomaterials, mechanics of natural tissues, applied polymers.

Horbett, Thomas A.,* 1973, (Research), (Chemical Engineering), ‡ Ph.D., 1970, Washington; interactions of cells and proteins with foreign materials, insulin-delivery devices.

Huntsman, Lee L.,* 1968, Ph.D., 1968, Pennsylvania; mechanics of heart and heart muscle, cardiovascular system assessment, new measurement techniques.

Johnson, Dale E.,* 1976, (Materials Science and Engineering), M.S., 1967, Ph.D., 1971, Chicago; elemental microanalysis of biological systems, electron energy loss spectrometry.

Matsen, Frederick A. III,* 1974, ‡(Orthopaedics), M.D., 1968, Baylor; biomechanics of bones and joints, imaging in orthopaedics.

Pollack, Gerald H.,* 1968, Ph.D., 1968, Pennsylvania; muscular contraction.

Ratner, Buddy D.,* 1972, (Chemical Engineering), ‡ Ph.D., 1972, Polytechnic Institute of Brooklyn; synthesis and characterization of polymeric biomaterials for cardiovascular, ophthalmologic, and drug-delivery applications, surface analysis by ESCA, drug-delivery systems.

Rushmer, Robert F.,* 1947, (Emeritus), M.D., 1939, Chicago; biomedical instrumentation, health-care systems.

Schwartz, Stephen M.,* 1974, ‡(Pathology), M.D., 1967, Boston; Ph.D., 1973, Washington; mechanisms controlling cell growth in vessel wall, abnormal growth control role in atherosclerosis and hypertension.

Associate Professors

Afromowitz, Martin A.,* 1975, ‡(Electrical Engineering), M.S., 1966, School of Engineering and Applied Science (New York); Ph.D., 1969, Columbia; chemical sensors and biomedical instrumentation.

Bashein, Gerard,* 1978, ‡(Anesthesiology), M.S., 1964, Ph.D., 1969, Carnegie-Mellon; M.D., 1974, New Mexico; automation techniques in anesthesia, transesophageal ultrasonic cardiac assessment for operating-room monitoring.

Beach, Kirk W.,* 1976, (Research), ‡(Surgery), M.S.Ch.E., 1968, Ph.D., 1971, California (Berkeley); M.D., 1976, Washington; diagnosis and treatment of vascular diseases.

Bruckner, Adam P.,* 1972, (Research), ‡(Aeronautics and Astronautics), M.A., 1968, Ph.D., 1972, Princeton; scattering of ultrashort light pulses in dense biological media, laser effects on biological tissue, ocular holography.

Foster, David M.,* 1979, (Research), M.Sc., 1965, San Diego State; Ph.D., 1969, British Columbia; biomathematics and modeling methodology, simulation analysis, lipid and lipoprotein metabolism, gluconeogenesis.

Kim, Yongmin,* 1982, ‡(Electrical Engineering), M.S., 1979, Ph.D., 1982, Wisconsin (Madison); computer architecture, parallel processors, minicomputer and microcomputer applications, image processing, medical instrumentation.

MacKenzie, Alan P.,* 1976, (Research), (Biological Structure), ‡ Ph.D., 1958, London (England); physical and biochemical cryobiology, biotechnological applications of freezing and freezing-related procedures.

Martin, Roy W.,* 1975, (Research), (Anesthesiology), ‡ M.S., 1970, Southern California; Ph.D., 1975, Washington; bioinstrumentation, ultrasonic Doppler, echo, tissue characterization, signal processing.

Nelson, Alan C.,* 1986, ‡(Electrical Engineering, Pathology, Radiology), Ph.D., 1980, California (Berkeley); biophysics, imaging.

Pearlman, Alan S.,* 1978, ‡(Medicine), M.D., 1970, Harvard; echocardiography, assessment of cardiac anatomy, dynamics and blood flow.

Phillips, David J.,* 1981, (Research), ‡(Surgery), Ph.D., 1975, Duke; clinical applications of biomedical instrumentation.

Spelman, Francis A.,* 1977, (Electrical Engineering, Otolaryngology), M.S.E.E., 1968, Ph.D., 1975, Washington; local control of peripheral circulation, biophysics of the implanted cochlea, bioinstrumentation for primate research.

Verdugo, Pedro J.,* 1975, (Biological Structure), ‡ M.S., 1958, M.D., 1965, State University of Chile; microrheology and control of ciliary and flagellar motion, biomechanics of cervical and respiratory mucus, instrumentation in laser scattering.

Yager, Paul,* 1987, Ph.D., 1980, Oregon; physical chemistry and applications of biomembranes.

Assistant Professors

Burns, David H.,* 1985, (Research), Ph.D., 1984, Washington; analytical chemistry.

Cantino, Marie E.,* 1984, (Research), Ph.D., 1981, Washington; muscle ultrastructure and myocardial calcium regulation.

Rowberg, Alan H.,* 1975, \pm (Radiology), M.D., 1970, Washington; computers in medical imaging.

Soma, Mani,* 1982, \pm (Computer Science, Electrical Engineering), M.S.E.E., 1977, Ph.D., 1980, Stanford; integrated circuits, bioelectronics.

Course Descriptions

Courses for Undergraduates

BIOEN 299 Introduction to Bioengineering (1) A Sp Verdugo Lectures, discussions, and reading assignments on the various aspects of bioengineering; orientation in bioengineering studies and practice. Offered on credit/no credit basis only.

BIOEN 401 Engineering Analysis of Cell Function (3) A Verdugo For engineers with no previous experience in the biological sciences, this course introduces the fundamentals of cell biology in an engineering-oriented framework. Includes structure, energetics, information processing, transduction, biological engines.

BIOEN 436 Medical Instrumentation (4) Sp Spelman Introduction to the application of instrumentation to medicine. Topics include transducers, signal-conditioning amplifiers, electrodes and electrochemistry, ultrasound systems, electric safety, and the design of clinical electronics. Laboratory included. For juniors, seniors, and first-year graduate students who are preparing for careers in bioengineering, both research and industrial. Joint with E E 436. Prerequisite: some knowledge of human physiology and electronics or instrumentation or permission of instructor. Recommended: 535, E E 433. Entry card required.

BIOEN 467 Biochemical Engineering (3) Application of basic chemical engineering principles to biochemical and biological process industries such as fermentation, enzyme technology, and biological waste treatment. Rapid overview of relevant microbiology, biochemistry, and molecular genetics. Design and analysis of biological reactors and product recovery operations. Joint with CH E 467. Prerequisites: CH E 340, organic chemistry; recommended: CH E 485.

BIOEN 490 Engineering Materials for Biomedical Applications (3) W Hoffman Combined application of the principles of physical chemistry, biochemistry, materials engineering, mass transfer, and fluid mechanics to biomedical problems. Case studies include considerations of the selection of materials, design, and the operation of instruments, components of, or entire, artificial organs (heart, kidney, lung) and artificial structural elements (bone, teeth, skin), all for use in contact with body fluids. Joint with CH E 490. Prerequisite: organic chemistry or permission of instructor. (Offered even-numbered years.)

BIOEN 491 Controlled-Release Systems—Principles and Applications (3) W Hoffman Mechanisms for controlled release of active agents and the development of useful systems for this purpose. Release mechanisms include diffusive, convective, or erosive driving forces. Applications to the biomedical, agricultural, forestry, and oceanography fields. Some special case studies covered in detail. Joint with CH E 491. Prerequisite: permission of instructor. (Offered odd-numbered years.)

BIOEN 492 Surface Analysis (3) W Understanding of solid surfaces for research and development in microelectronics, catalysis, adhesion, biomaterials, science wear, and corrosion science. Newer methods available to study surfaces of materials. Electron emission spectroscopies (ESCA, Auger); ion scattering, ion spectroscopic, photon spectroscopic, and thermodynamic methods. Joint with CH E 458.

BIOEN 499 Special Projects (2-6, max. 6) AWSpS Individual undergraduate bioengineering projects under the supervision of an instructor. In addition, classes on selected topics of current interests as announced. Prerequisite: permission of instructor. Entry card required.

Courses for Graduates Only

BIOEN 510 Bioengineering Seminars (1) Topics of current bioengineering interests presented by resident and visiting faculty members and students. Graduate students actively involved in bioengineering research are eligible to enroll for credit and can be expected to attend regularly, participate in discussions, and make presentations.

BIOEN 511 Biomaterials Seminar (1) AWSpS Hoffman, Horbett, Ratner Presentation of student research results. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

BIOEN 515 Introduction to Clinical Medicine for Engineers (3) Introduction to concepts and methods used in clinical medicine for students with engineering and physical science backgrounds. How and where engineering principles and methodologies can be applied to health-care problems. Prerequisite: basic physiology or permission of instructor.

BIOEN 531, 532, 533 Electron Microscopy (1-5, 1-5, 1-5) A,W,Sp Cantino, Luft Theoretical and applied aspects of microscopy in biology, including newer methods. Light microscopy and electron optics, the electron microscope in detail, and methods for preparation of biological specimens. Joint with B STR 531, 532, 533. Offered on credit/no credit basis only. Prerequisite: permission of instructor. (Offered alternate years, beginning with even-numbered Autumn quarters.)

BIOEN 534 Introduction to Biomedical Instrumentation (4) Spelman (Analog) Techniques of biological systems analysis using Fourier and Laplace transforms. Electronic circuit analysis techniques applied to biological problems. Operational amplifiers as interfaces to transducers and as signal processors. Computer-aided design used in both homework and weekly laboratory. Prerequisites: MATH 238, PHYS 121-123, or equivalents.

BIOEN 535 Introduction to Biomedical Instrumentation (4) W Martin (Digital) Instrumentation systems (power supplies, transducers, amplifiers, recording and display devices); techniques of signal/noise enhancement (grounding, shielding, averaging); digital logic and instrumentation; A/D and D/A conversion; use of laboratory computers and laboratory experience in these areas. Biomedical applications. Prerequisite: permission of instructor.

BIOEN 540 Problem Solving in Bioengineering (3) W Foster Introduction to techniques of mathematical modeling. How to use computer methods to solve selected bioengineering problems in data analysis and modeling, and use models to test hypotheses. Hands-on computer experience. Prerequisite: permission of instructor. (Offered even-numbered years.)

BIOEN 550 Mass Transport and Exchange in Biological Systems (3) W Bassingthwaite Review of basic mechanisms of transport; transport through vascular system and blood-tissue exchange processes in organs; integrated systems analysis of closed systems and applications to physiological regulation, medical imaging, and pharmacokinetics. Prerequisites: calculus, introduction to differential equations; cardiovascular physiology; EE network analysis or systems analysis, chemical engineering transport.

BIOEN 555 Introduction to Biomechanics (3) Sp Daly, Luft, Pollack Mechanical properties of biological tissues, with emphasis on the underlying histological bases. Bones, joints, cartilage, blood vessels, connective tissue, muscle, heart. Many laboratory sessions. (Offered odd-numbered years.)

BIOEN 560 Ultrasound in Bioengineering (4) Fundamentals of ultrasonic generation, formation, reception, and treatment of absorption, scattering, and transmission. Conventional and new methodology. (A, B, T-M mode, imaging, Doppler, tissue characterization, and nonlinear effects.) Offered on credit/no credit basis only. Prerequisite: M E 525 or E E 525 for non-bioengineering students or permission of instructor.

BIOEN 561 Biomedical Optics (4) W Burns Advanced theories of optical and spectroscopic measurement with emphasis on biomedical laser applications. Laser principles, instrumentation, and current practice in various biomedical uses, covering such areas as medicine, surgery, and biology. Prerequisite: E E 381 or permission of instructor.

BIOEN 562 Bioelectromagnetics (4) Guy Interaction of radio-frequency electromagnetic fields with biological systems: history, quantities and units, theoretical analysis, instrumentation and measurements, biological effects, medical applications, including cancer detection and therapy, major energy sources, public controversies, public and occupational health protection, international and national safety standards. Prerequisite: E E 381, or permission of instructor.

BIOEN 568 Image-Processing Computer Systems (4) Haralick, Kim, Nelson Components of digital processing computer systems. Two-dimensional filtering and optimal filter design as well as basic image-processing operations. Selected advanced image-processing topics introduced. Individual student project. Joint with E E 568. Prerequisite: permission of instructor.

BIOEN 590 Advanced Topics in Biomaterials (3) Major, controversial issues in application of synthetic materials to medical problems. Blood compatibility, bioadhesion, intraocular lenses, contact lenses, polyurethanes, biodegradation, protein adsorption, corrosion, bone fixation, new materials, artificial heart, medical device regulation. Joint with CH E 590. Prerequisite: 490 or CH E 490.

BIOEN 591 Biotechnology Principles and Applications (3) Sp Hoffman Recombinant DNA and monoclonal antibody processing, product applications, and economics in the medical, veterinary, and agricultural fields covered. Current literature critically reviewed.

BIOEN 592 Surface Analysis (3) W Ratner Understanding of solid surfaces for research and development in microelectronics, catalysis, adhesion, biomaterials, science, wear, and corrosion science. Newer methods available to study surfaces of materials. Electron emission spectroscopies (ESCA, Auger); ion scattering, ion spectroscopic, photon spectroscopic, and thermodynamic methods. Joint with CH E 558.

BIOEN 599 Special Topics in Bioengineering (1-6, max. 15) AWSpS Offered at a graduate level periodically by faculty members within the Center for Bioengineering; concerns areas of research activities with current and topical interest to bioengineers. Prerequisites: undergraduate or graduate courses (or equivalent) determined individually for each special topic. Entry card required.

BIOEN 600 Independent Study or Research (*) AWSpS Offered on credit/no credit basis only.

BIOEN 700 Master's Thesis (*) AWSpS Offered on credit/no credit basis only.

BIOEN 800 Doctoral Dissertation (*) AWSpS Offered on credit/no credit basis only.

Molecular and Cellular Biology

A327 Health Sciences

Graduate Program

The School of Medicine, the College of Arts and Sciences, and the Graduate School offer a program in molecular and cellular biology leading to a Ph.D. degree in the respective sponsoring departments. Faculty members are drawn from the School of Medicine's Departments of Biochemistry, Biological Structure, Microbiology, Pathology, Physiology and Biophysics, and Pharmacology; the College of Arts and Science's Departments of Botany, Genetics and Zoology; the Center for Bioengineering; and the Fred Hutchinson Cancer Research Center.

The goals of the program are to provide students with a sound background in molecular and cellular biology and access to research expertise of all faculty members and laboratories involved in research in this area. The program includes a three-quarter core course (required), three or more quarter-long laboratory rotations conducted within and outside the student's department (required), advanced courses in molecular and cellular biology (elected), and a series of informal workshops and seminars. Critical evaluation of pertinent literature, exposure to current research methods, creative thinking through independent research are stressed. Students are expected to begin active research in their first year.

Students will join concurrently both the program and a "home" department. Because the program does not grant a degree, students must fulfill the requirements of both the program and the department to obtain the Ph.D. degree. This does not impose an additional burden inasmuch as program and departmental requirements overlap.

The 160 faculty members who participate in the program are leaders in the development of technologies of molecular and cellular biology and their application to the understanding of basic biological processes. A list of participating faculty members and their specific research interests is mailed to students who inquire about the program. In general, the faculty's research interests encompass both prokaryotic and eukaryotic (animal and plant) organisms and include such areas as cell structure; cell-cell interactions; cell signaling and cellular messages; cell-matrix interactions; cell, tissue, and organ development and differentiation; membrane biogenesis and cytoskeletal structure and function; chromosome structure and function; protein synthesis and compartmentalization; gene structure and regulation; and the mechanisms by which normal processes are altered in disease states. Such techniques as recombinant DNA analysis, gene transfer, monoclonal antibody production and use, peptide and oligonucleotide synthesis, and microinjection are used in conjunction with the classical methods of biochemistry microbiology, genetics, cell culture, and light and electron microscopy. A wide variety of research facilities are available to program participants.

Financial Aid

The program offers first-year stipend and tuition support at the level established by the University for teaching assistants. Subsequent funding of the student's graduate program is derived from the home department, a training grant, or the research program of the student's thesis supervisor. Students with satisfactory academic progress can anticipate funding for the duration of their program.

Application Process

Students who have emphasized the biological or physical sciences in their undergraduate careers are en-

couraged to apply. Each applicant is requested to send a copy of his or her transcript, GRE scores on the general test and in one specific subject area, and three letters of evaluation from individuals who are familiar with the applicant's work and can evaluate his or her aptitude for graduate study and a career in research in the biological sciences. Applications are considered and students are accepted between January 15 and March 15. Applications received after March 15 are considered only in unusual circumstances. Students enter the program on September 15.

Correspondence and Information

Dr. Karen A. Holbrook, Chairperson
Molecular and Cellular Biology Program, SC-64

Faculty

SCHOOL OF MEDICINE

Biochemistry

Professors

Bornstein, Paul,* 1967, (Medicine), M.D., 1958, New York; regulation of expression of genes coding for secreted macromolecules; structure, function, and regulation of synthesis of connective tissue macromolecules; role of connective tissue in morphogenesis and development; role of growth factors in regulation of expression of matrix macromolecules.

Dale, Beverly A.,* 1972, (Research), (Medicine, Periodontics, Oral Biology), Ph.D., 1968, Michigan; regulation of structural protein expression in epidermis and oral epithelia.

Davie, Earl W.,* 1962, Ph.D., 1954, Washington; protein synthesis in liver, mechanism of blood clotting.

de Haen, Christoph,* 1973, (Research), (Medicine), M.S., 1966, Dr.Sc., 1969, Swiss Federal Institute of Technology (Zurich); mechanisms of action of polypeptide hormones.

Eisenman, Robert N.,* 1976, (Affiliate), (Biochemistry), Ph.D., 1971, Chicago; function of nuclear-acting oncogenes, control of retrovirus replication.

Eyre, David R.,* 1985, (Orthopaedics), Ph.D., 1969, Leeds (England); connective tissue biochemistry, inborn skeletal diseases and cartilage pathology.

Fischer, Edmond H.,* 1953, Ph.D., 1947, Geneva (Switzerland); relationship of protein structure to enzyme activity, hormonal regulation of metabolic processes through protein phosphorylation and calcium.

Giomset, John A.,* 1960, (Medicine), M.D., 1960, Uppsala (Sweden); structure and function of cell membranes, mechanism of receptor-mediated stimulus transduction, regulation of cell proliferation and differentiation.

Gordon, Milton P.,* 1959, (Microbiology), Ph.D., 1953, Illinois; molecular basis of plant tumors, control of gene expression in plants.

Hauschke, Stephen D.,* 1967, (Zoology), Ph.D., 1966, Johns Hopkins; mechanism of embryonic cellular interactions, especially sequential biochemical changes accompanying muscle differentiation; growth factor regulation and gene expression.

Morris, David R.,* 1966, Ph.D., 1964, Illinois; control of eukaryotic cell growth with emphasis on T-lymphocytes, regulation of proliferation-specific gene expression, biosynthesis and biological function of polyamines.

Palminter, Richard D.,* 1974, Ph.D., 1968, Stanford; molecular endocrinology, regulation of gene expression in transgenic mice.

Parson, William W.,* 1967, Ph.D., 1965, Western Reserve; bioenergetics, with particular emphasis on photosynthesis, picosecond spectroscopy.

Petra, Philip H.,* 1966, (Obstetrics and Gynecology), M.S., 1962, Ph.D., 1966, Tulane; molecular basis of steroid-protein interaction, chemical structure and physiological role of the plasma sex steroid-binding protein SBP.

Reid, Brian R.,* 1980, (Chemistry), M.A., 1960, Cambridge (St. Johns); Ph.D., 1965, California (Berkeley); nucleic acid-protein recognition processes in the genetic code; analysis of transfer RNA structure, function, and dynamics using high-resolution nuclear magnetic resonance.

Saari, John C.,* 1974, (Ophthalmology), M.S., 1963, Minnesota; Ph.D., 1970, Washington; metabolism and transport of vitamin A, structure and function of photoreceptor membranes.

Shapiro, Bennett M.,* 1970, M.D., 1964, Jefferson Medical College; biochemistry of fertilization, molecular regulation of cellular behavior, assembly and processing of extracellular matrix.

Teller, David C.,* 1965, Ph.D., 1964, California (Berkeley); physical chemistry of macromolecules, association reactions of proteins.

Walsh, Kenneth A.,* 1958, M.S., 1953, Purdue; Ph.D., 1959, Toronto; amino acid sequence; function, evolution, and regulation of proteins.

Young, Elton T.,* 1969, (Genetics), Ph.D., 1967, California Institute of Technology; regulation of gene activity in the yeast *Saccharomyces cerevisiae*.

Associate Professors

Haschke, Richard H.,* 1972, (Anesthesiology), M.S., 1966, Ph.D., 1969, Illinois (Urbana); biochemical mechanisms of response to traumatic injury.

Herriott, Jon R.,* 1969, Ph.D., 1967, Johns Hopkins; X-ray crystallography of macromolecules, protein structure and function.

Assistant Professors

Hurley, James B.,* 1985, Ph.D., 1979, Illinois (Urbana); molecular biology of guanyl nucleotide binding proteins involved in signal transduction in eukaryotic cells.

Klevit, Rachel E.,* 1986, D.Phil., 1981, Oxford (England); protein structure and changes in conformation related to function as studied by magnetic resonance spectroscopy.

Perlmutter, Roger M.,* 1984, (Medicine), M.D., 1979, Ph.D., 1979, Washington (St. Louis); regulation of mammalian antibody production, molecular genetics of lymphocyte differentiation, molecular biology of neoplasia.

Bioengineering

Professors

Bassingthwaite, James B.,* 1975, M.D., 1955, Toronto; Ph.D., 1964, Minnesota; cardiovascular mass transport and ion exchanges, simulation analysis of integrated systems.

Hoffman, Allan S.,* 1973, (Chemical Engineering), M.S.Ch.E., 1955, Sc.D., 1957, Massachusetts Institute of Technology; synthesis, characterization, and biological interaction of biomaterials, mechanics of neural tissues, applied polymers.

Horbett, Thomas A.,* 1973, (Research), (Chemical Engineering), Ph.D., 1970, Washington; interactions of cells and proteins with foreign materials, insulin-delivery devices.

Johnson, Dale E.,* 1976, (Materials Science and Engineering), M.S., 1967, Ph.D., 1971, Chicago; elemental microanalysis of biological systems, electron energy loss spectrometry.

Pollack, Gerald H.,* 1968, Ph.D., 1968, Pennsylvania; molecular mechanisms of muscular contraction.

Ratner, Buddy D.,* 1972, (Chemical Engineering), Ph.D., 1972, Polytechnic Institute of Brooklyn; synthesis and characterization of polymeric biomaterials for cardiovascular, ophthalmologic, and drug-delivery applications; surface analysis by ESCA, drug-delivery systems; silane treatment of surfaces.

Associate Professors

- Cantino, Marie,* 1984, (Research), Ph.D., 1981, Washington; muscle ultrastructure and myocardial calcium regulation, X-ray microanalysis.
- Holloway, G. Allen, Jr.,* 1972, (Research), M.D., 1964, Harvard; clinical measurement of blood flow.
- MacKenzie, Alan P.,* 1976, (Research), (Biological Structure), Ph.D., 1958, London (England); physical and biochemical cryobiology, biotechnological applications of freezing and freezing-related procedures.
- Verdugo, Pedro J.,* 1975, (Biological Structure), M.S., 1958, M.D., 1965, State University of Chile; micro-rheology and control of ciliary and flagellar motion, biomechanics of cervical and respiratory mucus, instrumentation in laser scattering.

Biological Structure**Professors**

- Hendrickson, Anita E.,* 1965, (Ophthalmology), Ph.D., 1964, Washington; structure and development of the visual system.
- Holbrook, Karen A.,* 1972, (Medicine), M.S., 1966, Wisconsin; Ph.D., 1972, Washington; structure, function, and development of human skin in normal fetuses and as modified by inherited skin disease.
- Koehler, James K.,* 1963, M.S., 1958, Ph.D., 1961, California (Berkeley); cellular changes in gametes during fertilization.
- Luft, John H.,* 1956, M.D., 1953, Washington; cell ultrastructure, fast-fixation methods.
- Pollack, Sylvia B.,* 1973, (Research), Ph.D., 1967, Pennsylvania; tumor and cellular immunology.
- Rosse, Cornelius,* 1967, M.B.Ch.B., 1964, M.D., 1974, D.Sc., 1983, Bristol (England); differentiation of hematopoietic cells and lymphocytes.
- Westrum, Lesnick E.,* 1966, (Neurological Surgery), M.D., 1963, Washington; Ph.D., 1966, University College (London); neuroplasticity, synaptology, and dental projections.

Associate Professors

- Adman, Elinor T.,* 1971, (Research), M.A., 1964, Ph.D., 1967, Brandeis; structure of blue copper proteins, iron sulfur proteins, electron transport.
- Baskin, Denis G.,* 1979, (Research), (Medicine), Ph.D., 1969, California (Berkeley); regulation of brain function by peptides.
- Bolender, Robert P.,* 1975, M.A., 1965, Columbia; Ph.D., 1970, Harvard; integration of cellular structure and function, development of stereological methods.
- Clark, John I.,* 1982, Ph.D., 1974, Washington; structural basis of cataracts, applications of computer technology to biochemical education.
- Farr, Andrew G.,* 1982, Ph.D., 1975, Chicago; cell interactions governing lymphocyte production and function.
- Lee, Minako Y.,* 1977, (Research), (Medicine), M.D., 1976, Tokyo Women's College (Japan); cell differentiation and production in the hematopoietic system.
- Nameroff, Mark A.,* 1970, M.D., 1965, Ph.D., 1966, Pennsylvania; cell differentiation of skeletal muscle.
- Prothero, John W.,* 1965, Ph.D., 1960, Western Ontario; morphometrics and computer modeling in diverse biological systems.
- Sage, E. Helene,* 1980, Ph.D., 1977, Utah; vascular biology, connective tissue proteins, extracellular matrix.
- Stenkamp, Ronald E.,* 1981, M.Sc., 1971, Ph.D., 1975, Washington; crystallographic and structure analysis of macromolecules, molecular dynamics calculations, computer graphics related to macromolecular structure.
- Yoshimura, Fayth K.,* 1980, (Research), Ph.D., 1972, Yale; retroviral transformation of hematopoietic cells.

Assistant Professors

- Broderick, Stevan H.,* 1967, Ph.D., 1967, New York State (Buffalo); structural basis of neuronal function, with special reference to neurotransmitters.
- Harris, Roger M.,* 1982, Ph.D., 1975, Washington; computer graphics and magnetic resonance imaging in the central nervous system, local circuits in somatosensory systems of mammals (morphometrics and computer modeling, neurobiology).
- Muller, Charles H.,* 1983, (Research), (Obstetrics and Gynecology), M.A., 1972, Colorado; Ph.D., 1976, California (Berkeley); differentiation of male germ cells, hormonal regulation of sperm maturation.
- Sherk, Helen A.,* 1982, Ph.D., 1978, Massachusetts Institute of Technology; structure and function of the mammalian visual system, particularly the visual cortex.

Senior Research Associate

- Sieker, Larry C.,* 1981, (Research), Ph.D., 1981, Washington; molecular structure of antitumor and metalloproteins and electron transport proteins.

Microbiology**Professors**

- Champoux, James J.,* 1972, (Genetics), Ph.D., 1970, Stanford; DNA replication, tumor virology.
- Corey, Lawrence,* 1977, (Laboratory Medicine, Medicine, Pediatrics), M.D., 1971, Michigan; epidemiology, therapy, and cellular immune response to herpes virus; rapid viral diagnosis.
- Groman, Neal B.,* 1950, Ph.D., 1950, Chicago; medical bacteriology, bacteriophage, microbial genetics.
- Hakomori, Sen-Itiro,* 1967, (Biochemistry, Chemistry), Pathobiology, 1952, D.Med.Sci., 1956, Tohoku (Japan); structure and function of glycosphingolipids and glycoprotein in cell membranes and their roles in development and transformation.
- Hellstrom, Ingegerd E.,* 1966, (Pathology), M.D., 1964, Ph.D., 1966, Karolinska Institute (Sweden); tumor immunology and transplantation immunology.
- Nester, Eugene W.,* 1962, Ph.D., 1959, Case Western Reserve; bacteria-plant interactions, plant molecular biology.
- Staley, James T.,* 1971, (Environmental Studies), M.S., 1963, Ohio; Ph.D., 1967, California (Davis); general microbiology; biology of budding, prosthecate, and gas-vacuolated bacteria; microbial ecology; bacterial polymers.
- Whiteley, Helen R.,* 1956, M.A., 1947, Texas; Ph.D., 1951, Washington; regulation of transcription, development of *Bacillus subtilis* phages, protein-nucleic acid interactions.

Associate Professors

- Clark, Edward A.,* 1979, Ph.D., 1977, California (Los Angeles); molecular and cellular immunology, emphasizing lymphocyte surface molecules and immunologic disease.
- Lara, Jimmie C.,* 1972, M.S., 1967, California State (Los Angeles); Ph.D., 1970, California (Riverside); microbial physiology and crytology, sporulation and gas vesicle synthesis and regulation.
- Linal, Maxine L.,* 1974, (Research), (Pathology), Ph.D., 1970, Tufts; retroviral-host cell interactions, retroviral mediated transformation.
- Rohrschneider, Larry R.,* 1978, (Research), (Pathology), Ph.D., 1973, Wisconsin; mechanisms of transformation by avian and feline RNA tumor viruses; localization, identification, and function of transforming proteins.

Assistant Professors

- Gallatin, William Michael,* 1986, (Affiliate), Ph.D., 1981, Alberta (Canada); molecular basis for recognition of endothelial cells by lymphocytes, heterotypic cell-cell adhesion in hematopoiesis.

Leigh, John A.,* 1985, M.S., 1979, Ph.D., 1983, Illinois; bacterial physiology, genetics, and biochemistry; bacteria-plant interactions.

Lory, Stephen,* 1984, Ph.D., 1980, California (Los Angeles); biochemistry and genetics of microbial virulence factors.

Moseley, Stephen L.,* 1985, (Pediatrics), M.S., 1978, Catholic University of America; Ph.D., 1981, Washington; molecular basis of pathogenesis in *E. coli* diarrhea.

Wong, Timothy Chee-Hing,* 1983, Ph.D., 1979, Texas (Dallas); pathogenesis of slow viruses, tumor virology.

Pathology**Professors**

- Benditt, Earl P.,* 1957, (Emeritus), M.D., 1941, Harvard; atherosclerosis, mutagenesis, carcinogenesis.
- Byers, Peter H.,* 1977, (Medicine), M.D., 1969, Case Western Reserve; extracellular matrix synthesis, genetic disorders of collagen metabolism, secretion of collagen.
- Groudine, Mark T.,* 1979, (Radiation Oncology), M.D., 1975, Ph.D., 1976, Pennsylvania; regulation of gene expression during development and oncogenesis, molecular biology of spermatogenesis, chromatin structure.
- Hellstrom, Karl E.,* 1966, (Microbiology), M.D., 1964, Ph.D., 1964, Karolinska Institute (Sweden); oncology, cancer immunology.
- Loeb, Lawrence A.,* 1978, (Biochemistry), M.D., 1961, New York; Ph.D., 1967, California (Berkeley); fidelity of DNA replication, molecular basis of mutagenesis, chemical carcinoma.
- Martin, George M.,* 1957, (Genetics), M.D., 1953, Washington; somatic-cell genetics, pathobiology of aging.
- McDougall, James K.,* 1979, (Research), M.Sc., 1970, Ph.D., 1971, Birmingham (England); transformation and oncogenicity of herpes viruses and human papilloma viruses.
- Narayanan, A. Sampath,* 1971, (Research), M.Sc., 1963, Ph.D., 1967, Madras (India); pathology and biochemistry of connective tissues and mechanisms of destruction in periodontal disease, cell growth regulation.
- Neiman, Paul E.,* 1968, (Medicine), M.D., 1964, Washington; cellular and viral oncogenes, retrovirus biology and molecular biology, normal and neoplastic B-cell development.
- Norwood, Thomas H.,* 1974, M.D., 1968, Maryland; somatic cell genetics, pathobiology of aging, mitotic cell cycle regulatives.
- Page, Roy C.,* 1967, (Periodontics), D.D.S., 1957, Maryland; Ph.D., 1967, Washington; connective-tissue pathology, chronic inflammation, immunopathology, periodontal disease, fibroblast growth regulation.
- Ross, Russell,* 1962, (Biochemistry), D.D.S., 1955, Columbia; Ph.D., 1963, Washington; atherosclerosis, growth factors, regulation of cell growth-regulatory factors, connective tissue pathology, wound healing.
- Schwartz, Stephen M.,* 1974, (Bioengineering), M.D., 1967, Boston; Ph.D., 1973, Washington; atherosclerosis, growth control of vascular cells; vascular pathology, hypertension, cell kinetics.

Associate Professors

- Bowen-Pope, Daniel F.,* 1982, Ph.D., 1979, California (Berkeley); mechanism of action of polypeptide growth factors.
- Brown, Joseph P.,* 1982, (Affiliate), Ph.D., 1974, Cambridge (England); genetic regulation of tumor-specific cell-surface proteins.
- Disteche, Christine,* 1980, Ph.D., 1976, Liege (Belgium); molecular genetics, human and mouse cytogenetics.

Galloway, Denise, 1982, (Research), Ph.D., 1976, City (New York); molecular pathogenesis of herpes simplex virus and human papilloma virus infections.

Gown, Allen C.,* 1979, M.D., 1975, Albert Einstein; immunocytochemistry, monoclonal antibodies and cytoskeletal proteins.

Lewis, James B.,* 1982, (Affiliate), M.A., 1968, Ph.D., 1972, Harvard; cellular transformation by adenovirus, control of oncogene expression by viral proteins.

Margolis, Robert L.,* 1982, (Affiliate), (Biochemistry), Ph.D., 1975, Wesleyan; cytoskeletal structure, microtubule assembly and its control by associated proteins; centromeres.

Rabinovitch, Peter S.,* 1981, M.D., 1979, Ph.D., 1980, Washington; cell proliferation in aging and neoplasia, flow cytometry, cell cycle kinetics, immunosenescence, proliferative abnormalities in preneoplastic diseases.

Salk, Darrell J.,* 1980, (Pediatrics), M.D., 1974, Johns Hopkins; human cytogenetics, chromosomal instability syndromes.

Smith, Gerald R.,* 1983, (Affiliate), (Genetics), Ph.D., 1970, Massachusetts Institute of Technology; mechanism and control of homologous genetic recombination in bacteria, gene expression during early development.

Wight, Thomas N.,* 1978, M.S., 1968, Ph.D., 1972, New Hampshire (Durham); proteoglycans in pathology; atherosclerosis; cancer; aging.

Wolf, Norman S.,* 1968, (Animal Medicine), D.V.M., 1953, Kansas State; Ph.D., 1960, Northwestern; hematopoiesis control, stem-cell biology.

Assistant Professors

Gajdusek, Corinne M.,* 1981, (Research), (Surgery), Ph.D., 1972, Colorado; endothelial-cell biology and atherosclerosis.

Monnat, Raymond J.,* 1982, M.D., 1976, Chicago; molecular genetic analysis of human somatic mutation, oxygen-induced mutation in human somatic cells; heritable human defects in the production of oxygen radicals; application of molecular genetic techniques to human disease diagnosis.

Nepom, Gerald T.,* 1982, (Affiliate), Ph.D., 1977, M.D., 1978, Washington; immunogenetics, immunoregulation, and neuroimmunology.

Pharmacology

Professors

Beavo, Joseph A.,* 1977, Ph.D., 1970, Vanderbilt; mechanism of action of cyclic nucleotides, roles of cyclic nucleotide phosphodiesterase isozymes in regulating cyclic nucleotide action and metabolism.

Catterall, William A.,* 1977, Ph.D., 1972, Johns Hopkins; molecular basis of electrical excitability; biochemical studies of purified components of electrically excitable membranes; nerve and muscle cells in culture; molecular biology of ion channels.

Horita, Akira,* 1954, (Psychiatry and Behavioral Sciences), M.S., 1951, Ph.D., 1954, Washington; drugs acting on the CNS; neuropeptides; central regulation of peripheral autonomic function.

Juchau, Mont R.,* 1969, M.S., 1963, Washington State; Ph.D., 1966, Iowa; developmental pharmacology, drug metabolism.

Krebs, Edwin G.,* 1948, (Biochemistry), M.D., 1943, Washington (St. Louis); regulation of cellular functions by protein phosphorylation-dephosphorylation, mechanism of action of growth factor receptor protein kinases; protein kinase structure-function relations.

Storm, Daniel R.,* 1978, M.S., 1967, Washington; Ph.D., 1971, California (Berkeley); regulation of cyclic nucleotide metabolism, mechanism for hormonal stimulation of adenylate cyclase; structure and function of biological membranes.

Vincenzi, Frank,* 1967, M.S., 1962, Ph.D., 1965, Washington; membranes and membrane transport of calcium and the effects of drugs on these processes; use of human red blood cells as models of normal cellular function and abnormal function in disease.

Associate Professors

Dorsa, Daniel M.,* 1979, (Research), (Medicine, Psychiatry and Behavioral Sciences), Ph.D., 1977, California (Davis); neuropeptide pharmacology and neurochemistry with special emphasis on vasopressin and endorphinergic neuronal systems of the brain.

McKnight, G. Stanley,* 1979, Ph.D., 1976, Stanford; molecular events that modulate the transcription of specific genes, protein kinase gene function in transfected cells and transgenic mice.

Nathanson, Neil M.,* 1979, Ph.D., 1975, Brandeis; molecular studies of neurotransmitter functions, regulation and function of neurotransmitter receptors and effector proteins, expression and regulation of receptors and coupling proteins.

Watson, Eileen L.,* 1972, (Research), (Oral Biology), Ph.D., 1970, Utah; mechanisms of salivary gland secretion with emphasis on intracellular messengers calcium cAMP and cGMP, bacterial cell physiology.

Assistant Professors

Chavkin, Charles,* 1984, Ph.D., 1982, Stanford; neurophysiology of opiate receptors, electrophysiology and neurochemistry of opiate receptor function, opiate receptor diversity and regulation of function.

Moon, Randall T.,* 1985, Ph.D., 1982, Washington; mechanisms leading to segregation of mRNAs to distinct intracellular regions, dissecting the functions of cytoskeletal proteins by overexpression, inhibition of expression by anti-sense RNA; molecular neurobiology.

Omliecinski, Curtis J.,* 1983, (Environmental Health), Ph.D., 1980, Washington; molecular biology of enzyme systems involved in bioactivation and detoxication of xenobiotics; developmental and tissue-specific regulation of expression of these enzymes.

Physiology and Biophysics

Professors

Almers, Wolfhard,* 1974, Ph.D., 1971, Rochester; study of secretion and exocytosis.

Detwiler, Peter B.,* 1976, Ph.D., 1970, Georgetown; signal transduction in photoreceptors.

Gordon, Albert M.,* 1964, Ph.D., 1961, Cornell; mechanisms of calcium regulation of muscle contraction.

Hille, Bertil,* 1968, Ph.D., 1967, Rockefeller; ion channels of excitable membranes, receptors and modulation.

Stahl, William L.,* 1967, (Medicine), Ph.D., 1963, Pittsburgh; structure and function of Na, K-ATPase.

Steiner, Robert A.,* 1977, (Obstetrics and Gynecology, Zoology), Ph.D., 1975, Oregon; regulation of neuropeptide gene expression in the brain.

Stirling, Charles E.,* 1968, Ph.D., 1966, State University of New York (Upstate); properties of transport proteins in *Xenopus* oocytes injected with mRNA from mammalian cells.

Associate Professor

Bothwell, Mark A.,* 1985, Ph.D., 1975, California (Berkeley); nerve growth factor, biology and mechanism of action.

Assistant Professor

Carlson, Steven S.,* 1985, Ph.D., 1975, California (Berkeley); identification and study of nerve terminal anchorage proteins during nerve regeneration and development.

COLLEGE OF ARTS AND SCIENCES

Botany

Professors

Bendich, Arnold J.,* 1970, (Genetics), Ph.D., 1969, Washington; molecular genetics of mitochondria and chloroplasts, plant genetic engineering.

Cattolico, Rose A.,* 1975, M.A., 1968, Temple; Ph.D., 1973, State University of New York at Stony Brook; molecular evolution of chloroplast DNA, topoisomerases; transformation of macroalgae.

Cleland, Robert E.,* 1964, Ph.D., 1957, California Institute of Technology; control of ATPase activity of H⁺-excretion in plant cells by hormones; control of cell-wall mechanical properties.

Genetics

Professors

Fangman, Walton L.,* 1967, Ph.D., 1965, Purdue; molecular genetics: control of replication of yeast chromosomes, plasmids, and mitochondrial genome.

Gallant, Jonathan A.,* 1961, Ph.D., 1961, Johns Hopkins; molecular genetics, control mechanisms in bacteria, accuracy of translation.

Gartler, Stanley M.,* 1957, (Medicine), Ph.D., 1952, California (Berkeley); mammalian somatic cell genetics with emphasis on the mechanism of X-chromosome inactivation.

Hartwell, Leland H.,* 1968, Ph.D., 1964, Massachusetts Institute of Technology; genetic analysis of chromosome transmission: formal and molecular genetic techniques utilized to identify the gene products controlling replication and segregation of eukaryotic chromosomes during mitosis.

Motulsky, Arno G.,* 1953, (Medicine), M.D., 1947, Illinois; clinical population genetics and human biochemical genetics, delineation and mechanisms of disease susceptibility, pharmacogenetics, study of molecular genetics of lipid and color vision disorders.

Pious, Donald A.,* 1964, (Pediatrics), M.D., 1956, Pennsylvania; major histocompatibility complex (MHC) gene regulation; mapping functional sites on MHC molecules; molecular basis for MHC-autoimmune disease associations; somatic cell genetics.

Associate Professors

Furlong, Clement E.,* 1977, (Research), (Medicine), Ph.D., 1968, California (Davis); human biochemical genetics and biochemistry of membrane transport systems.

Sibley, Carol H.,* 1976, M.A., 1966, M.S., 1969, Rochester; Ph.D., 1974, California (San Francisco); mammalian cell genetics: function, structure, and regulation of cell membrane receptors in differentiation of normal cells and tumor counterparts.

Assistant Professors

Garber, Richard L.,* 1983, M.Phil., 1976, Ph.D., 1977, Yale; developmental genetics of *Drosophila*: molecular, genetic, and embryological techniques employed to study fly development.

Zakian, Virginia,* 1982, (Affiliate), (Pathology), 1975, Yale; control of chromosomal replication and segregation in yeast, telomere structure and function.

Zoology

Professors

Laird, Charles D.,* 1971, (Genetics), Ph.D., 1968, Stanford; cell and developmental biology.

Odell, Garrett M.,* 1985, Ph.D., 1972, Johns Hopkins; mathematical modeling of biological phenomena at the cellular and organismic levels.

Reeder, Ronald,* 1981, (Affiliate), Ph.D., 1965, Massachusetts Institute of Technology; transcription of Xenopus ribosomal RNA and its control during development, promoter structure and activating factors.

Riddiford, Lynn M.,* 1973, Ph.D., 1961, Cornell; insect development and physiology, invertebrate endocrinology.

Schroeder, Thomas E.,* 1974, (Research), Ph.D., 1968, Washington; fine structure and biochemistry of contractile systems; control and mechanisms of cell division, oocyte maturation, structural aspects of early embryonic development.

Schubiger, Gerold A.,* 1972, (Genetics), Ph.D., 1967, Zurich; developmental biology of insects, embryonic determination in *Drosophila*, pattern formation in imaginal disks.

Truman, James W.,* 1973, M.A., 1969, Ph.D., 1970, Harvard; hormones and invertebrate behavior, insect physiology, circadian rhythms.

Weintraub, Harold M.,* 1979, (Affiliate), (Pathology), Ph.D., 1971, M.D., 1973, Pennsylvania; chromatin structure, replication and function, control of gene expression during early development.

Associate Professors

Bakken, Aimee H.,* 1973, Ph.D., 1970, Iowa; developmental and cell biology, chromosome structure and function in oogenesis and embryogenesis, developmental genetics.

Hille, Merrill B.,* 1976, Ph.D., 1965, Rockefeller; cell and developmental biology, RNA and protein synthesis, fertilization and embryogenesis of echinoderms, cell adhesion and its role in development using sea urchin embryos as a model.

Moody, William J.,* 1982, Ph.D., 1977, Stanford; single-cell electrophysiology.

Assistant Professor

Wakimoto, Barbara T.,* 1984, (Genetics), Ph.D., 1981, Indiana; developmental biology; relationship of gene function and chromosome organization using *Drosophila*.

Neurobiology

F427 Health Sciences

Graduate Program

The Departments of Physiology and Biophysics, Pharmacology, and Biological Structure of the School of Medicine and the Department of Zoology of the College of Arts and Sciences offer an interdepartmental training program in neurobiology. The program leading to a Ph.D. degree provides a broad background in basic neurobiology, in-depth experience in one of the participating academic disciplines, and extensive training in the application of modern experimental methods to fundamental problems in neurobiology.

Upon admission to the program, students designate a tentative choice of departmental affiliation. After entry, they may alter their choice of departmental pathway among the four participating departments. Students must fulfill basic course requirements of their designated department and receive from that department a Ph.D. degree with a stated emphasis in neurobiology. Exceptional students whose objectives are not met within the departmental pathways in neurobiology may develop an individual Ph.D. program with the guidance of the program's faculty.

A broad series of courses that spans the various disciplines of neurobiology is offered as part of the interdisciplinary program. Critical evaluation of the original literature and exposure to current experimental meth-

ods are stressed. Students are expected to begin active research during their first year. Research opportunities for students encompass many areas of neurobiology. Participating in the program are more than forty faculty members, who are active in the areas of vertebrate and invertebrate neurophysiology, membrane biophysics, neuropharmacology, molecular neurobiology, neuroanatomy, and developmental neurobiology.

Application Process

Students who have emphasized either biological or physical sciences in their undergraduate careers are invited to apply. Applicants are requested to send a copy of their academic record; GRE scores, including, if possible, scores on the subject test in chemistry, physics, or biology; and three letters of recommendation from the persons who can best evaluate their potential for success in graduate study. New students enter the graduate program September 15. Applications are considered and students are accepted between January 15 and March 15. Applications received after March 15 are considered only in unusual circumstances.

Research Facilities

Sponsoring departments are located in the Health Sciences Center and in the College of Arts and Sciences. Because the program is interdepartmental, extensive research facilities in all areas of neurobiology are available to the student. The member departments maintain electronics shop, machine shop, and computer facilities, and equipment for ultrastructural studies is readily available. Students also may employ the resources of the Regional Primate Research Center and the Friday Harbor Laboratories.

Financial Aid

The program offers full stipend and tuition support to students through traineeships derived from NIH training grants and private foundation support and through research assistantships supported by the University or research grant monies. Students with satisfactory academic progress can anticipate that funding will continue for the duration of their program.

Correspondence and Information

Dr. William A. Catterall
Department of Pharmacology, SJ-30

Faculty

Director

William A. Catterall

Professors

Almers, Wolfhard,* 1974, (Physiology and Biophysics), Ph.D., 1971, Rochester; ion channels in muscle, calcium regulation of secretion and contraction.

Anderson, Marjorie E.,* (Physiology and Biophysics, Rehabilitation Medicine), Ph.D., 1969, Washington; CNS control of movement and posture.

Beavo, Joseph A.,* 1977, (Pharmacology), Ph.D., 1970, Vanderbilt; cyclic nucleotides in visual coupling, cyclic nucleotide phosphodiesterases.

Berger, Albert J.,* 1977, (Physiology and Biophysics), M.A., 1965, Ph.D., 1967, Princeton; Ph.D., 1976, California (San Francisco); neural control of respiration.

Binder, Marc D.,* 1978, (Physiology and Biophysics), M.S., 1972, Ph.D., 1974, Southern California; control of motor function.

Catterall, William A.,* 1977, (Pharmacology), Ph.D., 1972, Johns Hopkins; molecular basis of electrical excitability, biochemistry, cellular and molecular biology of ion channels and their genes.

Crill, Wayne E.,* 1967, (Medicine, Physiology and Biophysics), M.D., 1962, Washington; electrophysiology of CNS neurons, mechanisms of epilepsy.

Detwiler, Peter B.,* 1976, (Physiology and Biophysics), Ph.D., 1970, Georgetown; physiology of sensor receptors, light transduction by photoreceptors.

Edwards, John S.,* 1967, (Zoology), M.Sc., 1956, Auckland (Australia); Ph.D., 1960, Cambridge; development, function, and evolution of the insect nervous system, axonal guidance, cell lineage.

Fetz, Eberhard E.,* 1969, (Physiology and Biophysics), Ph.D., 1966, Massachusetts Institute of Technology; functional organization of primate motor cortex.

Fuchs, Albert F.,* 1969, (Physiology and Biophysics), M.S., 1961, Drexel; Ph.D., 1966, Johns Hopkins; CNS control of eye movement.

Hendrickson, Anita E.,* 1965, (Biological Structure, Ophthalmology), Ph.D., 1964, Washington; neuroanatomical development of the primate visual system including retina, thalamus, and visual cortex.

Hille, Bertil,* 1968, (Physiology and Biophysics), Ph.D., 1967, Rockefeller; ion channels in nerve and muscle, pharmacology of excitable membranes.

Horita, Akira,* 1954, (Pharmacology, Psychiatry and Behavioral Sciences), M.S., 1951, Ph.D., 1954, Washington; psychoactive drugs, thyrotropin-releasing hormone as a neurotransmitter in brain.

Palka, John M.,* 1969, (Zoology), Ph.D., 1965, California (Los Angeles); arthropod neurobiology, synaptic neurobiology and development in insects.

Riddiford, Lynn M.,* 1973, (Zoology), Ph.D., 1961, Cornell; invertebrate endocrinology, developmental neurobiology of insects.

Rubel, Edwin W.,* 1986, (Physiology and Biophysics, Otolaryngology), M.S., 1967, Ph.D., 1969, Michigan State; developmental physiology and anatomy of the auditory system.

Schwartzkroin, Philip A.,* 1978, (Neurological Surgery, Physiology and Biophysics), Ph.D., 1972, Stanford; electrophysiology and pharmacology of hippocampus, mechanisms of epilepsy.

Schwindt, Peter C.,* 1978, (Physiology and Biophysics), M.S., 1965, Massachusetts Institute of Technology; Ph.D., 1972, Washington; electrophysiology of CNS neurons.

Smith, Orville A., Jr.,* 1959, (Physiology and Biophysics), M.A., 1950, Ph.D., 1953, Michigan State; CNS control of cardiovascular system.

Stahl, William L.,* 1967, (Medicine, Physiology and Biophysics), Ph.D., 1963, Pittsburgh; Na, K-ATPase in neurons and glia, protein-lipid interactions.

Steiner, Robert A.,* 1977, (Obstetrics and Gynecology, Physiology and Biophysics, Zoology), Ph.D., 1975, Oregon; neuroendocrine regulation of pituitary function in the reproductive system.

Storm, Daniel R.,* 1978, (Pharmacology), M.S., 1967, Washington; Ph.D., 1971, California (Berkeley); cyclic AMP and Ca²⁺ regulation in the brain, molecular properties of adenylate cyclase.

Towe, Arnold L.,* 1957, (Physiology and Biophysics), Ph.D., 1953, Washington; physiology of CNS, pyramidal system and somatosensory system.

Truman, James W.,* 1973, (Zoology), M.A., 1969, Ph.D., 1970, Harvard; hormones and invertebrate behavior, insect neurobiology, circadian rhythms.

Westrum, Lesnick E.,* 1966, (Biological Structure, Neurological Surgery), M.D., 1963, Washington; Ph.D., 1966, University College (London); synaptic ultrastructure in neural development and plasticity, trigeminal dental projections.

Willows, A. O. Dennis,* 1969, (Zoology), Ph.D., 1967, Oregon; invertebrate neurophysiology, neural mechanisms underlying invertebrate behavior.

Winn, H. Richard, 1983, (Neurological Surgery, Physiology and Biophysics), M.D., 1968, Pennsylvania; regulation of the cerebral vasculature by neurotransmitters and neuromodulators.

Associate Professors

Baskin, Denis G.,* 1979, (Research), (Biological Structure, Medicine), Ph.D., 1969, California (Berkeley); neuroendocrinology, CNS functions of neuropeptides and peptide hormones, localization of peptide receptors.

Bothwell, Mark A.,* 1985, (Physiology and Biophysics), Ph.D., 1975, California (Berkeley); nerve growth factor and its receptors, genes encoding nerve growth factor receptor.

Byers, Margaret R., 1971, (Research), (Anesthesiology, Biological Structure), Ph.D., 1969, Harvard; structure and function of sensory receptors, particularly those mediating dental touch and pain.

Dorsa, Daniel M.,* 1979, (Research), (Medicine, Pharmacology), Ph.D., 1977, California (Davis); neuropeptide pharmacology, vasopressin as a neurotransmitter in brain.

McKnight, G. Stanley,* 1979, (Pharmacology), Ph.D., 1976, Stanford; regulation of gene expression, cAMP-dependent protein kinases in neurons.

Nathanson, Neil M.,* 1979, (Pharmacology), Ph.D., 1975, Brandeis; receptors for neurotransmitters, regulation of muscarinic acetylcholine receptors.

Sarthy, P. Vijay, 1980, (Research), (Ophthalmology, Physiology and Biophysics), M.S., 1967, Mysore (India); Ph.D., 1973, Bombay (India); development of the retina, cell structure, cell surface antigens on retinal neurons.

Assistant Professors

Carlson, Steven S.,* 1985, (Physiology and Biophysics), Ph.D., 1975, California (Berkeley); synaptic function, extracellular matrix molecules in synapse specificity.

Chavkin, Charles,* 1984, (Pharmacology), Ph.D., 1982, Stanford; endogenous opioid peptide effects on neuronal physiology and opioid receptor regulation.

Harris, Roger M.,* 1982, (Biological Structure), Ph.D., 1975, Washington; cellular neuroanatomy of the mammalian thalamus.

Moody, William J.,* 1982, (Zoology), Ph.D., 1977, Stanford; ion channels in oocytes and developing embryos, electrophysiology of early neural development.

Sherk, Helen A.,* 1982, (Biological Structure), Ph.D., 1978, Massachusetts Institute of Technology; functional neuroanatomy of mammalian visual cortex.

Faculty

Director

E. David Ford

Professors

Bare, B. Bruce,* 1969, (Forest Resources), M.S., 1965, Minnesota; Ph.D., 1969, Purdue; systems analysis, operations research, computer modeling, forest land management, forest valuation and taxation.

Bevan, Donald E., 1959, (Emeritus), (Fisheries, Marine Studies), Ph.D., 1959, Washington; resource management, computer simulation, biometrics.

Chapman, Douglas G.,* 1949, (Emeritus), (Fisheries), M.A., 1940, Ph.D., 1949, California (Berkeley); biometrics, population dynamics.

Dowdle, Barney,* 1962, (Economics, Forest Resources), M.F., 1958, Ph.D., 1962, Yale; growth and development of forest products industries, public forest land management.

Ford, E. David,* 1985, (Fisheries), Ph.D., 1968, University College (London); simulation of plant physiological and ecological processes, analysis of spatial processes.

Gallucci, Vincent F.,* 1972, (Biostatistics, Fisheries), M.S., 1966, State University of New York (Buffalo); Ph.D., 1971, North Carolina State; biomathematics and population dynamics.

Hatheway, William H.,* 1969, (Emeritus), (Forest Resources), S.M., 1952, Chicago; M.F., 1954, Ph.D., 1956, Harvard; tropical forest ecology, biometrics, dendrology and model building, cold hardiness.

Mathews, Stephen B.,* 1969, (Fisheries), M.A., 1962, California (Berkeley); Ph.D., 1967, Washington; quantitative fishery management.

Pickford, Stewart G.,* 1976, (Forest Resources), M.S.F., 1966, Ph.D., 1972, Washington; forest fire science, wildland fire management.

Schreuder, Gerard F.,* 1971, (Forest Resources), M.S., 1960, Wageningen; M.S., 1967, North Carolina State; Ph.D., 1968, Yale; photogrammetry and management of economics and statistics.

Swartzman, Gordon L.,* 1973, (Research), (Fisheries), M.S.E.E., 1965, Ph.D., 1969, Michigan; ecological modeling, quantitative natural resource management.

Associate Professors

Anderson, James J.,* 1981, (Research), (Fisheries), Ph.D., 1977, Washington; fisheries and oceanography.

Bledsoe, Lewis J.,* 1972, (Research), (Fisheries), M.S., 1968, Ph.D., 1976, Colorado; systems ecology.

Briggs, David G.,* 1980, (Forest Resources), M.F., 1968, Yale; Ph.D., 1980, Washington; wood utilization, computer applications in wood processing.

Conquest, Loveday L.,* 1978, (Biostatistics, Fisheries), M.S., 1972, Stanford; Ph.D., 1975, Washington; statistical analysis of water pollution and community ecology data, aquatic ecosystems, biostatistics.

Greulich, Frances E.,* 1977, (Forest Resources), M.S., 1967, Ph.D., 1976, California (Berkeley); logging engineering.

Johnson, Jay A.,* 1984, (Forest Resources), M.S., 1970, State University of New York (Syracuse); Ph.D., 1973, Washington; mechanical and physical properties of wood and wood composite material.

Rustagi, Krishna P.,* 1973, (Forest Resources), M.Sc., 1953, Agra (India); M.F., 1971, Ph.D., 1973, Yale; operations research application to problems of forest management planning.

Skalski, John R.,* 1987, (Fisheries), M.S., 1976, M.S., 1978, Ph.D., 1985, Cornell; biometrician, aquatic monitoring, wildlife census, design and analysis of field studies, mark-recapture experiments.

Assistant Professors

Cundy, Terrance W.,* 1983, (Forest Resources), M.S., 1980, Minnesota; Ph.D., 1983, Utah State; hydrology and watershed management.

Maguire, Douglas A., 1986, (Forest Resources), M.S., 1979, Rutgers; M.S., 1986, Ph.D., 1986, Oregon State; growth and yield modeling, forest biometrics, crown development.

Ribic, Christine A.,* 1985, (Research), (Fisheries), M.S., 1980, M.S., 1983, Ph.D., 1984, Minnesota; population ecology, biometrics, marine mammals and birds.

Course Descriptions

Courses for Undergraduates

Q SCI 291, 292 Analysis for Biologists (4,4) AW Differentiation; integration, including multiple integrals and partial derivatives. Numerical and computing techniques in analysis. Emphasis on biological problems, particularly in ecology. Prerequisites: MATH 105 and placement examination for 291; 291 or MATH 124 and placement examination for 292.

Q SCI 340 Application of Digital Computers to Biological Problems (5) Asp Methods and procedures for processing biological and natural resource data by means of digital computers; interactive computing, file manipulation, problem analysis, elementary FORTRAN programming, use of data-base and statistical packages, interfacing of programs and software packages. Joint with FISH 340. May not be taken for credit if FISH 340 has been taken. Prerequisite: 381 or equivalent.

Q SCI 366 Quantitative Methods in Forest Resource Management (3) A Rustagi Survey, discussion, and critique of the application of quantitative methods to forest resource management, planning, and decision making. Methods utilized in management science and in econometric and computer science that are currently used by resource planners. Introduction to systems analysis, linear programming, computer simulation, goal programming, forecasting, statistical techniques, and computer information systems. Joint with FRM 366. Prerequisite: 381.

Q SCI 381 Introduction to Probability and Statistics (5) AWSps Elementary concepts of probability. Sample space set theory, random variables, expectations, variances, covariance; multinomial, normal, hypergeometric, Poisson, negative-binomial, geometric, uniform normal, chi square, "t" and "F" distributions. Point and interval estimation, basic concepts of hypothesis testing; applications to biological problems. Prerequisite: MATH 105 or equivalent.

Q SCI 391 Introduction to Matrices and Their Applications (3) Sp Elementary concepts of matrices and matrix operations; use of computer in inverting matrices, solving systems of equations and other matrix operations; applications in operations research and biology. Prerequisites: 381, MATH 125; ENGR 141 or FISH 340 or equivalent course in computer use, or permission of instructor.

Q SCI 392 Techniques of Applied Mathematics in Biology I (3) A Ordinary differential equations—linear and nonlinear; systems of differential equations; approximation techniques, numerical solution techniques; applications to biological processes. Prerequisite: 292 or MATH 126, or permission of instructor.

Q SCI 393 Techniques of Applied Mathematics in Biology II (3) W Applications of advanced ordinary differential equations, special functions, and partial differential equations to descriptions of biological phenomena. Particular emphasis on transport in biological systems, including diffusion and fluid flow. Prerequisite: 392 or permission of instructor.

Q SCI 456 Mathematical Models in Population Biology (4) A Gallucci Definition and role of mathematical models in population biology; types of models;

Quantitative Science

The Center for Quantitative Science in Forestry, Fisheries, and Wildlife is an intercollege academic unit sponsored by the College of Forest Resources and the School of Fisheries of the College of Ocean and Fishery Sciences. The center offers a comprehensive program of study in mathematics and statistical methods as applied to problems in ecology and natural resources management. The faculty of the center includes members of the College of Forest Resources and the School of Fisheries, and most are also adjunct members of the Department of Biostatistics. Students may enroll for study at the center through one of these academic units.

The Center for Quantitative Science provides leadership for the quantitative ecology resource management pathway (QERM) of the graduate program in biostatistics and biomathematics, which is administered by the Department of Biostatistics. The QERM pathway focuses on the application of statistical, mathematical, and decision sciences to problems in marine and terrestrial ecology, natural resource management, and mathematical biology. Students may specialize in any one of those areas. Students accepted are expected to have a strong background in mathematics, statistics, or resource management ecology. The center is well equipped with computers for research and graduate instruction, and it offers a consulting service to biological and ecological graduate students.

population processes and population growth; use of computer in model building; sampling and other methods of estimation of population parameters. Prerequisites: 381, 292, FISH 425 or BIOL 210 or permission of instructor.

Q SCI 457 Management of Exploited Animal Populations I (4) W Mathews Equilibrium yield model; spawner-recruit models, management methods; use of catch-effort statistics in estimation and management, computer simulation in management decisions. Joint with FISH 457. Prerequisites: 381, 292; BIOL 210 or FISH 425, or permission of instructor.

Q SCI 458 Management of Exploited Animal Populations II (4) Sp Gallucci, Mathews Continuation of 457. Estimating catch and effort and analyzing catch-per-effort statistics. Standardizing effort, gear selectivity, recruitment, models of exploited fishery populations with management applications. Introduction to simulation of fish and wildlife populations with emphasis on applications using current data from fishery and game organizations. Joint with FISH 458.

Q SCI 480 Sampling Theory for Biologists (3) Sp Gallucci, Rustagi Theory and applications of sampling finite populations including: simple random sampling, stratified random sampling, ratio estimates, regression estimates, systematic sampling, cluster sampling, sample size determinations, applications in fisheries and forestry. Other topics include sampling plant and animal populations, sampling distributions, estimation of parameters and statistical treatment of data. Joint with STAT 480. Prerequisites: 482, 483, or permission of instructor.

Q SCI 482, 483 Statistical Inference in Applied Research (5,5) AW, WSp Analysis of variance and covariance; chi square tests; multiple and curvilinear regression; sampling theory; discrete distributions; experimental design and power of tests. Application to biological problems. Use of computer programs in standard statistical problems. Prerequisites: 381, MATH 124 or Q SCI 291 or permission of instructor for 482; 482 for 483.

Q SCI 486 Experimental Design (3) Sp Conquest Topics in analysis of variance and experimental designs: choice of designs, comparison of efficiency, power, sample size, use of computer for standard analyses. Joint with STAT 486. Prerequisite: 483 or equivalent.

Q SCI 499 Undergraduate Research (1-5, max. 5) AWSpS Special studies in quantitative ecology and resource management for which there is not sufficient demand to warrant the organization of regular courses. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

Courses for Graduates Only

Q SCI 502 Statistical Consulting for the Life Sciences (1-4) AWSp Conquest Consulting experience in data analysis, applied statistics, experimental design, parameter estimation, and sampling. For graduate students in the Center for Quantitative Science and Biomathematics. Student provides consultation services to students and faculty. Students spend one classroom hour per week under faculty supervision discussing problems encountered. Prerequisites: 482, 483, STAT 341, 342, or BIOST 571, 572, 573, or equivalents, and permission of instructor.

Q SCI 521 Scientific Method in Resource Management (2) Ford Process of scientific discovery and strategies used for different problems in ecology and natural resources management. Relationship between growth of objective knowledge and use made of that knowledge in natural resources management. Joint with FISH 521. (Winter Quarter 1993 last quarter offered.)

Q SCI 545 Topics in Fisheries Computing (3) Sp Students gain experience and insights into complex computer algorithms in fisheries by doing projects typi-

cal of research in natural resource management. Students need at least an introductory programming course and background in the subject areas covered. Prerequisites: 340 or equivalent, 292 or equivalent, and permission of instructor. (Offered odd-numbered years.)

Q SCI 550 Applied Ecological Modeling (4) A Methods of applied ecological modeling at individual community and ecosystem levels. Systems of ordinary differential equations, population growth models, linear compartment models, and Monte Carlo event-oriented models. (Winter Quarter 1993 last quarter offered.)

Q SCI 551 Modeling Organism Dynamics (3) W Application of techniques of stochastic differential equations, time series analysis, simulating dynamic processes to plant and animal growth. Prerequisites: 482, 483, 550, or permission of instructor. (Winter Quarter 1993 last quarter offered.)

Q SCI 552 Spatial Processes in Ecology (3) A Ford Spatial distribution of organisms, the mechanisms that produce different distributions, and how they may be described mathematically and modeled. Spatial distribution of communities, how this arises, and what its consequences are. Prerequisites: 482, 483, 550. (Winter Quarter 1993 last quarter offered.)

Q SCI 560 Decision Methods in Natural Resources Management (3) A Rustagi Formulation and optimization of management planning and resource allocation in forestry, fisheries, and wildlife. Importance of quantitative data needs in decision making. Solution procedures for both linear and nonlinear formulations. Term project required. Joint with FRM 560. Prerequisite: 391 or equivalent or permission of instructor.

Q SCI 561 Multi-Objective Programming in Resources Management (3) W Rustagi Concepts and philosophy of goal programming as a tool in the evaluation of resource allocation among multiple, conflicting, often incommensurate objectives (goals). L.P. and G.P. computer programs are used to study impact of changes in relative importance of difficult goals. Goal programming applications in natural resource areas are discussed. Joint with FRM 561. Prerequisites: familiarity with linear programming and permission of instructor.

Q SCI 565 Quantitative Resource Management (3) W Bare, Mathews Formulation, solution, and interpretation of fisheries, forestry, and other natural resource problems, using mathematically based models. Principles of resource management from a quantitative perspective. (Winter Quarter 1993 last quarter offered.)

Q SCI 597 Seminar in Quantitative Ecology (2) AWSpS Current topics in quantitative ecology and resource management. Fisheries, forestry, and marine resources. Prerequisite: permission of instructor.

Q SCI 598 Special Topics in Quantitative Resource Management (1-3, max. 12) AWSpS Population and community ecology, systems ecology, and physical processes in ecosystems. Prerequisite: permission of instructor.

Q SCI 599 Research in Quantitative Resource Management (*, max. 12) AWSpS Topics can be theoretical in nature or combined theory and experiment. Research might be a prelude to thesis or dissertation research. Offered on credit/no credit basis only.

Quaternary Research Center

19 Johnson

Quaternary studies focus on the processes that presently shape the natural environment and have oper-

ated over approximately the past two million years (Quaternary Period). A knowledge of Quaternary events facilitates an understanding of earth history in relation to the modern environment and has predictive value with regard to present-day and future environmental changes.

Quaternary research is typically interdisciplinary, and thus it commonly involves related interests of two or more academic units. The Quaternary Research Center was established in 1967 to foster such interdisciplinary studies on a cooperative basis.

The center has as goals: (1) to understand environments and climate changes of the past two million years in the context of modern surface processes, which include historical changes, prehistoric postglacial environments, and Ice Age events; (2) to serve as an effective catalyst in fostering interdisciplinary studies in the fields of atmospheric sciences, archaeology/anthropology, botany, engineering, fisheries, forestry, geology, geophysics, oceanography, pedology, and zoology; (3) to provide a scientific perspective on the scale of modern and man-made environmental changes, including those of climate, in the context of recent earth history; (4) to conduct a curriculum jointly with other disciplines in the training of graduate students in Quaternary-oriented studies; and (5) to seek applications of Quaternary studies to modern environmental problems that will help predict consequences of policy decisions.

Graduate Program

Students associated with the center obtain their degrees through cooperating departments. Students interested in graduate work at the center should apply to the department of their choice but plan to do their research in a Quaternary-related subject.

Research Facilities

The research laboratories of the center provide an array of modern facilities for investigation of Quaternary problems:

Quaternary Isotope Laboratory. The work emphasizes use of carbon and oxygen isotopes to study various aspects of the carbon and hydrological cycles. A major interest is also in radiocarbon dating as applied to time-scale calibration and the study of climate change.

Periglacial Laboratory. The laboratory contains cold rooms equipped for manipulating and studying the freezing and thawing of soils, rocks, and building materials. A large, unique tilt table permits the study of soils under controlled conditions of slope, temperature, and moisture. Research stress is placed on frost action in arctic and alpine environments.

Quaternary Palynology and Paleoecology Laboratories. These facilities foster studies of the biotic environment through time and of the uses of plant and animal fossils in Quaternary environmental and ecological reconstruction. Studies of vegetational changes are supported by an extensive modern pollen and plant reference collection from Asia and western North America.

Tephrochronology Laboratory. Volcanic ash deposits of unknown origin are characterized petrographically and are identified by being matched against tephra of known source and composition. A reference collection of tephra from source areas around the world is being developed.

Correspondence and Information

Director
Quaternary Research Center, AK-60

Faculty

Director

Stephen C. Porter

Professors

Dunne, Thomas,* 1973, ‡(Environmental Studies, Geological Sciences), Ph.D., 1969, Johns Hopkins; forest ecology, Quaternary paleoecology, dendrochronological and palynological studies of vegetation and climatic histories in northern Alaska and the Pacific Northwest.

Dunnell, Robert C.,* 1967, ‡(Anthropology), Ph.D., 1967, Yale; archaeological theory, dating methods, photogrammetry, archaeology of eastern United States.

Edmondson, W. Thomas,* 1949, ‡(Zoology), Ph.D., 1942, Yale; limnology.

Emerson, Steven R.,* 1976, ‡(Oceanography), M.Phil., 1973, Ph.D., 1974, Columbia; carbon cycling and diagenesis in marine sediments, redox chemistry in marine anoxic basins, air-water exchange of metabolic gases in the ocean.

Hallet, Bernard,* 1980, (Geological Sciences), Ph.D., 1975, California (Los Angeles); field, theoretical, and laboratory studies of processes that shape alpine and arctic landscapes.

Hedges, John I.,* 1976, ‡(Oceanography), Ph.D., 1975, Texas (Austin); organic geochemistry; sources, pathways, and fates of major biochemicals in rivers, lakes, and oceans; paleovegetation.

Kohn, Alan,* 1981, ‡(Environmental Studies, Zoology), Ph.D., 1957, Yale; invertebrate zoology, functional morphology, and paleobiology of marine invertebrates, especially mollusks.

Leopold, Estella B.,* 1976, ‡(Botany, Environmental Studies, Forest Resources, Geological Sciences), M.S., 1950, California (Berkeley); Ph.D., 1955, Yale; palynology and paleoecology, Cenozoic floras in western United States and Alaska, late Quaternary and historical pollen studies in the Pacific Northwest and western Mojave Desert, modernization of late Cenozoic floras in the Rocky Mountains.

Porter, Stephen C.,* 1962, (Geological Sciences), ‡ M.S., 1958, Ph.D., 1962, Yale; Quaternary stratigraphy, chronology, and paleoclimatology; glaciation and geomorphology of alpine regions; volcanic geology and tephrochronology.

Raymond, Charles F.,* 1969, ‡(Geological Sciences, Geophysics), Ph.D., 1969, California Institute of Technology; glaciology, surging and sliding behavior of glaciers and thermodynamic processes in temperate ice and wet snow.

Stuiver, Minze,* 1969, (Oceanography), (Geological Sciences), ‡ M.S., 1953, Ph.D., 1958, Groningen (Holland); isotope research and radiometric dating, biospheric carbon fluxes, calibration of radiocarbon time scale, relationship of radiocarbon activity to solar and climatic variability.

Tsukada, Matsuo,* 1969, ‡(Botany, Geological Sciences), M.S., 1958, D.Sc., 1961, Osaka City (Japan); late Quaternary ecology; fossil assemblages of pollen, Cladocera, and benthic animals; climatic changes recorded in lacustrine sediments of the Pacific Rim region.

Ugolini, Fiorenzo C.,* 1966, ‡(Forest Resources), Ph.D., 1960, Rutgers; soil formation and weathering in temperate, alpine, and polar environments; soil dynamics revealed by soil solution; forest ecosystems and geochemical cycles; soil development in tephra of the Cascade Mountains and Japan.

Washburn, A. Lincoln, 1966, (Emeritus), ‡(Geological Sciences), Ph.D., 1942, Yale; periglacial studies, geomorphology of cold environments, glacial geology and periglacial phenomena in arctic Canada.

Associate Professors

Brubaker, Linda B.,* 1973, ‡(Forest Resources), M.S., 1967, Ph.D., 1973, Michigan; forest ecology, Quaternary paleoecology, dendrochronological and palynological studies of vegetation and climatic histories in northern Alaska and the Pacific Northwest.

Eck, Gerald G.,* 1974, ‡(Anthropology), M.A., 1974, Ph.D., 1977, California (Berkeley); primate paleontology, especially African Pliocene/Pleistocene monkeys and hominids.

Hartmann, Dennis L.,* 1977, ‡(Atmospheric Sciences), M.A., 1973, Ph.D., 1975, Princeton; climate diagnostics and climate theory, energy balance and dynamics of the atmosphere, applications of satellite sensing.

Quay, Paul D.,* 1977, (Oceanography), ‡ Ph.D., 1977, Columbia; isotopic studies of carbon cycling in freshwater and marine systems, upper ocean circulation rate studies based in chemical/isotopic tracer distributions, global methane and carbon dioxide cycles.

Richey, Jeffrey E.,* 1973, (Research), ‡(Environmental Studies, Oceanography), M.S.P.H., 1970, North Carolina; Ph.D., 1973, California (Davis); biogeochemistry, aquatic ecology, and hydrology; carbon and nutrient dynamics in large river basins, particularly the Amazon.

Stein, Julie K.,* 1980, ‡(Anthropology), M.A., 1976, Ph.D., 1980, Minnesota; archaeology; geoarchaeology; sedimentological and pedological aspects of archaeology; excavations in northwest coastal United States, Kentucky, Michigan, Greece, Peru, and Belize.

Warren, Stephen G.,* 1982, ‡(Atmospheric Sciences, Geophysics), A.M., 1969, Ph.D., 1973, Harvard; radiation and climate, solar and infrared radiative properties and climate effects of snow and clouds.

Assistant Professor

Spaulding, W. Geoffrey,* 1981, (Research), ‡(Botany), M.S., 1974, Ph.D., 1981, Arizona; Quaternary paleoecology and paleoclimatology; applications of plant macrofossil analysis in archeobotany, arid-land paleoenvironmental reconstruction, and waste isolation site assessment.

Course Descriptions

QUAT 417 Quaternary Glacial Ages (3) S Porter Physical, biological evidence of climatic change during Quaternary period, emphasizing stratigraphy and chronology. Impact of alternating glacial/interglacial cycles on earth's terrestrial, marine environments. Use of this data to assess theories on causes of climatic variation. Joint with GEOL 417. Prerequisite: Introductory course in earth science and biological science.

QUAT 422 Concepts and Methods in Paleoecology (4) A Brubaker, Leopold, Tsukada Biological fossils as key evidence in reconstruction of past environments. Conceptual framework and methods of study for interpretation of fossils in sediments, tree rings, sedimentary/geochemical evidence. Past dynamic changes in plant communities and species history evaluated in context of modern ecological theory. Joint with BOT 453 and FRM 422. Prerequisite: BOT 354.

QUAT 501 Seminar in Quaternary Environments (1, max. 6) WSp Interdisciplinary seminar in the changing natural environments of the Quaternary Period, with emphasis on climatic changes and their effects. Speakers from the University and elsewhere present lectures on their specialties, followed by discussion. Offered on credit/no credit basis only.

QUAT 502 Interdisciplinary Quaternary Investigations (2, max. 6) WSp Research course for interdisciplinary investigation of Quaternary problems. Student attends sessions of 501 and pursues a problem-oriented case study concurrently under faculty direction. Required paper on case study. Offered on credit/no credit basis only. Prerequisite: graduate standing.

QUAT 503 Quaternary Ecology and Biogeography of the American West (4) Focuses on last fifty thousand years of ecological and biogeographic change in interior western North America; techniques of reconstructing past environments from fossil record; community development in response to glacial/interglacial climatic oscillations. Review of paleoecological record of arid and semiarid regions of North America. Joint with BOT 503.

QUAT 504 Special Topics in Quaternary Sciences (1-3) Environments and climate changes of past two million years (Quaternary Period) in context of modern surface processes, including historical changes, prehistorical environments of postglacial period, and Ice Age events. Provides scientific perspective on scale of modern and man-made environmental changes, including those of climate in context of recent earth history. Offered on credit/no credit basis only. Prerequisites: background courses in earth sciences and ecology.

University Conjoint Courses

Each of the following courses is administered by two or more schools or colleges within the University. No degree program is offered.

Courses for Undergraduates

UCONJ 100 Introduction to Health Professions (1) AWSp May, Strandford Opportunities in health professions. Information on educational requirements, professional/patient interaction, interprofessional roles, licensing, registering for practice in profession, salaries, and career opportunities.

UCONJ 411 Psychology of Aging (3) W Kiyak Focuses on developing the skills necessary for critically evaluating current psychological theories of aging, research findings in this area, and the implications of findings on the aging person. Special consideration given to the effects of socioeconomic, sex, and ethnic differences in the psychology of aging. Open to upper-division undergraduates and beginning graduate students interested in the field of gerontology.

UCONJ 420 Biological Safety Practices (1) A Kenny General introduction to appropriate laboratory procedures used for handling potentially hazardous biological agents. Particular focus on laboratory safety and appropriate protocols that should be employed by those engaged in infectious disease and recombinant DNA research. Offered on credit/no credit basis only.

UCONJ 422 Sexually Transmitted Diseases: An Overview (2) A Elmer, Holmes Clinically oriented course designed to train upper-class health science students to participate effectively in community outreach programs for the prevention of venereal diseases. Lecture-discussion session each week with emphasis on the prevalent sexually transmitted diseases. Field experience includes visits to venereal disease clinics and possible speaking engagements. Offered cooperatively by the departments of Medicinal Chemistry, Medicine, and Epidemiology and International Health. Department of Medicinal Sciences responsible for administration of course. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

UCONJ 440 Biological Aspects of Aging (3) A Introductory course on aspects of the biology of human aging and of functional changes associated with nor-

mal aging and with those illnesses that may be present in the elderly. Focus on the relationship between changes in physical function, environment, and quality of life. Includes theoretical perspective on aging as well as the aging process in specific physiological systems. Designed for upper-level undergraduate students with an interest in aging. Prerequisite: introductory course in biology or permission of instructor.

UCONJ 442 Social and Cultural Aspects of Aging (3) Sp Involves faculty members from the various social science fields examining the range and variation of relationships among age-linked attitudes and cultural values related to aging; the social and economic factors that influence the elderly in contemporary society; the effects of ethnic and sex differences in sociocultural aging. Open to upper-division undergraduates and beginning graduate students interested in gerontology. Entry card required.

UCONJ 443 Interdisciplinary Seminar on Aging (1-6, max. 15) Borgatta Interdisciplinary examination of the contemporary theoretical literature on gerontology and long-term care. For upper-level undergraduate and graduate students with an interest in aging. Quarterly offerings available from the Institute on Aging. Prerequisites: 411, 440, 442, or permission of instructor.

UCONJ 490 Social Sensitivity in Health Care (3) AWSp Multidisciplinary course for health professions students. Health professionals' roles in dealing with social, cultural, and physical barriers to health care of low-income groups and ethnic people of color. Personal involvement through field experiences and faculty drawn from affected communities as well as health sciences, social work schools. Prerequisite: permission of instructor.

UCONJ 492 The Developmentally Disabled Child: Selected Interdisciplinary Topics (1-10, max. 10) AWSp Interdisciplinary minicourses on effective professional functioning with the developmentally disabled child. Intensive examination of basic components: normal growth and development, assessment devices and strategies, intervention strategies, information exchange skills, and community functioning. Especially

developed for trainees in Child Development and Mental Retardation Center. Offered on a credit/no credit basis only. Prerequisite: permission of course coordinator.

UCONJ 497 Health Care in a Rural Community (3) Sp Critical analysis built upon concepts relative to interdisciplinary health-care delivery in a rural community. Students develop an organizational model for rural health care and study innovative ways of mobilizing community resources and support for a comprehensive rural health-care system. Pharmacy students, nurses, and other health professionals study application of theory in an appropriate clinical setting within the conceptual framework of each student's professional field.

Courses for Graduates Only

UCONJ 501, 502, 503 International Health Education (1,1,1) A,W,Sp Weekly two-hour seminar provides in-depth and concrete preparation for international health work involving extensive use of case studies; a problem-solving format; practical skills and tools relevant to clinical, epidemiological, and laboratory needs. Each seminar prepared and presented by a faculty/student team.

UCONJ 504, 505, 506 Cell and Molecular Biology and Disease (3,3,3) A,W,Sp 504: nucleus, normal and abnormal function; 505: detailed consideration of cytoplasm, emphasis on cell biology and pathology of cellular membranes, elements of cytoskeleton; 506: integrates topics in 504 and 505, cell injury, inflammation, immunology, and neoplasia. Prerequisites: genetics or biochemistry or permission of instructor for 504; 504 for 505; 505 for 506.

UCONJ 510 Seminar in Neurobiology (0) AWSps Weekly seminars organized each quarter by one of the four participating departments: biological structure, physiology and biophysics, psychology, and zoology. Required of graduate students supported by the Systems and Integrative Biology Training Program. Offered on credit/no credit basis only.

UCONJ 512 Hypertension (2-3) Analysis and synthesis of knowledge required to identify and manage

hypertension in all age groups while functioning as a member of an interdisciplinary health-care team. Lecture stresses analysis of information regarding the etiology, pathophysiology, epidemiology, and psychological and behavioral correlates of hypertension and its complications. Optional seminar focuses on clinical application of this information.

UCONJ 513 Dynamics of Patient Management: Diabetes Mellitus (2) Sp Analysis of advanced knowledge related to interdisciplinary management of diabetes. Commonalities and differences in provider approaches, recent research and its effect on management practices, collaborative communication, knowledge application. Brief interactive presentations, decision-making opportunities, discussion. Prerequisites: graduate standing in pharmacy, dietetics, nursing; third- or fourth-year medical student; or permission of instructor.

UCONJ 524 Developmental Neurobiology (3) Sp Survey of issues in developmental neurobiology, neurogenesis and differentiation; electrophysiological, morphological and neurochemical phenotype; neuronal pathways and synaptic contacts; cellular and synaptic plasticity; their molecular biological, morphological, electrophysiological, and behavioral approaches. Prerequisite: courses or background in neurophysiology, neuroanatomy, molecular neurobiology.

UCONJ 584 Plant Tumors (1, max. 9) M. Gordon Discussion of the literature of plant tumors and current research work being carried on in this area at the University. Offered cooperatively by the departments of Biochemistry, Botany, and Microbiology and Immunology. Offered on credit/no credit basis only. Prerequisite: offered only to persons actively pursuing work in this area.

UCONJ 585 Seminar in Molecular and Cellular Biology (1, max. 15) AWSp Gordon, Staff For students enrolled in the Molecular and Cellular Biology Training Program. Participants present the background and current progress in their thesis research. Offered on credit/no credit basis only. Prerequisites: enrollment in doctoral degree program in biological science and in graduate research.



School of Law

Dean

John R. Price
326 Condon

Associate Deans

Robert L. Fletcher
338 Condon

John O. Haley
304 Condon

Assistant Dean

Reena L. Zigelman
334 Condon

Established in 1889, the School of Law is a member of the Association of American Law Schools and is on the American Bar Association's list of approved law schools. Graduates of the school are prepared to practice law anywhere in the United States. Additional information about the school is contained in the current University bulletin *School of Law*.

Facilities and Services

The School of Law is housed in Condon Hall, adjacent to the University's main campus. It is equipped with classroom, library, lounge, and office facilities.

The Marian Gould Gallagher Law Library is one of the finest law libraries in the country. Its collection, among the largest university law collections on the West Coast, currently numbers more than 425,000 volumes. In addition to the extensive main collection, it houses important materials that support the Asian and Marine Law graduate programs and serves as a federal depository for selected United States government documents. An experienced audiovisual librarian directs the use of video equipment in the Trial Advocacy and Moot Court programs. The library is equipped with the latest in microreaders and printers in order to make full use of the growing microform collection. The library is a subscriber to LEXIS, WESTLAW, and the Western Library Network.

Juris Doctor Program

Juris Doctor Degree

The Juris Doctor degree is conferred upon a student who has met the residence requirements, consisting of nine quarters of at least 12 credits each, and has earned at least 135 credits satisfactory to the School of Law.

As in most law schools of the United States, the first-year courses are required and are designed to introduce students to basic legal skills, foundational subject matter, and the variety of public and private processes with which the profession is concerned. Those courses deal with contracts, torts, property, civil procedure, criminal law, administrative law, and basic legal skills.

Except for a required course in professional responsibility and an analytical writing requirement, courses in the second and third years are elective. Therefore, a student may choose a program designed to suit his or her interests and needs.

Admission

New students may enter the School of Law only in Autumn Quarter. Instruction begins for first-year students a few days earlier than the time set for upper-class students. Beginning students must have received a baccalaureate degree from an accredited college or university prior to commencing the study of law.

All applicants are required to take the Law School Admission Test (LSAT) and to register for the Law School Data Assembly Service (LSDAS). Registration packets and test information are available at most law schools and from Law School Admission Services, Box 2000, Newtown, Pennsylvania 18940.

No specific prelaw course is required or recommended, and the School of Law subscribes to the remarks set forth on prelaw preparation in the *Prelaw Handbook—Official Guide to U.S. Law Schools*. Applications for admission to the next entering class must be received by February 1. To be assured of consideration for admission, an applicant must cause complete credentials, including the LSDAS report, to be filed in the School of Law by March 1. An application fee (at this writing, \$35) also is required.

Transfer Applicants

Students who have completed at least one year at a member school of the Association of American Law Schools may apply to this school for admission with advanced standing with credit for no more than one year of such work. A student who has completed or expects to complete at least two years of work at a member school of the Association of American Law Schools and who expects to graduate from that member school may apply to this school for admission as a non-degree candidate.

Applicants should request application forms and instructions from the admissions office in time to permit filing of the application by July 15. To be assured of consideration, the applicant must complete his or her application file by August 1.

Applications are considered only if vacancies exist. Selection of the applicants is based on evidence either (1) that the candidate can produce acceptable work at this law school and that only by transferring to this law school will the candidate alleviate serious hardship, or (2) that the candidate can produce above-average work at this law school. Minority transfer applicants are considered under criteria applicable to first-year admissions.

Students working on law degrees to be conferred by the University have priority over non-degree candidates in the selection of courses. This policy is in accordance with the general University policy on the registration of nonmatriculated students.

Inquiries

A more detailed statement on admission policy and application procedure is available in the School of Law. Requests for application materials and the University law school bulletin should be addressed to Law School Admissions, Condon Hall, JB-20, University of Washington, Seattle, Washington 98195.

Graduate Program

John O. Haley, Associate Dean and Graduate Program Coordinator

In addition to the professional law program leading to the Juris Doctor degree, the law faculty offers graduate programs leading to the Master of Laws (LL.M.) in Law and Marine Affairs and in Asian and Comparative Law, and the Doctor of Philosophy (Ph.D.) degree in Asian and Comparative Law only. The requirements for each program are as follows:

Asian Law Program. The Master of Laws degree program in Asian and comparative law is designed for students with career and research interests in one or more of the legal systems of East Asia, with particular emphasis on that of Japan, as well as for lawyers from East Asia seeking advanced comparative study of American law. The Asian law program is structured around extensive course offerings involving comparative study of basic areas of United States and East Asian law and tutorials in areas of special interest to each student.

Admission to the LL.M. degree program in Asian and comparative law is limited to language-qualified applicants who have received the first degree in law and who have a record of superior academic achievement. Graduates of American law schools must have a degree from an ABA-accredited institution. The applicant must be admitted to practice and must be competent in either Japanese, Chinese, or Korean (or, in the case of foreign students, in English). The program contemplates one year in residence, at least 36 credits, and an acceptable major research undertaking.

Admission to the Ph.D. program in law is limited to exceptional scholar-lawyers who are fluent in English and in either Japanese, Chinese, or Korean. Prospective Ph.D. students must normally complete the LL.M. program before being accepted as Ph.D. students. The core of the program is a major creative research project using Asian-language sources as well as English-language sources. At least two, and usually three, years in residence are necessary in order to accomplish the work that must be done in order to pass the General Examination that precedes candidacy for the doctoral degree. An acceptable dissertation must thereafter be submitted to complete the requirements for the degree. The Candidate may spend a year abroad while working on the dissertation but must be in residence during the quarter in which the degree is to be conferred.

Law and Marine Affairs Emphasis. Students who have acquired a first degree in law can become prospective candidates for the LL.M. degree in Law and Marine Affairs. Graduates of American law schools must have a degree from an ABA-accredited school. Particular emphasis is placed on interdisciplinary aspects of marine affairs and coastal zone management. Attainment of the LL.M. degree with specialization in law and marine affairs requires satisfactory completion of forty hours of course and research work, at least fifteen of which must be in the School of Law. In the School of Law, courses include Law of the Coastal Zone, International Law of the Sea, Ocean Policy and Resources, United States Law and the Marine Environment, and Admiralty. Pertinent courses are also offered in the Institute for Marine Studies, the Graduate School of Public Affairs, College of Engineering, School of Fisheries, the departments of Economics, and Geography, and the School of Oceanography.

Financial Aid

Scholarship funds for graduate students in law are quite limited. Inquiries should be made to Law School Graduate Admissions, Condon Hall, JB-20, University of Washington, Seattle, Washington 98195, U.S.A.

Faculty

Professors

Andersen, William R.,* 1964, LL.B., 1956, Denver; LL.M., 1958, Yale; administrative law, regulated industries, urban government.

Aronson, Robert H.,* 1975, J.D., 1973, Pennsylvania; evidence, criminal law, professional responsibility.

Burke, William T.,* 1968, (Marine Studies),† J.D., 1953, Indiana; J.S.D., 1959, Yale; marine law.

Chisum, Donald S.,* 1969, LL.B., 1968, Stanford; corporations, civil procedure, intellectual property, federal courts and jurisdiction.

Corker, Charles E.,* 1965, (Emeritus), LL.B., 1946, Harvard; contracts, constitutional law.

Cosway, Richard P.,* 1958, (Emeritus), J.D., 1942, Cincinnati; commercial transactions, contracts.

Cross, Harry M.,* 1943, (Emeritus), J.D., 1940, Washington; property.

Fitzpatrick, Joan F.,* 1983, J.D., 1975, Harvard; federal courts, contracts.

Fletcher, Robert L.,* 1956, LL.B., 1947, Stanford; property.

Gallagher, Marian G., 1944, (Emeritus), LL.B., 1937, Washington; law librarianship.

Haley, John O.,* 1974, (International Studies), LL.B., 1969, Yale; LL.M., 1971, Washington; comparative law (Japan).

Hardisty, James H.,* 1970, LL.B., 1966, Harvard; criminal law, law and psychiatry, juvenile courts, torts.

Harsch, Alfred, 1930, (Emeritus), LL.B., 1928, Washington; LL.M., 1940, Columbia; law.

Hazelton, Penny A., 1985, J.D., 1975, Lewis and Clark; M.L.L., 1976, Washington; law librarianship.

Henderson, Dan F.,* 1962, (International Studies), LL.B., 1949, Harvard; Ph.D., 1955, California (Berkeley); U.S./Japanese business transactions, corporate relations, admiralty.

Hershman, Marc J.,* 1976, ‡(Marine Studies), J.D., 1967, Temple; LL.M., 1970, Miami; law of the coastal zone, legal legislation, coastal planning and management.

Hjorth, Roland L.,* 1964, LL.B., 1961, New York; transnational tax, Common Market, federal taxation.

Hume, Linda S.,* 1972, J.D., 1970, California (Los Angeles); commercial transactions, property, equal rights.

Hunt, Robert S.,* 1966, (Emeritus), LL.B., 1947, Yale; S.J.D., 1952, Wisconsin; land use, securities regulation, property.

Huston, John C.,* 1967, J.D., 1952, Washington; LL.M., 1955, New York; federal taxation.

Jay, Stewart M.,* 1980, J.D., 1976, Harvard; civil procedure, theories of justice, constitutional law.

Johnson, Ralph W.,* 1955, (Environmental Studies, Marine Studies), LL.B., 1949, Oregon; natural resources, legislation, Indian law.

Junker, John M.,* 1964, J.D., 1962, Chicago; criminal law and procedure.

Kummert, Richard O.,* 1964, M.B.A., 1955, Northwestern; LL.B., 1961, Stanford; business planning, corporations, federal tax.

Loftus, Elizabeth F.,* 1973, (Psychology), M.A., 1967, Ph.D., 1970, Stanford; cognition, long-term memory, eye-witness testimony, psychology and law.

Loh, Wallace D.,* 1974, (Psychology), M.A., 1968, Cornell; Ph.D., 1971, Michigan; J.D., 1974, Yale; contracts, criminal procedure, social science and the courts.

Meisenholder, Robert,* 1954, (Emeritus), J.D., 1939, S.J.D., 1942, Michigan; federal courts and federal systems, procedure.

Morris, Arval,* 1955, (Education), M.A., 1952, J.D., 1955, Colorado; LL.M., 1958, Yale; LL.D., 1972, Colorado; constitutional law, jurisprudence.

Peck, Cornelius J.,* 1954, LL.B., 1949, Harvard; administrative law, labor law, torts.

Price, John R.,* 1969, LL.B., 1961, New York; estate planning, taxation, property.

Prosterman, Roy L.,* 1965, LL.B., 1958, Harvard; international law.

Rieke, Luvern V.,* 1949, (Emeritus), LL.B., 1949, Washington; LL.M., 1953, Chicago; LL.D., 1959, Pacific Lutheran; contracts, domestic relations.

Roddie, Richard S. L.,* 1968, (Emeritus), J.D., 1954, California (Berkeley); insurance.

Rodgers, William H., Jr.,* 1967, J.D., 1965, Columbia; legislation, environmental law, resource management.

Rombauer, Marjorie D.,* 1960, J.D., 1960, Washington; creditor and debtor, personal property.

Shattuck, Warren L., 1935, (Emeritus), LL.B., 1934, Washington, J.S.D., 1936, Yale; commercial law.

Smith, Charles Z.,* 1973, (Emeritus), LL.B., 1955, Washington; evidence, judicial administration.

Smith, Frank W., Jr.,* 1985, J.D., 1962, Richmond; LL.M., 1968, Harvard; commercial law.

Stoebe, William B.,* 1967, M.A., 1953, Indiana; J.D., 1959, Washington; S.J.D., 1973, Harvard; property, land use, legal history.

Trautman, Philip A.,* 1956, J.D., 1954, Washington; conflict of laws, procedure.

Assistant Professors

Andrews, Thomas R., 1985, M.A., 1973, Northwestern; J.D., 1979, Pennsylvania; trusts and estates, professional responsibilities.

Ellis, Jane W., 1987, J.D., 1983, Yale; contracts and domestic relations.

Hicks, Gregory A., 1984, J.D., 1978, Texas; torts, securities regulation.

Vaughn, Lea, 1984, (Public Affairs), †J.D., 1978, Michigan; labor law, administrative law.

Wolcher, Louis E., 1986, J.D., 1973, Harvard; contracts and restitution.

Lecturers

Kirtley, Alan, 1984, J.D., 1972, Indiana; University Defender Clinic.

Sullivan, John J., 1979, LL.B., 1949, Washington; trial practice.

Course Descriptions

Courses for Undergraduates

LAW 442 Land Law and the Urban Environment (3) Examination of the major legal tools available to shape the urban environment by controlling the use of land. Considers zoning, subdivision controls, urban renewal, private land-use restrictions, and the rules of nuisance law. Offered on credit/no credit basis only. Open to law and nonlaw students. (Not offered every year.)

LAW 443 The Legal Process I (3 or 5) Open only to nonlaw students. The system of law and its functions rather than substantive law pertaining to any particular subject or discipline. Offered on credit/no credit basis only.

LAW 444 Constitutional Freedom and American Education (3-6, max. 6) Examines the relationships between the Constitution of the United States and the American system of public education, excluding higher education, in areas of constitutional freedom and legal controls, racial desegregation, and equal educational opportunity, including equal financing of the public schools. Joint with EDPGA 444. (Not offered every year.)

LAW 445 Major Issues in American Constitutional Law (3) Significant themes in American constitutional law. Doctrine of judicial review, application of the Bill of Rights to the states, Supreme Court's recognition of fundamental rights, the Equal Protection clause, the Religion clauses, freedom of speech, and Presidential powers. Open to law and nonlaw students.

LAW 446 Race, Age, and Sex Discrimination in Employment (3) What constitutes race, age, and sex discrimination in employment, and related prohibited practices that limit employment opportunities. Methods of proving such discrimination and establishing that a practice should be prohibited. Remedies for violations considered. Open to law and nonlaw students.

LAW 447 Copyright Law for the Lay Person (3) Introductory survey of federal copyright law. Protection of original works, fair use, required formalities, and related issues. Open to law and nonlaw students.

LAW 448 The System of Military Justice (3) Exploration of the system of criminal law under the Uniform Code of Military Justice. Emphasis on procedures and the operation of the system rather than upon substantive crimes. Discussion and lecture involve case studies. Prerequisite: junior standing or permission of instructor. (Not offered every year.)

LAW 467 American Law and the American Indian (3) Relationship between Indians and the United States from 1789 to the present. Significant constitutional, legislative, and judicial actions. Legal events explored within their political, military, social, and cultural contexts. Comparisons with other minority-group experiences. Joint with HSTAA 416.

LAW 495 Introduction to Law: A Social Science Perspective (4) Policy-oriented, interdisciplinary study of uses and limits of social science in the law-making process on appeal and fact-finding process at trial. Critical perspectives on roles of social science, especially social psychology, in adjudication. Joint with PSYCH 495. Open to upper-division undergraduates and graduate students only.

First-Year Courses

The courses below are intended for law students; other students are admitted only rarely with special permission of the Dean. Only the course titles are given. For complete course descriptions, see the School of Law Bulletin.

LAW A 500 Administrative Law (4)

LAW A 501- Contracts ((2-8)-, max. 8)

LAW A 502- Civil Procedure I ((2-6)-, max. 6)

LAW A 503- Property I ((2-8)-, max. 8)

LAW A 504- Torts ((2-8)-, max. 8)

LAW A 505- Criminal Law ((2-5)-, max. 5)

LAW A 506- Basic Legal Skills ((1-6)-, max. 6)

LAW A 507- Civil Litigation ((1-12)-, max. 12)

Second- and Third-Year Courses

LAW A 508 Payment Systems (3)

LAW A 509- Corporations VI ((2-6)-, max. 6)

LAW A 510 Sales (3)

LAW A 512 Secured Transactions (3)

LAW A 513- Creditor-Debtor Law ((2-3)-, max. 5)

LAW A 514 Corporations (3 or 4)

LAW A 515 Associations (3)

LAW A 516 Legal Accounting (4)

LAW A 517 Securities Regulations (4)

LAW A 518 Restitution (3)

LAW A 520- Property II ((2-8)-, max. 8)

LAW A 521 Community Property (3)

LAW A 522 Land-Use Controls (3)

LAW A 523 Real Property Security (3)

LAW A 524 Private Land Development (3)

LAW A 525 Water Law (3)

LAW A 526 Copyrights, Patents, and Trademarks (4)

LAW A 527 Environmental Law: Pollution Control (3)

LAW A 528 Natural Resources: Energy (3)

LAW A 529 Public Land Law (3)

LAW A 530- Basic Income Tax ((2-6)-, max. 6)

LAW A 531 Death and Gift Taxation (2-5)

- LAW A 532** Federal Income Taxation of Business Enterprise (5)
- LAW A 533** Partnership Taxation (3)
- LAW A 534** Federal Tax Procedures (3)
- LAW A 536** Deferred Compensation (3)
- LAW A 537-** Business Planning ((2-6)-, max. 6)
- LAW A 538** Estate Planning Workshop (3)
- LAW A 539-** Federal Tax Policy ((1-3)-, max. 3)
- LAW A 540** Land Use Planning (3)
- LAW A 541** Transnational Tax (5)
- LAW A 542** Oil and Gas Law (3)
- LAW A 543** Business Reorganization Under the Bankruptcy Code (3)
- LAW A 544** Advanced Commercial Law (3)
- LAW A 548-** Civil Rights ((2-6)-, max. 6)
- LAW A 550-** Constitutional Law ((2-8)-, max. 8)
- LAW A 551** Constitutional Freedom and American Education (4)
- LAW A 552-** Antitrust ((2-5)-, max. 5)
- LAW A 553** Fundamentals of Antitrust (3)
- LAW A 554-** Labor Relations and the Law ((3-2)-, max. 5)
- LAW A 555** Labor Relations in the Public Sector (3)
- LAW A 556-** Employment Discrimination ((2-4)-, max. 4)
- LAW A 557** Equal Rights (3)
- LAW A 558-** Jurisprudence and Legal Philosophy ((2-4)-, max. 4)
- LAW A 559** Legal Method (3)
- LAW A 560** Income Maintenance Legislation (3)
- LAW A 563** Urban Government (4)
- LAW A 564** Legal History (3)
- LAW A 565** American Indian Law (3)
- LAW A 566-** Theories of Justice ((2-4)-, max. 4)
- LAW A 568** Collective Bargaining and Labor Arbitration (4)
- LAW A 569** Law and Social Science (3 or 4)
- LAW A 571** International Organizations (3)
- LAW A 572** International Legal Order (3)
- LAW A 573** Arms Control and Disarmament: The Legal Perspective (3)
- LAW A 574** The International Legal Process (2-4, max. 4)
- LAW A 575** United States Legal History (3)
- LAW A 577** Immigration Law (3)
- LAW A 578-** International Commercial Law ((1-4)-, max. 4)
- LAW A 579** Children and the Law (3)
- LAW A 580** Domestic Relations (3)
- LAW A 583** Insurance I (3)
- LAW A 584** Insurance II (3)
- LAW A 585** Admiralty (3)
- LAW A 587** Computer Law (3)
- LAW B 500** Civil Procedure II (4)
- LAW B 501** Criminal Procedure IV (4)
- LAW B 502-** Criminal Procedure VI ((2-6)-, max. 6)
- LAW B 503-** Evidence ((2-6)-, max. 6)
- LAW B 505** Rules of Evidence in the Courtroom (3)
- LAW B 506-** Conflict of Laws ((2-5)-, max. 5)
- LAW B 507** Federal Courts and the Federal System (3 or 4)
- LAW B 508** Equitable Remedies (4)
- LAW B 510-** Problems of Professional Responsibility (4)
- LAW B 511** Civil Procedure III (3)
- LAW B 512** Rights of Prisoners in Washington (3)
- LAW B 513** Evidence IV (4)
- LAW B 520-** Trial Advocacy ((2-6)-, max. 6)
- LAW B 521-** Appellate Advocacy ((1-3)-, max. 3)
- LAW B 523** Negotiation: Dispute Settlement and Planning (3)
- LAW B 524** Litigation, Negotiation, and Alternative Methods of Dispute Resolution (3)
- LAW B 525** Alternative Dispute Resolution (3)
- LAW B 527** Criminal Law Clinic (7)
- LAW B 530-** Judicial Externship ((1-15)-, max. 15)
- LAW B 532-** Supervised Analytic Writing ((1-3)-, max. 3)
- LAW B 533** Interviewing and Counseling for Lawyers (3)
- LAW B 535-** Legislative Externship ((1-15)-, max. 15)
- LAW B 536** Introduction to Legal Drafting (3)
- LAW B 538-** Agency Externships ((1-15)-, max. 15)
- LAW B 539** Public Interest Law Externship ((1-15)-, max. 15)
- Asian and Comparative Law**
- LAW B 540** Law in East Asia: Japan (3) Joint with SISEA 540.
- LAW B 541** Law in East Asia: China (3) Joint with SISEA 543.
- LAW B 542** Law in East Asia: Korea and South-east Asia (3)
- LAW B 543** Islamic Literature on Jurisprudence and Law in English (3) Joint with N E 432.
- LAW B 544** Justiciability Under the Civil Law and the Common Law (4)
- LAW B 545-** United States-Japanese Contract and Sales Problems ((2-4)-, max. 4)
- LAW B 546** United States-Japanese Corporate Relations (4)
- LAW B 547** United States-Japanese Tax Problems (3 or 4)
- LAW B 548** Japanese Administrative Law (3) Joint with SISEA 548.
- LAW B 549** Government Regulation of Business in Japan (3) Joint with SISEA 549.
- LAW B 550-** Legal Analysis and Research for Students Not Trained in the Common-Law System ((1-4)-, max. 4)
- LAW B 551-** Comparative Law Seminar ((2-6)-, max. 6)
- LAW B 552-** Tutorial in Comparative Law ((1-4)-, max. 4)
- LAW B 553** Chinese Legal Tradition (3) Joint with SISEA 553.
- LAW B 554** Survey of Soviet Law (3)
- Law and Marine Affairs**
- LAW B 560** Coastal Zone: Legal Regulation of On-shore Activities (2) Joint with IMS 510.
- LAW B 561** International Law of the Sea (4) Joint with IMS 506.
- LAW B 563-564** Ocean Policy and Resources Seminar (3-3)
- LAW B 565** U.S. Law and the Marine Environment (3) Joint with IMS 515.
- Seminars**
- LAW B 573-** Federal Tax Policy Seminar ((1-6)-, max. 6)
- LAW B 575-** The Supreme Court and the Constitution ((2-6)-, max. 6)
- LAW B 578-** Seminar on Legal Problems of Economic Development ((1-6)-, max. 6)
- LAW B 579-** Federal Tax Seminar ((2-6)-, max. 6)
- LAW B 583-** Eminent Domain ((1-3)-, max. 3)
- LAW B 584-** Indian Law Seminar ((2-6)-, max. 6)
- LAW B 585-** Information Law Seminar ((2-2-2)-, max. 6)
- LAW B 586-** Issues in Discrimination ((2-6)-, max. 6)
- LAW B 587-** Problems in Labor Law Seminar ((1-4)-, max. 4)
- LAW B 588-** Advanced Antitrust Seminar ((1-4)-, max. 4)
- LAW B 589-** Intellectual Property Law Seminar ((1-4)-, max. 4)
- LAW B 590-** Social Security Act Seminar ((1-3)-, max. 3)
- LAW B 591-** Issues in Labor Law Seminar ((1-6)-, max. 6)
- LAW B 592-** Seminar on the Legal Rights of Handicapped Persons ((1-4)-, max. 4)
- LAW B 594-** Public Land Law Seminar ((2-6)-, max. 6)
- LAW B 595-** Mental Health Law Seminar ((1-4)-, max. 4)
- LAW B 596** International Protection of Human Rights Seminar (2-2, max. 4) (Formerly LAW A 576.)
- LAW B 598-** Advanced Research and Writing Seminar ((2-6)-, max. 6)
- LAW B 599-** Special Topics ((1-12)-, max. 12)
- LAW 600** Independent Study or Research (*)
- LAW 800** Doctoral Dissertation (*)

Graduate School of Library and Information Science

Director

Margaret E. Chisholm
133 Suzzallo

Graduate Program

A 63-credit course of study leads to the Master of Librarianship degree, which prepares graduates for professional positions in information management in libraries and a variety of other environments. The school's curriculum incorporates a significant number of courses in the organization, storage, retrieval, and management of information through the use of diverse technologies. Foundation courses provide the theoretical base for the program. Technical and advanced courses are organized around five areas of concentration: managerial tools, organization of resources, information resources and retrieval, design and provision of information services, and environments of information service.

The law librarianship program requires a J.D. degree for admission and may be completed in one calendar year. This specialized course of study prepares lawyers to serve as law librarians in courts, federal and state governmental agencies, schools of law, corporations, and law firms.

Special Research Facilities

The school's computer laboratory provides a dedicated facility for research and instruction in the design and utilization of information systems. Microcomputers, laser disc drives, and allied equipment support a broad variety of data bases, applications software, and programming capabilities, as well as providing access to the University's computer network and off-campus bibliographic utilities and information services.

Admission Requirements

The following criteria are examined as evidence of the applicant's ability to progress satisfactorily in a graduate program: (1) application for admission; (2) a baccalaureate degree from a college or university of recognized rank, and evidence of above-average scholastic ability, usually shown by a 3.00 minimum grade-point average for the junior and senior years; (3) an official score from the Graduate Record Examination, general aptitude section, taken within five years of the year of expected enrollment (an exception is made for those who have completed a Ph.D. degree program); (4) three letters of recommendation; and (5) a statement of educational and personal objectives. In addition, an applicant from a non-English-speaking country must demonstrate a satisfactory command of English by submitting a recent score from the Test of English as a Foreign Language examination. Students may be admitted any quarter, though most choose to begin Autumn Quarter. Completed applications for admission for Summer and Autumn quarters must be received by May 1, for Winter Quarter by November 1, and for Spring Quarter by February 1. International students, however, are advised to complete their applications by March 1.

In addition to the above requirements, an applicant for the law librarianship program must hold a degree from an accredited American law school or from a law school in one of the common-law countries.

While not required, it is helpful if applicants have completed some formal study of a modern foreign language.

Financial Aid

The school has funding available each year for one research assistantship and several student positions. In addition, fellowships from the Cobb, Henry, Page, and Wilson endowment funds and the Finley multiethnic fellowship are awarded each year. Fellowships from the U.S. Department of Education are available during selected years. The amount of assistance and number of awards varies from year to year. All awards have financial need as one criterion, which is based on the figures the applicant provides on the Financial Aid Form. This form is provided in the application packet and must be submitted by March 1 each year. The school is unable to offer financial assistance to international students. Other fellowships are described in *Financial Assistance for Library Education*, available from the American Library Association, 50 East Huron Street, Chicago, Illinois 60611.

Correspondence and Information

Director
Graduate School of Library and Information Science,
FM-30

Faculty

Director

Margaret E. Chisholm

Professors

Ahlert, Eleanor E., 1986, (Emeritus), M.A., 1957, Washington; librarianship.

Benne, Mae M., 1965, (Emeritus), M.S., 1955, Illinois; children's literature, public library services for children.

Bevis, L. Dorothy, 1947, (Emeritus), M.A., 1951, Washington; librarianship.

Chisholm, Margaret E., 1975, M.Lib., 1958, Ph.D., 1966, Washington; school library media programs, organization and administration, library education.

Hiatt, Peter, 1974, M.L.S., 1957, Ph.D., 1963, Rutgers; adult services, special populations, library education, staff development, continuing education.

Lieberman, Irving, 1956, (Emeritus), M.A., 1950, Ed.D., 1955, Columbia; librarianship.

Shaw, Spencer G., 1971, (Emeritus), B.L.S., 1941, Wisconsin; librarianship.

Associate Professors

Fidel, Raya, 1982, M.L.S., 1976, Hebrew (Jerusalem); Ph.D., 1982, Maryland; information storage and retrieval systems, system analysis and automation, research methods.

Mignon, Edmond, 1970, M.A., 1952, Syracuse; M.Lib., 1959, Washington; Ph.D., 1976, California (Berkeley); information retrieval, bibliographic organization, information studies, methods of research.

Skelley, Grant T., 1989, M.A., 1952, M.Lib., 1952, Washington; Ph.D., 1968, California (Berkeley); bibliography and reference, subject literature, history of the book.

Turner, Mabel A., 1941, (Emeritus), M.S.L.S., 1959, Columbia; librarianship.

Assistant Professors

Brooks, Terrence A., 1986, M.L.S., 1971, McGill; M.B.A., 1975, York; Ph.D., 1981, Texas (Austin); information storage and retrieval, data-base design, bibliometrics, statistical methodology.

Nelson, Jerold A., 1971, M.A., 1964, Minnesota; Ph.D., 1971, California (Berkeley); interpersonal relations in libraries, intellectual freedom.

Soper, M. Ellen, 1972, M.S., 1963, Ph.D., 1972, Illinois; technical services, organization of library materials, cataloging, subject analysis.

Sy, Karen J., 1984, (Public Affairs), M.S., 1968, Ph.D., 1984, Wisconsin (Madison); information systems, information policy, information dissemination and utilization.

Course Descriptions

LIBR 450 Survey of Children's Literature (3) Designed for educators, librarians, and others interested in the selection and utilization of children's books for family, school, and library enrichment. Not open to librarianship majors. Prerequisite: junior or higher standing.

LIBR 451 Literature for Young Adults (3) Reading and appraisal of literature appropriate to the needs, interests, and abilities of young adults. For the general student as well as the teacher. Not open to librarianship majors. Prerequisite: junior or higher standing.

LIBR 470 History of the Book (3) Skelley Survey of the development of the book from hieroglyphics and clay tablets to the present, with emphasis on the printed book in the Western world since Gutenberg. The book as a physical object and the processes and materials of its production, viewed in the context of changing technologies and various cultural, esthetic, economic, and trade influences. Includes aspects of book collecting. Offered on credit/no credit basis only. Prerequisite: junior or higher standing.

LIBR 471 Storytelling: Art and Techniques (3) Storytelling, past and present, noting its development as an art form. Reading and analyzing storytelling materials (folk literature and literary forms) used by storytellers throughout historical periods. Learning essential techniques necessary to maintain this artistic skill in a professional field. Planning storytelling programs for various age and interest groups and situations, utilizing folk, classic, and contemporary literature. Not open to librarianship majors. Prerequisite: junior or higher standing.

LIBR 498 Special Topics (1-5, max. 15) Library service and information science subject matter in seminars, workshops, or other appropriate formats. Topics vary and may be repeated for credit. Offered on credit/no credit basis only. Prerequisite: junior or higher standing.

LIBR 500 Society, Users, and Libraries (4) Hiatt, Nelson Technological, societal change as it relates to information. Society's information processes, ways individuals use information in their environments. Skills basic to other courses developed, including awareness of resources for study of library and information science. Intellectual context of librarianship as service profession. Prerequisite: major standing.

LIBR 501 Bibliographic Control (4) Skelley, Soper Survey of the major types of instruments for the bibliographic control of the various kinds of library materials and of the conventions used in describing them. Basic concepts, historical background, and theoretical and practical aspects of bibliographic control; evaluation and methodology. Prerequisite: major standing.

LIBR 502 Introduction to Information Science (3) Fidel Theory, understanding, and perspectives for the analysis of design and operation of information retrieval systems. Systems analysis applied to the process of information transfer. Consideration of user needs assessment, performance evaluation, and control of terminology. Prerequisites: 501, 503, or permission of instructor.

LIBR 503 Bibliographic Data Bases (4) *Brooks, Mignon* Concepts and conventions of bibliographic record structure, file organization, and search protocols. Elementary techniques in the use of bibliographic utilities and on-line search services. Prerequisite: major standing.

LIBR 510 Management for Librarianship (3) Management concepts critical to provision of library services. The planning process applied to library problems and opportunities. Communications awareness and skills in the professional environment. Organizational concerns, including personnel, budgeting, control techniques, theories of management, and evaluation of effectiveness. Prerequisite: 500 or permission of instructor.

LIBR 511 Library Administration Skills (3) Provides practice in the administrative skills related to personnel selection, supervision, and management, and to planning and budgeting processes in the library setting. Topics include work specification, performance evaluation, personnel policy formulation, budget types, and budget preparation and control. Prerequisite: 510 or permission of instructor.

LIBR 512 Community Analysis and Library Change (3) Review of the concepts, strategies, and tools for study of the community, response to community change, and promotion of desired library change. Includes experiential exercises, analysis of case studies, and investigation of the literature of relevant fields. Prerequisite: 500 or permission of instructor.

LIBR 513 Management of Automated Systems in Libraries (3) *Sy* Developing criteria for selection and design of computer systems for libraries and information centers. Applying criteria in evaluation of hardware and software. Examining related management challenges such as vendor relations, financing options, personnel requirements, and design of auxiliary activities. Offered on credit/no credit basis only. Prerequisites: 501, 503, or permission of instructor.

LIBR 520 Organization of Library Materials: Introduction (3) *Soper* Principles and techniques of standard methods of organizing library materials for use. Includes fundamentals of descriptive cataloging, primary systems of subject analysis, and developments in technical services. Prerequisites: 501, 503, or permission of instructor; recommended: 500.

LIBR 522 Descriptive Cataloging (3) *Soper* Continuation of 520, with emphasis on rules of descriptive cataloging for monographic print materials of all kinds and nonbook materials. Includes applications of automation to bibliographic control of library materials. Prerequisite: 520 or permission of instructor.

LIBR 523 Subject Analysis of Library Materials (3) *Soper* Continuation of 520, with emphasis on subject analysis of library materials. Includes work with Library of Congress and Dewey decimal classifications, Sears and Library of Congress subject headings, and other systems used in libraries today. Prerequisite: 520 or permission of instructor.

LIBR 525 Organization and Use of Serials (3) *Soper* Management of serials, including acquisition and replacement, control, subject access, preservation, and use of all types in all kinds of libraries. Includes application of new technology and international developments as they affect serials. Prerequisite: 522 or permission of instructor.

LIBR 526 Indexing and Abstracting (3) *Fidel* Techniques of vocabulary control and thesaurus construction as applied to indexing and abstracting processes. Design, selection, and evaluation of indexing systems. Computerized methods for free text, full text, and controlled vocabulary procedures. Application of methods to information retrieval systems. Prerequisites: 501, 503, or permission of instructor.

LIBR 528 Literature Searching (3) *Brooks, Mignon* Concepts and techniques of professional literature searches, using a variety of standard search lan-

guages on representative types of bibliographic data bases and on-line reference resources. Analysis and evaluation of data bases. Prerequisites: 501, 503, or permission of instructor.

LIBR 531 Organization of Retrieval Systems (3) *Fidel* Preliminary design of data bases for decision-support systems. Introduces methods of collecting user requirements, requirement analysis, data dictionary, the entity-relationship model, methods for database integration preparation for data collection, and evaluation. Offered on credit/no credit basis only. Prerequisites: 501, 503, or permission of instructor.

LIBR 533 Design of Relational Bibliographic Data-Bases (3) *Brooks* Declaration of tables, columns of data. Analysis of tables with the normalization process. Linking tables together to express one-to-many and many-to-many relationships. Strategies with tabular file managers. Economics of bibliographic files. Artificial intelligence and expert system applications. Survey of microcomputer relational data-base systems. Prerequisites: 501, 503, or permission of instructor.

LIBR 540 Materials for General Information Needs (3) *Nelson* Consideration of the individual in the generalized information environment. Interdisciplinary sources for the selection of library materials. Forms of materials for nonspecialized information retrieval and referral. Development of skills in question negotiation and search strategy. Prerequisites: 501, 503, or permission of instructor; recommended: 500.

LIBR 541 Information Access in the Humanities (3) *Nelson* Description and analysis of information problems and information sources in the humanities. Fields considered are philosophy, religion, visual arts, performing arts, language, and literature. Prerequisites: 501, 503, or permission of instructor; recommended: 500.

LIBR 542 Information Access in the Social Sciences (3) *Skellay* Description and analysis of information problems and information sources in the social sciences. Fields considered are anthropology, business economics, education, geography, history, political science, psychology, and sociology. Prerequisites: 501, 503, or permission of instructor.

LIBR 543 Information Access in Science and Technology (3) *Skellay* Covers the following topics as they apply in the literature of the natural sciences and engineering: nature of information transfer; characteristics and organization of bibliographic and reference sources; information retrieval from manual and computer on-line sources; search strategy; practice with specific data bases and manual sources. Prerequisites: 501, 503, or permission of instructor; recommended: 528.

LIBR 544 Legal Bibliography (3) *A Hazelton* Introduction to legal bibliography and law librarianship. Basic primary and secondary legal bibliographic tools. Integration of manual and computer resources for effective legal research. Prerequisites: law librarianship major or 501 and 503 for non-law librarianship major.

LIBR 545 Government Publications (3) *Nelson, Sy* Government publications of the United States and foreign countries, their acquisition, organization, and use. Offered on credit/no credit basis only. Prerequisites: 501, 503, or permission of instructor; recommended: 500.

LIBR 546 Business Information Resources (3) *Skellay* Survey of the extent and nature of business information and its sources, and of business information producers and consumers. Study and use of both print and on-line sources. Prerequisites: 501, 503, or permission of instructor.

LIBR 547 Evaluation and Selection of Audiovisual Materials (3) Develops competency in applying criteria to the evaluation, selection, and use of audiovisual materials and their accompanying technologies. Focuses on previewing the full range of audiovisual formats found in all types of libraries.

LIBR 549 Children's Materials: Evaluation and Use (3) Study of library materials for children with emphasis on literature in its various forms. Attention also given to criteria used in evaluation, issues in selection, and use of materials with children. Prerequisites: 500, 501, or permission of instructor.

LIBR 550 Children's Materials: Bibliography and Resources (3) Bibliography and selection aids necessary to develop collections for public, school, and academic libraries. Standard works of literary criticism; contemporary and historical studies, and texts dealing with the use of literature with children; and publications of organizations, both United States and foreign, role of the publisher, the needs of the selector and the scholar. Prerequisites: 500, 501, or permission of instructor.

LIBR 551 Literature for Young Adults (3) Reading, evaluation, and sharing of literature currently appropriate to the needs, interests, and abilities of young adults, ages twelve through twenty. Application of criteria to the assessment of young-adult reading materials and consideration of the uses of these materials with young people.

LIBR 553 Information Access in Health Sciences (3) *Mignon* Characteristics of users of biomedical literature. Information resources in health sciences and health-care planning. Use of information retrieval systems, emphasizing services of National Library of Medicine. Organization of medical, hospital libraries. Problems of information policy, professional standards, certification. Offered on credit/no credit basis only. Prerequisite: 528 or permission of instructor; recommended: 543.

LIBR 555 Socioeconomic Data Resources (3) *Mignon* Utilization of public data bases of economic and demographic statistics for information retrieval, special attention to services of Bureau of the Census. Application of on-line data files to library reference services. Offered on credit/no credit basis only. Prerequisites: 503 and 599 or knowledge of inferential statistics, or permission of instructor.

LIBR 557 Advanced Legal Bibliography (4) *W Hazelton* Legal bibliographic tools that answer more complex legal research problems, such as federal legislative histories, sources of administrative law, specialized research (e.g., tax, securities). Builds on skills and techniques utilized in 544. Extensive work with computer-assisted legal retrieval. Prerequisites: major standing in law librarianship, 544, or permission of instructor.

LIBR 558 Selection and Processing of Law Library Materials (3) *Sp Hazelton* Study of tools for collection development and collection development plans in law libraries. All law library technical processes, including acquisitions, budgeting, cataloging, and serials. Prerequisite: 544 or permission of instructor.

LIBR 560 Information Needs, Uses, and Users (3) *Nelson* Study of the factors and influences, both individual and social, associated with human beings needing, using, and acting on information. Information theory, human information processing, information flow among social and occupational groups, and research on information needs and uses. Prerequisite: 500 or permission of instructor.

LIBR 561 Serving Individual Information Needs (3) *Nelson* Training in awareness and skills for perceiving and responding to the information requests of users. Effective strategies for meeting information needs are learned through use of simulations, role playing, experiential exercises, discussion, and practice. Offered on credit/no credit basis only. Prerequisite: 500 or permission of instructor.

LIBR 562 Planning for Library and Information Services (3) *Hiatt* Principles underlying library and information services, and the selection and design of

services to meet user needs in all types of libraries and information centers. Emphasis on adult clientele in academic, public, and special libraries, but attention given to school library media centers and all age levels. Prerequisite: 500 or permission of instructor; recommended: 501.

LIBR 563 Services for Special Groups (3) *Hiatt* Needs analysis and design of library services for the blind and visually handicapped, deaf and hearing impaired, institutionalized, mentally and physically handicapped, functionally illiterate, minorities, and aging. Skills, insights, and knowledge to work with these groups. Current research, practice, and experimental programs. Prerequisite: 500 or permission of instructor.

LIBR 566 Special Librarianship (3) *Hiatt* Seminar in the practice of special librarianship in business and industrial firms, government agencies, and the free-lance sector. User services and information resources. Prerequisites: 24 credits in Master of Librarianship program.

LIBR 567 Public Library Services for Children (3) Administration of children's departments in public libraries; planning and promoting programs and services; evaluation of library collections; community and professional roles of the children's librarian. Prerequisites: 500, 501, or permission of instructor.

LIBR 568 Administration of the School Library Media Program (3) Develops competency in administering materials, equipment, and services of the library media program as an integral part of the educational process of the school. Focuses on developing skills in acquiring, organizing, and managing the full range of learning resources for access and use and communicating the program to users. Required for school library media specialists.

LIBR 571 Storytelling: Art and Techniques (3) Study of storytelling, past and present, noting its development as an art form. Reading and analyzing storytelling materials (folk literature and literary forms) used by storytellers throughout historical periods. Learning essential techniques necessary to maintain this artistic skill in a professional field. Planning storytelling programs for various age and interest groups and situations, utilizing folk, classic, and contemporary literature.

LIBR 572 Archival and Manuscript Services (3) Selection, organization, and uses of archival and manuscript collections. Emphasis on the principles and techniques; some attention to the administration of state archival and historical institutions' collections. Lecture, demonstration, and laboratory. Prerequisite: 501, or permission of instructor.

LIBR 577 Law Library Administration (4) *S Hazelton* Administration in law libraries, including organization, personnel, and management issues (e.g., interviewing, hiring, firing), communications, library planning, and bookkeeping. Prerequisite: 544 or permission of instructor.

LIBR 581 Intellectual Freedom in Libraries (3) *Nelson* Analysis of issues related to intellectual freedom, with particular attention to implications for libraries and librarians. Topics include consideration of the current legal climate, conformity versus freedom in the modern world, the librarian as censor, social responsibility and individual freedom, the intellectual freedom of children, prospects for the future. Offered on credit/no credit basis only. Prerequisite: 500 or permission of instructor.

LIBR 583 Cooperative Information Systems (3) *Mignon* Analysis of cooperative information systems found among all types of libraries and information centers. Emphasis on developments in the United States and also treatment of foreign and multinational systems, with assessment of their contributions. Prerequisite:

sites: 500, 501, or permission of instructor.

LIBR 584 Information Policy (3) *Sy* Review of efforts to develop national information policy and assessment of where we are in process. Consideration of legislation and issues pertinent to national information policy (e.g., freedom of information, privacy, copyright, management of government information, telecommunications, transborder data flow, and satellite technology). Prerequisites: 500, 503, or permission of instructor; recommended: 501, 545.

LIBR 585 Information in the Public Policymaking Process (3) *Sy* Demystifying information base for policymaking in a democracy. Review of theoretical needs and opportunities for input of information associated with three branches of government and each phase of policy-making. Focus on actors who bring information to policymakers. Federal, state, and local comparison. Joint with PB AF 581. Offered on credit/no credit basis only. Prerequisite: 500 or permission of instructor; recommended: 501.

LIBR 590- Directed Fieldwork (4-) *Chisholm* Library and information science majors only. A minimum of 200 hours of professional, supervised fieldwork in a library or professional information agency. May be taken in one quarter or as many as three consecutive quarters. Offered on credit/no credit basis only. Prerequisite: 33 credits in Master of Librarianship program.

LIBR 592 Aspects of Publishing (3) *Skellay* Examination of selected topics and figures relating to book and periodical publishing, primarily from the Renaissance to the present. Focus on publishing practices, processes, and strategies considered in given economic, cultural, and social contexts. Does not cover the arts, crafts, materials, and technical means involved in producing the published product, but the combination of activities, entrepreneurial or otherwise,

that constitute publishing. Offered on credit/no credit basis only.

LIBR 594 Collection Development (3) *Hiatt* Access to materials as context for development and management of library collections in academic, public, school libraries. Community analysis, library mission; collection development policies, criteria, principles, levels, responsibilities; aids to selection; collection evaluation, use studies; controversial, difficult materials. Major issues, research, trends. Offered on credit/no credit basis only. Prerequisites: 500, 501, or permission of instructor; recommended: course in 540 sequence.

LIBR 597 Directed Fieldwork Seminar (2) *Chisholm* Research or in-depth study that leads to a consideration of problems, concerns, or issues of mutual interest that originated during field experiences. Offered on credit/no credit basis only.

LIBR 598 Special Topics in Librarianship (3) Seminar dealing with various topics in librarianship. Offered by visitors or resident faculty. Topics are changed from quarter to quarter. May not be offered every quarter. May be repeated for credit. Offered on credit/no credit basis only. Prerequisite is determined by specific course.

LIBR 599 Methods of Research in Librarianship (3) *Brooks* Introduction to research methods commonly used in library and information science. Emphasis on problem selection, study design, data interpretation, and dissemination of results. Prerequisites: 12 credits in Master of Librarianship program, or permission of instructor.

LIBR 600 Independent Study or Research (*) Offered on credit/no credit basis only.

LIBR 700 Master's Thesis (*) Offered on credit/no credit basis only.



School of Medicine

Dean

Michael B. Whitcomb
A300 Health Sciences

Associate Deans

Benjamin H. Belknap
Stanley J. Geyer
Karen A. Holbrook
D. Daniel Hunt
Wayne W. Myers
John M. Neff
Marvin Turck
Loren C. Winterscheid

Assistant Deans

Daniel O. Graney
David M. Irby
Werner E. Samson
John Yergan

WAMI Coordinators / Assistant Deans

Ronald J. Adkins, Washington State University
Raymond Bailey, University of Alaska
Stephen Guggenheim, Montana State University
Thomas McKean (Acting), University of Idaho

WAMI Program

Established in 1946, the School of Medicine is the only medical school directly serving the states of Washington, Alaska, Montana, and Idaho. Located in the Warren G. Magnuson Health Sciences Building, the school operates a decentralized program of medical education (WAMI) via a network of teaching affiliates throughout the Pacific Northwest.

The school's basic-science departments provide educational opportunities for students from all schools and colleges within the University. Clinical teaching programs are conducted at University Hospital, Harborview Medical Center, Children's Hospital and Medical Center, Seattle Veterans Administration Hospital, and Pacific Medical Center, as well as at other clinical affiliates in Seattle and throughout the WAMI states.

The school currently admits 175 medical students to its first-year class and has a total enrollment of seven hundred students pursuing the Doctor of Medicine degree. The full-time faculty numbers more than one thousand members. The affiliated University residency training network enrolls approximately six hundred house officers. Enrollment in the graduate programs in the basic sciences exceeds two hundred students, and approximately four hundred postdoctoral fellows are enrolled in various advanced training programs. The school has baccalaureate and graduate programs in occupational therapy, physical therapy, prosthetics and orthotics, and medical technology. It participates in training a broad spectrum of other allied health professionals.

Academic Program

Doctor of Medicine Degree

Upon completion of the curriculum of the School of Medicine, the M.D. degree is awarded to those candi-

dates who (1) have given evidence of good moral character, (2) have satisfactorily completed the requirements of the curriculum, (3) have fulfilled all special requirements, and (4) have discharged all indebtedness to the University.

Bachelor of Science Degree

Programs leading to a baccalaureate degree with a major in microbiology are offered through the College of Arts and Sciences. Those programs are described in the College of Arts and Sciences section of this catalog.

Bachelor of Science in Medical Technology Degree

A curriculum in medical technology is offered by the Department of Laboratory Medicine. This program provides study in the basic sciences plus clinical training designed to prepare competent laboratory scientists for varied employment opportunities. Information concerning admission to the medical technology program appears under Laboratory Medicine in this catalog.

Bachelor of Science in Occupational Therapy Degree

A curriculum in occupational therapy is offered by the Department of Rehabilitation Medicine. It provides professional training in the basic sciences and, in the clinical use of occupational therapy modalities, and procedures. Information concerning admission to the occupational therapy program appears under Rehabilitation Medicine in this catalog.

Bachelor of Science in Physical Therapy Degree

A curriculum in physical therapy is offered by the Department of Rehabilitation Medicine. It provides professional training in the basic sciences and in the clinical use of accepted physical therapy modalities and procedures. Information concerning admission to physical therapy appears under Rehabilitation Medicine in this catalog.

Bachelor of Science in Prosthetics and Orthotics Degree

A curriculum in prosthetics and orthotics leading to the degree of Bachelor of Science is offered by the Department of Rehabilitation Medicine. It provides professional training in the basic sciences and the clinical application, design, and fabrication of prostheses and orthoses. Information concerning admission to the curriculum in prosthetics and orthotics may be found under Rehabilitation Medicine in this catalog.

Master of Science and Doctor of Philosophy Degrees

Work leading to master's and doctoral degrees is offered, in accordance with the requirements of the Graduate School, in the Departments of Biochemistry, Biological Structure, Microbiology, Pathology, Pharmacology, and Physiology and Biophysics. Master's degree programs are offered by the Departments of Laboratory Medicine, Medical History and Ethics, and Rehabilitation Medicine.

Students may work toward these degrees concurrently with the M.D. degree, taking additional years beyond the typical four-year medical curriculum. To expedite the training of physicians who wish to specialize in public health and community medicine, the school has available a program that leads simultaneously to the degrees of Doctor of Medicine and Master of Public Health. The program usually requires the addition of a fifth year to the medical education process. The quarters of the fifth year may be taken sequentially or interspersed with medical training in a variable pattern, subject to appropriate academic approval. Students may elect concentration in any of four departments of the School of Public Health and Community Medicine: Biostatistics, Environmental Health, Epidemiology, or Health Services.

Concurrent degrees are possible in many other departments and colleges of the University. Recent graduates have pursued concurrent degrees in education and engineering, as well as in the basic sciences of

medicine and the School of Public Health and Community Medicine. A student who intends to work toward a graduate degree should confer with the Chairperson of the department in which graduate study is to be pursued and with the associate dean for academic affairs of the School of Medicine. Specific requirements for admission to work for advanced degrees appear in the Graduate Study and Research section of this catalog. Permission to pursue advanced degrees is granted to medical students only if they are progressing normally in the medical curriculum and show evidence of being able to take on this additional work load.

Medical Accreditation and Licensure

The University of Washington School of Medicine is a fully accredited institution, having received approval from the Liaison Committee on Medical Education representing the Association of American Medical Colleges and the American Medical Association.

Admission to the practice of medicine in any state is conditional upon meeting the requirements of that state's board of examiners. Admission to practice in the state of Washington is dependent on the candidate's having an M.D. degree, completing two years of graduate (residency) training, and passing the licensing examinations of the state. Washington accepts the National Board of Medical Examiners examination for this purpose. As of 1986, all states except Texas and Louisiana also accept this examination as well as the examination administered by the Federation of State Licensing Boards.

Additional information about licensure requirements may be obtained from the Washington State Division of Professional Licensing, Post Office Box 9649, Department 71175, Olympia, Washington 98504.

Postgraduate Medical Education

Internships and Residencies

Postgraduate clinical training programs are available at University-affiliated hospitals: University Hospital, Harborview Medical Center, Seattle Veterans Administration Hospital, Pacific Medical Center, Children's Hospital and Medical Center, Providence Hospital, Swedish Hospital, Group Health Cooperative of Puget Sound, and Boise Veterans Administration Hospital. All clinical departments cooperate with one or more of these institutions. A University network of affiliated family practice residencies includes training programs based in Seattle, Tacoma, Renton, Spokane, and Boise, Idaho, and in a military program at Madigan Army Medical Center. Training programs are available in anesthesiology, family medicine, general surgery, internal medicine, laboratory medicine, neurological surgery, neurology, nuclear medicine, obstetrics and gynecology, ophthalmology, orthopaedic surgery, otolaryngology, pathology, pediatrics, psychiatry, radiation therapy, radiology, rehabilitation medicine, and urology. Residency programs vary in duration from three to five years and are integrated, providing for rotation through several of the University-affiliated hospitals during this period of training.

Postdoctoral Fellowships and Traineeships

Postdoctoral fellowships and traineeships are available in all departments. They are designed to provide additional research, teaching and clinical experience for advanced students who already have obtained the Ph.D. or M.D. degree.

Medical Curriculum

Basic Curriculum (122 Credits)

The first two years (six quarters) of the medical student curriculum is identified as the *Basic Curriculum*. It consists of three phases, or groups, of courses in the human biology series: pre-organ system courses in the sciences basic to medicine, organ systems taught by basic and clinical disciplines, and introduction to clinical medicine and health care. The first phase is designed to provide the background in basic disciplines required for the organ system courses. In the second phase, the student is concerned with learning the normal and pathophysiologic properties of the several human organ systems. Emphasis is placed upon correlating these properties with clinical methods of data collection and problem formulation. Students pursue the Introduction to Clinical Medicine course throughout all six quarters, learning to interview patients, obtain a medical history, and perform physical examinations. In the course Medicine, Health, and Society, they also study the health-care system and problems of providing medical care to populations.

Students are expected to pursue the Basic Curriculum during their first six quarters in the School of Medicine. The academic demands of the Basic Curriculum are scaled so that most students also will be able to take elective courses. Electives may be used to make up educational deficiencies, to broaden the student's background, or to begin the fulfillment of the Independent Study in Medical Science requirement. No student is expected to undertake work in excess of 24 credits per quarter. In fact, assumption of an academic load in excess of this requires special permission.

FIRST QUARTER (AUTUMN)

HUBIO 510P	Microscopic Anatomy (Histology)
HUBIO 511P	Gross Anatomy and Embryology
HUBIO 512P	Mechanisms in Cell Physiology
HUBIO 513P	Introduction to Clinical Medicine
HUBIO 514P	Biochemistry
HUBIO 515P	Ages of Man

SECOND QUARTER (WINTER)

HUBIO 520P	Cell and Tissue Response to Injury
HUBIO 521P	Natural History of Infectious Disease and Chemotherapy
HUBIO 522P	Introduction to Clinical Medicine
HUBIO 523P	Introduction to Immunology
HUBIO 524P	Biochemistry
HUBIO 526P	System of Human Behavior I

THIRD QUARTER (SPRING)

HUBIO 530P	Epidemiology
HUBIO 531P	Head, Neck, Ear, Nose, and Throat
HUBIO 532P	Nervous System
HUBIO 534P	Natural History of Infectious Disease and Chemotherapy II
HUBIO 535P	Introduction to Clinical Medicine

FOURTH QUARTER (AUTUMN)

HUBIO 540P	Cardiovascular System
HUBIO 541P	Respiratory System
HUBIO 542P	Introduction to Clinical Medicine
HUBIO 543P	Principles of Pharmacology I
HUBIO 544P	Endocrine System
HUBIO 545P	Reproduction

FIFTH QUARTER (WINTER)

HUBIO 550P	Introduction to Clinical Medicine
HUBIO 551P	Gastrointestinal System
HUBIO 553P	Musculoskeletal System
HUBIO 554P	Genetics
HUBIO 555P	Medicine, Health, and Society
HUBIO 567P	Skin System

SIXTH QUARTER (SPRING)

HUBIO 560P	Introduction to Clinical Medicine
HUBIO 551P	Hematology
HUBIO 562P	Urinary System
HUBIO 563P	System of Human Behavior II
HUBIO 564P	Principles of Pharmacology II
HUBIO 566P	Systematic Pathology

Clinical Curriculum (120 Credits)

The clinical curriculum is pursued predominantly in the third and fourth years of medical school. It includes three elements: prescribed clerkships to be completed by all students (72 credits or thirty-six weeks in medicine, obstetrics and gynecology, pediatrics, psychiatry, surgery); a clinical selective series requiring a minimum number of credits (20) in three clinical areas (family medicine, rehabilitation medicine/chronic care, and emergency care/trauma); and a minimum of 28 credits of clinical clerkships elected by the student.

Education in the clinical curriculum utilizes the case-study method. Students gain clinical knowledge and gradually increase their clinical problem-solving abilities while working as junior members (clerks) of a medical-care team. Each such team is headed by a faculty clinician working in one of the medical school-affiliated hospitals or practice units.

Independent Study in Medical Science (10 Credits)

In addition to the basic and clinical curricula, the school has required since 1968 that each student complete a prescribed number of credits in one or more of the sciences basic to medicine. Beginning in 1982, this requirement is for 10 credits and must be a planned program consistent with the student's interests and career goals. Its purpose is that each student gain an understanding of the philosophy and methods of science as it relates to his or her chosen field of medicine. The planned program should include investigation in the disciplines studied and must result in a written paper acceptable to the student's adviser and faculty committee supervising this phase of the curriculum.

WAMI Program (Decentralized Medical Education)

The WAMI Program was initiated in 1971 as an experiment in decentralized medical education to provide a broader range of educational opportunities for students. It is an integral part of the undergraduate medical curriculum and is a fully accredited program of the School of Medicine. The WAMI Program is named for the four states (Washington, Alaska, Montana, and Idaho) that share resources and responsibilities in the regional educational program. Funds appropriated to the WAMI Program by Alaska, Montana, and Idaho legislatures assure each state of positions in the freshman medical class each year for its students.

UNIVERSITY PHASE

In the University Phase of the WAMI Program, approximately forty percent of the students admitted to the University's School of Medicine receive the first year of medical school training at Washington State University, University of Alaska, Montana State University, or the University of Idaho. Washington State University positions not filled by volunteers will be assigned by lottery. Every Washington resident applicant should recognize the possibility of assignment to Washington State University during the first year. Alaskans, Montanans, and Idahoans attend their home-state institutions. While in one of these institutions, they enroll in basic science courses taught by the science faculty and are provided supplemental resources from this university's School of Medicine faculty. Preceptorships with community physicians are also offered first-year students at the WAMI-participating universities. These students join their classmates at the University's campus in Seattle for the second year of medical studies.

CLINICAL PHASE

At the conclusion of the second year, students enter that portion of the curriculum that is predominantly clinical. As part of the clinical training, they complete clerkships at the University of Washington, at its affiliated

hospitals, or at seventeen Community Clinical Units located in the four-state region. At these sites, physicians in practice serve as School of Medicine clinical faculty members to provide supervised clinical training in five specialties: family medicine, internal medicine, obstetrics and gynecology, pediatrics, and psychiatry. The WAMI Community Clinical Units are also used for a portion of the residency training in the respective disciplines. Training experiences at the WAMI Community Clinical Units include outpatient contact at local physicians' private offices, hospital rounds, follow-through inpatient care, emergency room duty, service at local community special clinics, lectures, and didactic and participatory discussions. Clerkships in family medicine are offered at Boise and Pocatello, Idaho; Anchorage and Ketchikan, Alaska; Whitefish-Kalispell, Montana; and Anacortes, Omak, Spokane, and Tacoma, Washington. Clerkships in obstetrics and gynecology are offered at Spokane, Washington; Anchorage, Alaska; and Boise, Idaho. Psychiatric clerkships are offered at Anchorage, Alaska. Pediatrics clerkships are available in Pocatello, Idaho; Great Falls, Montana; and Spokane, Washington. Clerkships in internal medicine are offered at Boise, Idaho; Billings and Missoula, Montana; and Wenatchee, Washington. The average student spends one academic quarter (twelve weeks) at these community-based clerkships, and all students are expected to complete at least one such rotation. Additional time may be elected.

By capitalizing on the resources of neighboring state universities, the clinical expertise of community practitioners, and the medical center, the WAMI Program has been able to expand medical school admissions for students from all four states, to enlarge clinical training opportunities in the primary-care disciplines, and to increase continuing medical education programs offered health professionals in their local communities.

Admissions

(These procedures and policies described are subject to change. Information regarding changes is available at the School of Medicine Admissions Office.)

Requirements for Entrance

The Medical College Admission Test (MCAT) is required and must be taken by autumn of the year preceding the proposed date of enrollment. MCAT scores should be no older than three years prior to the application year. Minimum science course requirements are: biology (8 semester/12 quarter credits); organic chemistry (one year of lectures and laboratories). One quarter or one semester of biochemistry or molecular biology may be substituted for one quarter or one semester of organic chemistry (all options must include at least one quarter or one semester of organic chemistry laboratory), and physics (8 semester/12 quarter credits). These courses should be completed by the time of application if possible; all must be completed prior to anticipated medical school matriculation. Proficiency also is required in English and basic mathematics. All candidates must demonstrate substantial academic ability in their major field and in the required science courses. A minimum of three years of college is required; however, ninety-nine to one hundred percent of entrants in recent years have had baccalaureate degrees. No particular major is preferred, but a broad educational background is encouraged. A knowledge of, and exposure to, the needs of individuals and society and an awareness of health-care delivery systems are desirable.

Candidates are urged to discuss undergraduate credentials and curriculum with premedical advisers at their undergraduate institutions.

Medical College Admission Test

All applicants must provide the scores received on the MCAT. Arrangements for this test may be made with

the premedical adviser at the institution where premedical training is being taken. The MCAT customarily is given in the spring and autumn of each year. As noted, the MCAT must be taken by autumn of the year preceding the proposed date of enrollment. Additional information on the administration of this test may be obtained by writing to the American College Testing Program, Post Office Box 414, Iowa City, Iowa 52243, or telephoning (319) 337-1276. Early application for testing is advised. The deadline for registration is generally a month prior to the actual test date.

Variations in the type and amount of course work completed by the time of testing are considered in evaluation of MCAT results, particularly when retesting has been employed. All candidates are referred specifically to the section of the Association of American Medical Colleges' (AAMC) Medical School Admissions Requirements relating to the MCAT.

Application Process

The University is a participant in the American Medical College Application Service (AMCAS) Program. Application forms may be obtained from AMCAS offices, 1776 Massachusetts Avenue Northwest, Suite 301, Washington, D.C. 20036-1989. AMCAS begins accepting applications June 15, with the deadline for receipt of application by AMCAS being November 1. Because the admissions committee begins examining applications a year prior to the time of entrance, early application is advisable.

Candidates generally given serious consideration are persons who are legal residents of Washington, Alaska, Montana, and Idaho and, regardless of residence, M.D.-Ph.D. program candidates and Black Americans, American Indians, and Chicanos. Those considering application as nonresidents apart from the groups listed above should be aware that no such individuals gained admission to the last six entering classes. Applications from those who have failed to meet minimum standards in another medical school or a dental school cannot be considered.

The deadline for submitting additional application materials is February 1. These supplemental materials include: (1) A three-hundred-word autobiographical statement (can be written on the personal comment section of the AMCAS application or submitted separately) that should include a description of the origin and development of the candidate's motivation to become a physician and the reasons for desiring to attend this medical school. (2) A premedical committee evaluation or three individual letters submitted from instructors who have taught the candidate in a collegiate course (a mixture of evaluations from the sciences and humanities recommended; letters of recommendation should evaluate critically the difficulty of course work attempted and the candidate's academic ability, strengths, weaknesses, motivation for medicine, maturity, and special attributes and assets). (3) A supplemental information form supplied by the school during processing that requests information not given on the AMCAS application. (4) A \$35 fee, which should be submitted, along with the blue fee coupon, in the envelope provided (may be waived in hardship cases). (5) Legal residence certification by the appropriate state certifying officer that is required for Alaska, Montana, and Idaho applicants, and may be required for some Washington applicants. (6) The Medical Scientist Training Program application within three weeks after receiving the form from the school by those candidates who wish to be considered for the M.D.-Ph.D. program; this application form is sent to all eligible applicants together with the acknowledgement of receipt of their medical school application. Transcripts for all course work subsequent to the AMCAS application must be filed directly with the school's Admissions Office as soon as available. If the course of study (as outlined in the AMCAS application) changes, it is requested that this office be notified of these changes in writing, preferably using the format on the AMCAS application.

Interviews are by invitation only and, after careful review of completed applications, are granted to those

candidates considered potentially competitive for the positions available.

Attempts are made to issue notices of acceptance about the middle of each month, starting in November. Successful applicants should respond in writing to the notice of acceptance within two weeks. Prior to matriculation, the comptroller's office will require a \$50 deposit from those who expect to enter. This deposit is applied to the first quarter's tuition.

All students enrolled in the School of Medicine may, as part of the WAMI Program, receive a portion of training at sites away from the University campus. Those who enter as residents of Alaska, Montana, or Idaho are expected to spend their first year at the university site in their particular states. Twenty Washington residents will spend their first year at Washington State University. Offers of acceptance, therefore, are conditioned upon agreement to participate in the WAMI Program.

Inquiries, address changes, or other information regarding the application should be transmitted in writing and directed to the University of Washington; School of Medicine; Office of the Dean, SM-22; Committee on Admissions; Seattle, Washington 98195.

Residence Classification

Upon review of an application, the Committee on Admissions may request proof of legal residence of Washington candidates and will require proof of legal residence for Alaska, Montana, and Idaho candidates. Determination of state of legal residence is not made by the School of Medicine. Instead, the University's Residence Classification Office handles determinations of Washington residency for University purposes. Application for such a determination can be obtained by writing: University of Washington; Residence Classification Office; 209 Schmitz, PD-10; Seattle, Washington 98195.

Certification of Alaska, Montana, and Idaho residency for University purposes is made by each state's WAMI certifying office. Alaska applicants should contact University of Alaska; Dr. Helen Myers; WAMI Residence Committee; Office of the Provost, 1 Bunnell Hall, Fairbanks, Alaska 99775-5570. Idaho applicants should contact University of Idaho; Judy McNevin, Associate Director of Admissions; Moscow, Idaho 83843. Montana applicants should contact Ms. Jacki Wrigg, Certifying Office for the WAMI Program, 33 South Last Chance Gulch, Helena, Montana 59601. Please note that these certifying offices do not have access to the AMCAS application. Candidates must supply data on residency directly to the certifying offices.

Medical Scientist Training (M.D.-Ph.D.) Program

A limited number of highly qualified candidates who wish to pursue both the M.D. and Ph.D. degrees are considered annually. Medical scientist trainees must be accepted by the School of Medicine for the M.D. degree and by the Graduate School for the Ph.D. degree. They are permitted a wide choice of research specializations from among numerous disciplines and interdisciplinary areas of biomedical sciences. The program emphasizes continuity of both clinical and basic sciences exposure. Among participating graduate departments and interdepartmental disciplines are biochemistry, bioengineering, biological structure, biomathematics and biostatistics, epidemiology, genetics, medical history and ethics, microbiology, pathology, pharmacology, physiology and biophysics, physiology-psychology, psychology, and radiation biology.

Applicants should correspond directly with the Director of the Medical Scientist Training Program, D509 Health Sciences, SM-30, University of Washington, Seattle, Washington 98195, as well as proceed with the regular School of Medicine application.

Applicants who wish to be considered for the M.D.-Ph.D. program must submit the Medical Scientist Training Program application within three weeks after receiving the form from the school. This application form is sent to all eligible applicants together with acknowledgment of receipt of their medical school application. Serious consideration is not given to applicants with a cumulative grade-point average of less than 3.50 and average MCAT scores of less than 10 on Science Problems, Skills Analysis: Reading, and Skills Analysis: Quantitative.

Transfer Students

Residents of Washington, Alaska, Montana, and Idaho who are attending other medical schools are eligible to apply for transfer for clinical training into the third-year class only. Students interested in transferring from other medical schools should direct their inquiries to the Admissions Office of the School of Medicine for the latest information. It should be noted that transfers can be accepted *only* if there are adequate clinical facilities to accommodate them, and this has been a severely limiting factor since the increase in class size over the past decade. No transfers have been accepted since 1978.

Financial Information

Fees and Other Charges

All fees and extra service charges are payable in United States dollars and due at the time specified for such fees and charges. The University reserves the right to change any of its fees and charges without notice. Resident tuition presently is \$1,352 per quarter. Nonresident tuition presently is \$3,425 per quarter. For medical students, the average annual cost for books, supplies, equipment, and examination fees is \$1,150.

Financial Assistance

All financial aid is based on the demonstrated need of the student. All applicants for aid from the school must submit data for an analysis of need (Financial Aid Form) by the College Scholarship Service. This requires full disclosure of resources available to the student from individual and family sources. The Guaranteed Student Loan Program, the National Direct Student Loan Program, the Auxiliary (PLUS) Loan Program, the Health Professions Loan Program, and the Health Education Assistance Loan Program are the primary sources of aid.

Partial scholarships are available through the School of Medicine scholarship fund. These awards are limited to students of exceptional financial need and require financial information from the student and the student's parents, regardless of dependency status.

Financial aid information is distributed to all accepted applicants. Application forms for financial aid may be obtained from the Office of Student Financial Aid, School of Medicine. In case of emergency or special need, an application for financial assistance may be made at any time. Special consideration is given to entering minority students. The minority affairs program is an additional resource for financial aid information.

Outside employment is discouraged.

Medical Student Research Training Program

Research opportunities are offered to UW medical students interested in gaining valuable experience from training in medical research. The purpose of the program is to actively encourage students to participate in a research project as part of their medical education. This research is planned and carried out under the supervision of a faculty sponsor and may be undertaken during any quarter. Student trainees in the program receive a stipend supported largely by a special fund

from the School of Medicine. A sufficiently challenging project may require a working schedule of forty hours per week.

Minority Affairs Program

The minority affairs program assists students from minority and/or disadvantaged backgrounds. The program attempts to nurture interest in medical careers by providing support services in the areas of recruitment, admission, and retention.

The school is actively recruiting qualified minority applicants and encourages students to contact the Minority Affairs Office. Assistance is provided during the admissions application process, and program staff members communicate regularly with applicants and assist them with housing and transportation arrangements related to their visit to the campus.

A six-week prematriculation program, designed to teach students useful skills and to initiate their exposure to the medical school curriculum, is offered. Stipends are available to students who qualify. During the regular school year, the program serves as a general information resource for both academic and nonacademic needs and facilitates students' access to the multiple resources available in the School of Medicine and in the community.

Student Evaluation and Promotion

Award of the Doctor of Medicine degree is contingent upon satisfactory completion of academic and noncognitive requirements. The latter includes the acquisition of behavior patterns and attitudes consistent with the oath that all graduates take at the time of graduation. As such, student evaluation is based upon the faculty's observations of the student's behavior and conduct as well as upon papers and examinations. Periodic review of student progress is made by a faculty committee, and students are informed of their deficiencies and the remedial requirements for these deficiencies. Dismissal from the school may occur if the student fails to maintain an acceptable academic record, fails to follow academic directives provided by the committees of the school, or fails to develop attitudes and behavior patterns appropriate to a career in medicine. Opportunities to make up unsatisfactory work are allowed at the discretion of the Dean upon advice from the Academic Affairs Committee of the School of Medicine. Once dismissal or withdrawal from school has occurred, readmission requires the approval of the Academic Affairs Committee. Readmission after dismissal will not be considered without substantial evidence that the problems causing dismissal have been resolved. Every student is required to pass Parts I and II of the national board examination and all University of Washington examinations before receiving the Doctor of Medicine degree.

Grading System

Grades awarded in each course in the M.D. curriculum are Satisfactory, Not Satisfactory, or Honors. The school's goal is to provide a curriculum that defines the competencies to be achieved by the student at each level. Therefore, grading signifies satisfactory or not-satisfactory accomplishment of these competencies at the end of each course. Honors may be awarded in a course based on predetermined criteria that usually involve additional work in the subject as selected by the student. This system precludes ranking of students in class standing by a grade-point average.

Honors

A charter as Alpha of Washington was granted to the School of Medicine in 1950 by Alpha Omega Alpha, the honorary medical fraternity. Members are elected by the membership of Alpha Omega Alpha on the basis of high scholarship and good moral character.

Medical Thesis Program

The medical thesis program of the School of Medicine is voluntary, and participation is initiated by the student. Often a student will develop a special interest in some particular field in medicine. This interest will create a desire to learn more about the field or to do special work in it. The thesis program is a means of fulfilling that desire. Prizes are awarded for the best theses submitted each year, and certain departments offer prizes for the best thesis written under that department's supervision. The preparation of a satisfactory thesis may carry with it honors at graduation. Additional information concerning the thesis program can be obtained from the chairperson of the Medical Thesis Committee or from the Office of the Dean.

Graduation With Honor

A degree of Doctor of Medicine with honor may be awarded to students with high achievement who, in addition, have demonstrated initiative and success in clinical and scholarly pursuits related to medicine. Evidence of such scholarly achievement may include, but is not limited to, a thesis of acceptable quality, a paper accepted for publication in a recognized journal, or scholarly analysis of a clinical subject comparable to review papers and case reports. Candidates for graduation with honors are nominated by the departments each year and are selected on the basis of an Honors and Awards Committee review of academic records.

Continuing Medical Education

The Division of Continuing Medical Education offers a variety of programs for physicians and health professionals at the School of Medicine and in Pacific Northwest and Alaska communities.

Programs at the School of Medicine include short courses and conferences, year-long review courses, workshops, visiting professorships, preceptorships, and teleconferences. Programs in the communities include guest lecturers and programs as requested by communities throughout the region.

All physicians are invited to participate in continuing medical education programs and in the regular hospital rounds and conferences scheduled at the University Hospital or its affiliated hospital clinics.

The University of Washington is accredited by the Accreditation Council for Continuing Medical Education to sponsor continuing medical education for physicians. All programs sponsored by the Division of Continuing Medical Education are applicable to physician relicensure requirements of the Washington Board of Medical Examiners for Category I of the Physician's Recognition Award of the American Medical Association. Prescribed credit from the American Academy of Family Physicians is requested for all applicable programs.

Descriptive brochures for short courses and conferences are published up to twelve weeks in advance of each program. Information concerning Continuing Medical Education programs may be obtained from: University of Washington; School of Medicine; Division of Continuing Medical Education, SC-50; Seattle, Washington 98195; telephone (206) 543-1050. Information concerning hospital rounds should be requested from the various departments responsible.

Anesthesiology

BB1459 Health Sciences

The Department of Anesthesiology maintains an active program of teaching and research for the specialist and

nonspecialist. Medical students are introduced to the principles of anesthetic action and the effects of anesthetic agents on circulatory and respiratory physiology. The clinical clerkship program provides basic training in airway management and care of the unconscious patient. A four-year residency program is available for physicians who desire specialty training in anesthesiology. In addition, advanced clinical and research training is offered in several major subspecialty areas (cardiac anesthesia, neuroanesthesia, pediatric anesthesia, obstetrical anesthesia, pain management). Opportunities for collaborative research are available to undergraduate and graduate students. The department conducts a regular series of clinical conferences, didactic lectures, and research seminars.

Faculty

Chairperson

Thomas F. Hornbein

Professors

Amory, David W.,* 1971, M.S., 1955, St. Johns; Ph.D., 1961, Washington; M.D., 1967, British Columbia.

Bonica, John J., 1960, (Emeritus), M.D., 1942, Marquette.

Chapman, C. Richard,* 1971, (Psychology), (Psychiatry and Behavioral Sciences),† M.A., 1968, Ph.D., 1969, Denver; psychology, psychiatry, and behavior science.

Cheney, Frederick W., 1964, M.D., 1960, Tufts.

Cullen, Bruce F., 1972, M.D., 1966, California (Los Angeles).

Fink, B. Raymond, 1964, (Emeritus), M.B., B.S., 1938, London (England).

Freund, Felix G., 1957, (Emeritus), M.D., 1948, Buenos Aires (Argentina).

Furman, Eric B., 1980, M.B.B.Ch., 1958, Johannesburg (South Africa).

Hornbein, Thomas F.,* 1963, (Physiology and Biophysics),† M.D., 1956, Washington (St. Louis); physiology, biophysics.

Kenny, Margaret A.,* 1970, ‡(Laboratory Medicine), Ph.D., 1968, Illinois (Urbana).

Loeser, John D., 1969, ‡(Neurological Surgery), M.D., 1961, New York; pain, neurophysiology.

Murphy, Terence M., 1971, M.B.Ch.B., 1961, Liverpool (England).

Townes, Brenda D.,* 1961, ‡(Psychiatry and Behavioral Sciences, Psychology), M.A., 1958, Mills; Ph.D., 1970, Washington.

Ward, Richard J., 1963, M.D., 1949, St. Louis.

Associate Professors

Artru, Alan A., 1980, M.D., 1975, Wisconsin.

Bashein, Gerard,* 1978, (Bioengineering), M.S., 1964, Ph.D., 1969, Carnegie-Mellon; M.D., 1974, New Mexico.

Benedetti, Costantino, 1977, M.D., 1972, Rome.

Bishop, Michael J., 1979, (Medicine), M.D., 1974, California (San Diego).

Buckley, F. Peter, 1977, M.B.B.S., 1968, St. Bartholomew's Hospital (London).

Buffington, Charles W., 1977, M.D., 1973, West Virginia.

Butler, Stephen H., 1970, M.D., 1966, Toronto.

Byers, Margaret R., 1972, (Research), (Biological Structure, Endodontics), Ph.D., 1969, Harvard; biological structure.

Colley, Peter S., 1974, M.D., 1967, Vermont.

Dong, Willie K.,* 1976, (Research), (Psychology), Ph.D., 1974, California (San Francisco).

- Freund, Peter R., 1980, (Physiology and Biophysics), M.A., 1971, Brown; M.D., 1975, Columbia.
- Haschke, Richard H.,* 1972, (Biochemistry),† M.S., 1966, Ph.D., 1969, Illinois (Urbana).
- Lam, Arthur M.L., 1986, M.D., 1974, Western Ontario; neuroanesthesia.
- Lynn, Anne M., 1981, (Pediatrics), M.D., 1975, Stanford.
- Martin, Roy W.,* 1975, (Research), (Bioengineering),† M.S., 1970, Southern California; Ph.D., 1975, Washington.
- Murray, Jeffrey P., 1980, (Pediatrics), M.D., 1974, Rochester.
- Pavlin, D. Janet, 1975, M.Sc., 1966, M.D., 1969, Manitoba (Canada).
- Pavlin, Edward G., 1973, M.D., 1968, Manitoba (Canada).
- Ready, L. Brian, 1977, M.D., 1967, Saskatchewan (Canada).
- Sivarajan, Murali, 1974, M.B.B.S., 1967, Jawaharlal (India).
- Slattery, John T.,* 1978, ‡(Pharmaceutics), Ph.D., 1978, State University of New York (Buffalo).
- Su, Judy Y., 1976, (Research), M.S., 1964, Kansas; Ph.D., 1968, Washington.
- Tyler, Donald C., 1977, (Pediatrics),† M.D., 1970, Pennsylvania.

Assistant Professors

- Bowdle, T. Andrew, 1983, (Pharmaceutics), M.D., 1980, Ph.D., 1983, Washington.
- Chabal, Charles, 1987, (Acting), M.D., 1982, Pittsburgh.
- Chadwick, Heathcliff S., 1980, M.D., 1976, Oregon.
- Chan, Kwan Y., 1979, (Research), ‡(Ophthalmology), Ph.D., 1977, California (Los Angeles).
- Domino, Karen B., 1986, M.A., 1974, New Mexico; M.D., 1978, Michigan; neuroanesthesia.
- Jacobson, Lawrence E., 1987, (Acting), (Pediatrics), M.D., 1979, Michigan.
- Jacobson, Louis, 1985, M.B.Ch.B., 1973, Cape Town (South Africa); pain and regional anesthesia.
- Jardine, David S., 1987, (Acting), M.D., 1980, Johns Hopkins.
- Krane, Elliot J., 1983, (Pediatrics), M.D., 1977, Arizona.
- Mulroy, John J., 1988, (Acting), M.D., 1979, Washington (St. Louis).
- Oh, Shenton M. Y., 1982, (Clinical), M.B.B.S., 1970, Singapore.
- Orr, Rosemary, J., 1975, (Clinical), M.B.B.Ch., 1967, Queens (Belfast).
- Overand, Patrick T., 1986, M.D., 1982, Oregon.
- Rooke, G. Alec, 1985, (Acting), M.D., 1980, Washington; cardiac anesthesia.
- Ross, Brian K., 1987, M.S., Idaho State; Ph.D., 1975, North Dakota; M.D., 1983, Washington.
- Schwid, Howard A., 1986, M.D., 1982, Wisconsin.
- Sorensen, Gregory K., 1986, (Pediatrics), M.D., 1978, Nebraska.
- Strum, David P., 1987, M.D., 1980, Dalhousie (Nova Scotia).
- Unadkat, Jashvant D.,* 1985, ‡(Pharmaceutics), Ph.D., 1982, Manchester (England); theoretical pharmacokinetics.
- Williams, Virginia, 1981, (Pediatrics), M.D., 1973, Tulane.
- Zucker, Jonathan R., 1985, M.B.Ch.B., 1974, Cape Town (South Africa).

Instructor

- Barnes, Lee F., 1978, (Clinical), M.D., 1970, Temple.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

ANEST 498 Undergraduate Thesis (*) AWSpS Sivarajan By special arrangement. Time and credit to be arranged.

ANEST 499 Undergraduate Research (*) AWSpS Sivarajan Specific research problems relating to pulmonary, cardiovascular, renal, obstetric, and central nervous system functions, and their alteration by anesthetic techniques and agents. (Six weeks, full-time. Limit: two students.)

ANEST 680P Basic Anesthesia Clerkship (4) AWSpS Sivarajan Introduction to the principles of airway management, ventilatory support, use of local anesthetics, techniques of patient monitoring and fluid therapy. Skills taught include airway management, venipuncture, lumbar puncture and endotracheal intubation. Prerequisite: third- or fourth-year student. (Two weeks, full-time. Limit: five students each two-week period.) Affiliated hospitals.

ANEST 681P Advanced Clerkship in Anesthesiology (8) AWSpS Sivarajan Clerkship for students desiring greater exposure to anesthesiology as a specialty. Individual programs can be arranged in the following areas: surgical anesthesia, obstetrical anesthesia, and pain clinic. Prerequisite: 680P or permission of instructor. (Four weeks, full-time. Limit: one student per period.) Affiliated hospitals.

ANEST 697P Anesthesiology Special Electives (*, max. 24) AWSpS Sivarajan Special clerkships, externships, or research opportunities can at times be made available at institutions other than the University of Washington. Students wishing to elect this course should obtain a special assignment form from the Dean's office at least one month before advance registration. Prerequisite: permission of instructor. (Six to twelve weeks, full-time.)

Animal Medicine

T142 Health Sciences

The Division of Animal Medicine provides education and research opportunities in laboratory animal medicine and comparative pathology. Current educational programs include scheduled courses in zoonotic diseases and in the principles and techniques of animal experimentation (CONJ 407) for biomedical graduate students; training in laboratory animal medicine for veterinary students and veterinarians; and a Master of Science degree program in collaboration with the Department of Pathology. Areas of current research include bacteriological and viral diseases of laboratory animals, parasitic diseases, and animal models of human disease conditions.

Predoctoral Programs

These programs are designed to acquaint veterinary students with laboratory animal medicine as a veterinary specialty. Specific areas covered include the principal diseases, disease control and treatment, and principles of sound animal husbandry of the common laboratory animals, as well as the role of laboratory animals in biomedical research. Blocks of twelve weeks (offered in the summer to second- and third-year students) and four weeks (offered to fourth-year students year-round) are available. Stipend support is normally provided.

Postdoctoral Program

Postdoctoral training in the areas of laboratory animal medicine and comparative pathology are offered to

holders of the D.V.M. or equivalent degree. Training that consists of a combination of course work, residency experience, and research is normally completed in three years. The program prepares participants for specialty certification by the American College of Laboratory Animal Medicine or the American College of Veterinary Pathology. Stipend support is normally provided.

Master of Science Degree

Options are offered within the Master of Science degree program in pathology in the areas of comparative pathology and laboratory animal medicine. These may be added to the postdoctoral training described above. The degree options involve additional elective courses and the completion of a more involved research project, which usually extends the training period to three years.

Correspondence and Information

Academic Programs
T142 Health Sciences, SB-42

Faculty

Director

Gerald L. Van Hoosier, Jr.

Professors

- Rausch, Robert L.,* 1977, (Zoology), (Pathobiology),† D.V.M., 1945, Ohio State; M.S., 1946, Michigan State; Ph.D., 1949, Wisconsin; zoonotic disease, pathobiology of helminths, parasitology.
- Van Hoosier, Gerald L., Jr.,* 1975, ‡(Pathology), D.V.M., 1957, Texas A&M; laboratory animal medicine.

Associate Professors

- Dennis, Melvin B., Jr., 1971, (Medicine), D.V.M., 1961, Washington State; comparative medicine.
- DiGiacomo, Ronald F.,* 1974, (Epidemiology), V.M.D., 1965, Pennsylvania; M.P.H., 1974, Washington; epizootiology.
- Ladiges, Warren C., 1986, (Acting), D.V.M., 1971, M.S., 1978, Washington State; laboratory animal medicine.
- Thouless, Margaret E.,* 1980, ‡(Pathobiology), M.Sc., 1967, Ph.D., 1974, Birmingham (England); pathobiology.
- Wolf, Norman S.,* 1968, ‡(Pathology), D.V.M., 1953, Kansas State; Ph.D., 1960, Northwestern; pathology.

Assistant Professors

- Debb, Barbara J., 1987, (Acting), D.V.M., 1963, Illinois (Urbana); M.S., 1966, Washington; microbiology.
- Price, Lillian M., 1984, (Research), (Pathology)†, V.M.D., 1972, Ph.D., 1983, Pennsylvania; clinical veterinary medicine, experimental hematology.
- Russell, Robert G., 1984, M.V.Sc., 1978, Melbourne (Australia); Ph.D., 1979, Saskatchewan (Canada); comparative pathology.

Course Descriptions

CONJ 407 Principles of Animal Experimentation (3) W See Conjoint Courses.

ANMED 520, 521 Biology of Laboratory Animals (2,2) Van Hoosier Fundamentals of the morphological, functional, and applied aspects of anatomy, physiology, pharmacology, biochemistry, and immunology of the commonly used laboratory animal species, with emphasis on reproductive physiology. Similarities and differences within, and between, species, including man. Husbandry, genetics, behavior, and nutrition.

ANMED 526 Zoonotic Diseases (3) A DiGiacomo, Rausch Explores the public health aspects of zoonotic diseases, their epidemiology and current approaches to control. Focuses on the major viral, rickettsial, bacterial, protozoal, helminthic, and fungal diseases transmitted from wild and domesticated animals to humans in North America. Joint with EPI 526. Prerequisites: graduate standing and permission of instructor.

CONJ 530, 531 Diseases of Laboratory Animals (3,3) A,W See Conjoint Courses.

CONJ 540 Animal Models (1) Sp See Conjoint Courses.

ANMED 590 Selected Topics in Laboratory Animal Medicine (2) Dennis, Van Hooser Radiation biology, genetics, anesthesiology and experimental surgery, preventive medicine, and ethical aspects of use of animals in biomedical teaching and research. Specific topics vary from year to year, depending on the expertise of the annual visiting professor.

Biochemistry

J405 Health Sciences

Graduate Program Coordinator

James Hurley

The study of biochemistry involves the combined field of biology and chemistry. Specific research projects may entail study in such related fields as genetics, microbiology, organic chemistry, pharmacology, and physiology. Graduate students enrolled in the Department of Biochemistry engage in studies and research that prepare them for the challenging opportunities open to the professional biochemist in colleges and universities, research institutes, medical schools and hospitals, government laboratories, and the laboratories of chemical and pharmaceutical industries.

The course of advanced study is designed to give each student a firm foundation upon which to base further professional progress. In the first year of academic work, most students attend courses in biochemistry and in related fields such as advanced chemistry, genetics, and microbiology. In the second and succeeding years, an increasing amount of time is devoted to research and independent study. For the Ph.D. degree, each student is required to gain teaching experience, usually during the second year of the graduate program.

The basic requirements for admission for graduate study in biochemistry are one year of organic chemistry, one year of physical chemistry, and mathematics through integral calculus. Applicants must also meet the general admission requirements of the Graduate School.

Normally, all graduate students admitted to the Department of Biochemistry are provided with financial assistance.

Research facilities for the department are housed in the Biochemistry-Genetics Building, which provides approximately fifty-two thousand square feet of excellent research space, conference rooms, and a departmental library. In addition, approximately eleven thousand square feet of research space and conjoint facilities are shared with the Department of Genetics. The laboratories are equipped with the latest in research equipment and are supported extensively by external, centralized research facilities, which include a modern computer center, the Marine Biology Laboratory at Friday Harbor, and the Health Sciences Library. Close collaboration exists with investigators in other related departments, including biological structure, chemistry, genetics, and microbiology.

Correspondence and Information

Graduate Program Coordinator
Department of Biochemistry, SJ-70

Faculty

Chairperson

Bennett M. Shapiro

Professors

Bornstein, Paul,* 1967, (Medicine),† M.D., 1958, New York; structure and function of connective tissue macromolecules and their role in morphogenesis and development, disordered macromolecular structure and function in hereditary and acquired connective-tissue disorders and the aging process.

Byers, Breck E.,* 1970, ‡(Genetics), M.A., 1963, Ph.D., 1967, Harvard; cell biology: mitosis and meiosis, mechanisms of nuclear division and crossing-over in yeast.

Dale, Beverly, 1987, (Research), (Periodontics), Ph.D., 1968, Michigan; biological, biochemical, and molecular studies of filaggrin.

Davie, Earl W.,* 1962, Ph.D., 1954, Washington; protein synthesis, mechanism of blood clotting, cloning of plasma proteins.

Eisenman, Robert N.,* 1976, (Affiliate), (Pathology),† Ph.D., 1971, Chicago; retrovirus gene expression.

Eyre, David R.,* 1985, ‡(Orthopaedics), Ph.D., 1969, Leeds (England); connective tissue biochemistry.

Fischer, Edmond H.,* 1953, Ph.D., 1947, Geneva (Switzerland); relationship of protein structure to enzyme activity, hormonal regulation of metabolic processes through protein phosphorylation and calcium.

Fujikawa, Kazuo, 1970, (Research), M.S., 1961, Ph.D., 1965, Kyoto (Japan); mechanisms of blood clotting.

Glomset, John A.,* 1960, (Medicine),† M.D., 1960, Uppsala (Sweden); membrane structure and function.

Gordon, Milton P.,* 1959, (Microbiology), Ph.D., 1953, Illinois; molecular basis of plant tumors, control of gene expression in plants.

Hakomori, Sen-itiroh G.,* 1967, ‡(Chemistry, Microbiology, Pathobiology), M.D., 1952, D.Med.Sci., 1956, Tohoku (Japan); structure and function of glycoproteins and glycosphingolipids in cell membranes.

Hauschka, Stephen D.,* 1967, (Zoology), Ph.D., 1966, Johns Hopkins; regulation of skeletal muscle differentiation, growth factor-receptor signal mechanisms and the control of muscle gene expression.

Jensen, Lyle H.,* 1949, (Emeritus), (Biological Structure),† Ph.D., 1943, Washington; x-ray structure determination of biological molecules, protein crystallography.

Krebs, E. G.,* 1948, (Pharmacology),† M.D., 1943, Washington (St. Louis); carbohydrate metabolism, cyclic AMP, protein phosphorylation reactions.

Loeb, Lawrence A.,* 1978, ‡(Pathology), M.D., 1961, New York; Ph.D., 1967, California (Berkeley); DNA replication, DNA polymerases, environmental carcinogenesis, cellular aging.

Morris, David R.,* 1966, Ph.D., 1964, Illinois, biosynthesis and biological function of polyamines, regulation of growth of eukaryotic and prokaryotic cells.

Neurath, Hans, 1950, (Emeritus), Ph.D., 1933, Vienna (Austria); structure and functions of proteolytic enzymes, zymogen activation, evolution of proteins.

Palmiter, Richard D.,* 1974, Ph.D., 1968, Stanford; regulation of gene expression in transgenic mice.

Parson, William W.,* 1967, Ph.D., 1965, Western Reserve; bioenergetics, with particular emphasis on photosynthesis, picosecond spectroscopy.

Petra, Philip H.,* 1966, (Obstetrics and Gynecology),† M.S., 1962, Ph.D., 1966, Tulane; reproductive biochemistry, structure and function of steroid-binding proteins.

Reid, Brian R.,* 1980, (Chemistry),† M.A., 1960, Cambridge (St. Johns); Ph.D., 1965, California (Berkeley); nucleic acid-protein recognition processes in the genetic code, analysis of transfer RNA structure, function, and dynamics using high-resolution nuclear magnetic resonance.

Ross, Russell,* 1962, ‡(Pathology), D.D.S., 1955, Columbia; Ph.D., 1962, Washington; atherosclerosis, connective tissue pathology, wound healing.

Saari, John C.,* 1974, (Ophthalmology),† M.S., 1963, Minnesota; Ph.D., 1970, Washington; metabolism and transport of vitamin A, structure and function of photoreceptor membranes.

Shapiro, Bennett M.,* 1970, M.D., 1964, Jefferson Medical College; biochemistry of fertilization, molecular regulation of cellular behavior, assembly and processing of extracellular matrix.

Teller, David C.,* 1965, Ph.D., 1964, California (Berkeley); physical chemistry of macromolecules, association reactions of proteins.

Walsh, Kenneth A.,* 1958, M.S., 1953, Purdue; Ph.D., 1959, Toronto; structure and functions of proteins and zymogens, proteases and fertilization.

Young, Elton T.,* 1969, (Genetics), Ph.D., 1967, California Institute of Technology; regulation of gene activity in the yeast *Saccharomyces cerevisiae*.

Associate Professors

Babcock, Donner, 1986, (Research), Ph.D., 1971, Oregon State; reproductive cell biology, mechanisms of cytosolic pH homeostasis.

Chung, Dominic, 1982, (Research), Ph.D., 1976, California (Los Angeles); mechanisms of blood clotting.

Haschke, Richard H.,* 1972, (Anesthesiology),† M.S., 1966, Ph.D., 1969, Illinois (Urbana); biochemical mechanisms of response to traumatic injury.

Herriott, Jon R.,* 1969, Ph.D., 1967, Johns Hopkins; X-ray crystallography of macromolecules, protein structure and function.

Margolis, Robert,* 1985, (Affiliate), (Pathology),† Ph.D., 1975, Wesleyan; *in vitro* microtubule research; mechanisms of mitosis.

Perlmutter, Roger M.,* 1984, (Medicine),† M.D., 1979, Ph.D., 1979, Washington (St. Louis); molecular genetics of immune recognition, chromosomal translocations and oncogenesis, mammalian antibody production.

Woodbury, R. G., 1980, (Research), Ph.D., 1974, Vermont; function of mast cells and their enzymes.

Assistant Professors

Carbonneau, Harry, 1987, (Research), Ph.D., 1981, Georgia; calcium-activated protein kinases.

Cooper, Jonathan, 1987, (Affiliate), Ph.D., 1976, Warwick (Coventry); protein phosphorylation as a means of regulation in normal and malignant development.

Davis, Trisha N., 1987, Ph.D., 1983, Yale; molecular biology of calmodulin in yeast.

Gelb, Michael H., 1986, (Chemistry), Ph.D., 1982, Yale; mechanism-directed inhibitors of enzymes.

Hurley, James B.,* 1985, Ph.D., 1979, Illinois (Urbana); molecular biology of guanyl nucleotide binding proteins involved in signal transduction in eukaryotic cells.

Ichinose, Akitada, 1987, (Research), M.D., 1978, Kagoshima (Japan); blood coagulation and fibrinolysis.

Klevit, Rachel E., 1986, D.Phil., 1981, Oxford (England); protein structure and changes in conformation related to function as studied by magnetic resonance spectroscopy.

Muller, Eric, 1988, (Research), Ph.D., 1981, Yale; molecular analysis of regulatory proteins in photosynthesis.

Scott, John D., 1986, (Research), Ph.D. 1983, Aberdeen (Scotland); structure and function of protein kinases.

Lecturer

Wade, Roger D., 1967, B.A., 1949, Central Washington State; physical biochemistry.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

BIOC 405, 406 Introduction to Biochemistry (3,3) W,Sp Haschke, Petra, Saari, Teller Basic principles of biochemistry, emphasizing broad understanding of chemical events in living systems in terms of metabolism and structure-function relationships of biologically important molecules. Does not fulfill advanced biochemistry prerequisites (see 440, 441, 442). Prerequisites: general biology and organic chemistry or permission of instructor for 405; 405 or permission of instructor for 406.

BIOC 426 Basic Techniques in Biochemistry (3) Sp Haschke, Hurley Introduction to basic biochemistry experiments. Acquaints students with basic biochemical laboratory techniques and serves as a preparation for advanced biochemistry laboratory courses. Prerequisites: 405, 406 or 440, 441, 442, which may be taken concurrently.

BIOC 440, 441, 442 Molecular Biology (3,4,4) Interdisciplinary course in general biochemistry and molecular biology for undergraduate students in molecular and cellular biology and graduate students in other science departments. Prerequisites: 440 for 441 (one-hour quiz per week required in 441); 441 for 442 (one-hour quiz per week required in 442); recommended: three quarters of organic chemistry.

BIOC 498 Undergraduate Thesis (*) AWSpS For senior medical students. Prerequisite: permission of instructor.

BIOC 499 Undergraduate Research (*) AWSpS Investigative work on enzymes, proteins, lipids, nucleic acids, protein biosynthesis, intermediary metabolism, physical biochemistry, and related fields. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

BIOC 512P Medical Students' Laboratory (3) W When possible, the relationship of the biochemical techniques or experiments being performed to clinical or diagnostic medicine is demonstrated or discussed. For medical students and others by permission. Prerequisites: HUBIO 514P, 524P or equivalent, and permission of instructor.

BIOC 515P Biochemistry Review I (1) A Elective quiz section to clarify and amplify material presented in HUBIO 514P. Offered on credit/no credit basis only.

BIOC 520 Seminar (1) AWSp Seminar dealing with special topics in the field of biochemistry. May be repeated for credit. Prerequisite: permission of instructor.

BIOC 525P Biochemistry Review II (1) Quiz section to clarify and amplify material presented in HUBIO 524P. Not required. Offered on credit/no credit basis only. Entry card required.

BIOC 530 Advanced Biochemistry (3) A Graduate-level discussion of the structure, function, and chemistry of proteins, control of enzymatic reactions. Prerequisites: a comprehensive course in biochemistry and permission.

BIOC 531 Advanced Biochemistry (3) W Graduate-level discussion of the action of hormones, membrane structure and function, electron transport, oxidative phosphorylation, photosynthesis. Prerequisites: a comprehensive course in biochemistry and permission of instructor.

BIOC 532 Advanced Biochemistry (3) Sp Graduate-level discussion of nucleic acid structure, viruses including oncogenic viruses, RNA biosynthesis, protein biosynthesis, and eukaryotic cell cycle. Prerequisites: a comprehensive course in biochemistry and permission of instructor.

BIOC 540, 541, 542 Literature Review (2,2,2) A,W,Sp Emphasizes critical evaluation of original articles in the literature. Coordinated with 530, 531, 532, and to be taken concurrently. For first-year graduate students in biochemistry and students of other science departments, with permission. For 540: numerical grade; for 541 and 542: offered on credit/no credit basis only. Entry cards required.

BIOC 555 Current Topics (1) Overview of current research in biochemistry. Topics include protein chemistry, enzymology, blood coagulation, cell surface proteins, fertilization, genetic engineering, control of transcription, serum lipoproteins, and photosynthesis. Offered on credit/no credit basis only. Prerequisite: first-year biochemistry graduate standing.

BIOC 561 Physical Biochemistry I (2) W Solution properties of macromolecules, transport processes in biology, and the structure of macromolecules determined by x-ray diffraction. Prerequisite: physical chemistry or permission of instructor.

BIOC 562 Physical Biochemistry II (2) Sp Macromolecular structure determined in solution by high-resolution NMR, and by optical spectroscopic techniques. Prerequisite: 561 or permission of instructor.

BIOC 574 The Biochemical Basis of Disease (3) Sp Glomset Discussion of pathologic physiology and molecular basis of clinical disorders. An attempt is made to demonstrate the relevance of biochemical research to the understanding and the rational therapy of human disease. Scope limited to diseases in which new developments permit description in biochemical terms.

BIOC 581 Introduction to Biochemical Research (3, max. 6) WSp Student works with one of the research groups within the department for one quarter and then rotates to other laboratories for second and third quarters. Offered on credit/no credit basis only. Prerequisite: graduate standing in biochemistry or permission of instructor. Entry card required.

BIOC 582 Current Topics in Signal Transduction (1) Hurley, Shapiro Critical evaluation of the biochemical literature in areas related to hormone and growth factors, their receptors, and mechanisms of growth stimulation. Offered on credit/no credit basis only. May be repeated for credit. Prerequisite: permission of instructor.

BIOC 583 Advanced Techniques in Biochemistry (2) Laboratory course involving experiments concerning spectrophotometry, radioactive isotopes and ionic equilibria. For first-year graduate students in biochemistry and students of other science departments, with permission. Prerequisite: biochemistry graduate student standing or permission of instructor.

BIOC 585 Nucleic Acids in Biochemistry (1) AWSp Young Weekly research conferences on the role of nucleic acid in biochemistry. Offered on credit/no credit basis only. Prerequisites: permission of instructor.

BIOC 587 Molecular Aspects of Differentiation (1) Weekly conferences on laboratory research in microbial development and/or molecular aspects of differentiation. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

BIOC 589 Connective Tissue Macromolecules (1) AWSpS Bornstein Seminars designed to discuss current knowledge of the biochemistry and pathophysiology of fibrous proteins and other structural macromolecules. Prerequisite: 442 or HUBIO 514P, 524P or permission of instructor.

BIOC 590 Proteins and Enzymes Seminar (1, max. 8) AWSpS Neurath, Walsh Weekly conferences on current research in proteins and enzymes. For graduate students in biochemistry. May be repeated for credit. Prerequisite: permission of instructor.

BIOC 591 Seminar on Protein Structures (1, max. 20) AWSp Adman, Herriott, Jensen, Sieker, Stenkamp, Watenpaugh Weekly discussion of current topics in research on molecular structure, usually emphasizing techniques of x-ray crystallography. Joint with B STR 591. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

BIOC 592 Topics in the Biochemistry of Regulation (1) AWSpS Morris Control of enzyme activity and gene expression related to biology of growth and function. May be repeated for credit. Prerequisite: permission of instructor.

BIOC 593 Activation of Development (1) AWSpS Shapiro Weekly research conference. Concentrates on biochemical events at the time of fertilization and early development and on the role of membranes in metabolic control. May be repeated for credit. Offered on credit/no credit basis only. Prerequisites: 530, 531, 532, or equivalent, or permission of instructor.

BIOC 594 Glycogen Metabolism Seminar (1) AWSpS Fischer Weekly conferences on research in glycogen metabolism. May be repeated for credit. Prerequisite: permission of instructor.

BIOC 595 Membranes, Bioenergetics (1) AWSpS Shapiro Weekly research conferences on biochemical processes that occur in membranes. May be repeated for credit. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

BIOC 596 Gene Expression (1) AWSpS Palmiter Weekly research conferences. May be repeated for credit. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

BIOC 598 Seminar in Developmental Biology (1) AWSpS Hauschka Discussion covers recent advances in the field of developmental biology, especially those areas that are or can be analyzed by a biochemical approach. May be repeated for credit. Prerequisite: permission of instructor.

BIOC 600 Independent Study or Research (*) AWSpS

BIOC 700 Master's Thesis (*) AWSpS

BIOC 800 Doctoral Dissertation (*) AWSpS

Bioengineering

309 Harris Hydraulics Laboratory

The Center for Bioengineering provides a multidisciplinary program of collaborative research and training designed to accelerate the application of new engineering technologies to clinical practice and research. Major areas of current research involvement include biomaterials, biomathematics, biomechanics, controlled drug-release systems, mechanisms of microcellular transport, microsensors, bioelectromagnetics, hearing, imaging, laser applications, microanalysis of subcellular structures, microcirculatory exchanges and blood flow, muscle, and ultrasonic instrumentation. There are options for study leading to master's and doctoral degrees with different levels of specialization.

Faculty and students in the health sciences may engage in studies of mutual interest with faculty and students in the College of Engineering. Programs offered in the College of Engineering can lead to the interdepartmental undergraduate Bachelor of Science in Engineering and graduate Master of Science in Engineering and Master of Science degrees. The Master of

Science degree provides essential training in the engineering sciences that helps students with strong biological backgrounds to prepare for careers in research and development in either basic medical sciences or clinical investigations. The objective of the doctoral program is to train qualified individuals for careers in bioengineering research and teaching. Detailed information on Bioengineering, its faculty and courses appears in the Interschool or Intercollege Programs section of this catalog.

Biological Structure

G515 Health Sciences

Graduate Program Coordinator

Helen Sherk

The Department of Biological Structure offers graduate programs of study leading to the Master of Science and Doctor of Philosophy degrees. The department seeks to promote an understanding of biological processes through the study and analysis of structure-function relationships. The research problems that interest members of the faculty are diverse, with a unifying theme of cellular differentiation and development, a topic explored in a variety of biological systems. This diversity creates a lively atmosphere in the department that provides a stimulating environment for the training of scientists.

The department's graduate program is directed toward the education of doctoral students who anticipate academic careers that will involve teaching and research in the biomedical sciences. Graduates from the program are expected to have a broad knowledge of biological structure at all levels, from the macromolecular to the gross anatomical, with major emphasis on the cellular level.

Graduate students select research and teaching pathways in their program. The research pathways are designed to provide training for a student in one or two of the following areas: cell and developmental biology, neurobiology, reproductive biology, quantitative biology, cellular immunology, molecular biology, and macromolecular structure. The teaching pathways provide training to teach two or more of the anatomical subdisciplines: gross anatomy, neuroanatomy/neurobiology, histology, embryology/developmental biology, cell biology, and macromolecular structure.

Special Requirements

Applicants must have completed an undergraduate major in any appropriate field, such as anthropology, biology, chemistry, physics, psychology, or zoology.

Financial Aid

The department offers financial support through teaching assistantships and training grant positions and from research funds.

Correspondence and Information

Graduate Program Coordinator
Department of Biological Structure, SM-20

Faculty

Chairperson

Cornelius Rosse

Professors

Blandau, Richard J., 1949, (Emeritus), Ph.D., 1939, Brown, M.D., 1948, Rochester; endocrinology, embryology, phase microscopy, reproductive physiology.
Gehrig, John D., 1954, ‡(Oral and Maxillofacial Surgery), D.D.S., 1946, M.S.D., 1951, Minnesota; oral and maxillofacial surgery, chronic pain research.

Hendrickson, Anita E., 1965, (Ophthalmology), † Ph.D., 1964, Washington; neuroanatomy, morphology, and development of primate visual system.

Holbrook, Karen A., 1972, (Medicine), M.S., 1966, Wisconsin; Ph.D., 1972, Washington; fetal skin development and differentiation.

Jensen, Lyle H., 1949, (Emeritus), (Biochemistry), † Ph.D., 1943, Washington; molecular structure, x-ray diffraction.

Koehler, James K., 1963, M.S., 1958, Ph.D., 1961, California (Berkeley); electron microscopy, reproductive biology.

Luft, John H., 1956, M.D., 1953, Washington; cytology, light and electron microscopy.

Myall, Robert W. T., 1979, ‡(Oral and Maxillofacial Surgery), M.D., 1975, British Columbia; oral and maxillofacial surgery.

Odland, George F., 1962, (Medicine), † M.D., 1946, Harvard; dermatology.

Pollack, Sylvia B., 1973, (Research), Ph.D., 1967, Pennsylvania; cellular immunology.

Roesen-Runge, Edward C., 1952, (Emeritus), M.D., 1936, Hamburg (West Germany); histology.

Rosse, Cornelius, 1967, M.B.Ch.B., 1964, M.D., 1974, D.Sc., 1983, Bristol (England); hemopoiesis, gross anatomy.

Stout, G. Hugh, 1957, (Research), M.A., 1954, Ph.D., 1956, Harvard; crystallography.

Tamarin, Arnold, 1961, ‡(Oral Biology), D.D.S., 1951, Illinois; M.S.D., 1961, Washington; histology and embryology, comparative odontology.

Westrum, Lesnick E., 1966, (Neurological Surgery), † M.D., 1963, Washington; Ph.D., 1968, University College (London); neuroanatomy, neurocytology.

Associate Professors

Adman, Elinor T., 1971, (Research), M.A., 1964, Ph.D., 1967, Brandeis; macromolecular crystallography.

Baskin, Denis G., 1979, (Research), (Medicine), † Ph.D., 1969, California (Berkeley); histology, cytology, neuroendocrinology.

Bolender, Robert P., 1975, M.A., 1965, Columbia; Ph.D., 1970, Harvard; cell structure and function employing morphometric and biochemical techniques.

Byers, Margaret R., 1971, (Research), ‡(Anesthesiology), Ph.D., 1969, Harvard; neurocytology, sensory receptors, pain mechanisms, dental innervation, axonal transport.

Clark, John I., 1982, Ph.D., 1974, Washington; anatomy, lens opacification, cell biology.

DeVito, June, 1955, (Research), M.A., 1949, British Columbia; Ph.D., 1954, Washington; neuroanatomy.

Farr, Andrew G., 1982, Ph.D., 1975, Chicago; immunology.

Gaddum-Rosse, Penelope, 1972, Ph.D., 1965, Liverpool (England); reproductive biology.

Graney, Daniel O., 1966, M.A., 1962, Ph.D., 1965, California (San Francisco); gross anatomy, electron microscopy, intestinal absorption.

Halbert, Sheridan A., 1974, (Affiliate), (Bioengineering), † Ph.D., 1972, Washington; reproductive physiology.

Kashiwa, Herbert K., 1966, (Oral Biology), M.S., 1954, Ph.D., 1960, George Washington; gross anatomy, cytochemistry, calcium metabolism.

Landau, Barbara R., 1964, (Emeritus), (Physiology and Biophysics), † M.S., 1949, Ph.D., 1956, Wisconsin; anatomy.

Lee, Minako Y., 1977, (Research), (Medicine), † M.D., 1976, Tokyo Women's College (Japan); immunology.

MacKenzie, Alan P., 1976, (Research), (Bioengineering), † Ph.D., 1958, London (England); physical cryobiology (pure and applied).

Nameroff, Mark A., 1970, M.D., 1965, Ph.D., 1966, Pennsylvania; cell differentiation.

Prothero, John W., 1965, Ph.D., 1960, Western Ontario; model building, morphogenesis, cell kinetics, scaling.

Sage, E. Helene, 1980, Ph.D., 1977, Utah; cell biology.

Stenkamp, Ronald E., 1981, M.Sc., 1971, Ph.D., 1975, Washington; crystallography.

Sundsten, John W., 1962, Ph.D., 1961, California (Los Angeles); neuroanatomy, neurobiology.

Verdugo, Pedro J., 1975, (Bioengineering), † M.S., 1958, M.D., 1965, State University of Chile; fertility studies, cell biology of mucillary transport.

Yoshimura, Fayth K., 1980, (Research), Ph.D., 1972, Yale; mechanism of transformation of lymphocytes by murine retroviruses.

Assistant Professors

Broderon, Stevan H., 1967, Ph.D., 1967, New York State (Buffalo); lipid histochemistry.

Clark, Judy M., 1983, (Research), M.S., 1974, Washington; Ph.D., 1978, Boston; developmental biology.

Curcio, Christine A., 1985, (Research), (Ophthalmology), † Ph.D., 1982, Rochester; anatomy/ophthalmology.

Durham, Dianne, 1986, (Research), (Otolaryngology), † Ph.D., 1982, Washington; developmental neurobiology, neuronal response to afferent manipulation, quantitative histochemistry.

Harris, Roger M., 1982, Ph.D., 1975, Washington; neuroanatomy.

Muller, Charles H., 1983, (Research), (Obstetrics and Gynecology), † M.A., 1972, Colorado; Ph.D., 1976, California (Berkeley); reproductive biology.

Patton, Dorothy L., 1984, (Research), ‡(Obstetrics and Gynecology), M.S., 1973, Puget Sound; Ph.D., 1981, Washington; infertility and tubal disease, sexually transmitted diseases, chlamydial infections.

Quinn, LeBris S., 1986, (Research), Ph.D., 1982, Washington; cell differentiation, myogenesis, developmental biology.

Sherk, Helen A., 1982, Ph.D., 1978, Massachusetts Institute of Technology; neuroanatomy.

Stebbins, Thomas A., 1965, M.A., 1965, Amherst; medical illustration.

Senior Research Associate

Sieker, Larry C., 1981, Ph.D., 1981, Washington; crystallography.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

B STR 301 General Anatomy (6) Sp Quinn Survey of systemic human anatomy, with correlated lectures and selected laboratory demonstrations.

CONJ 340-341-342 Human Anatomy and Physiology (4-4-4) Becker, Gaddum-Rosse, Taylor See Conjoint Courses.

B STR 431 Introduction to Neuroanatomy (4) W Gehrig, Prothero, Sundsten, Westrum General survey of the structure of the central nervous system, including an analysis of sensory and motor systems and higher integrative functions and clinical correlation. Prerequisite: 301 or permission of instructor.

B STR 488 Undergraduate Thesis (*) AWSpS Prerequisite: permission of instructor.

B STR 499 Undergraduate Research (*) AWSpS Prerequisite: permission of instructor.

B STR 501 Gross Anatomy (1-10, max. 10) A Rosse Lecture and laboratory dissection course in regional anatomy: thorax, abdomen, pelvis, perineum. Prerequisite: graduate or medical student standing; others by permission of instructor.

B STR 502 Gross Anatomy (1-5) W Farr, Graney, Rosse Lecture and dissection course in regional anatomy: upper and lower extremities. For graduate students and medical students; others by permission of instructor.

B STR 503 Gross Anatomy (1-5) Sp Farr, Graney, Rosse Lecture course in regional human anatomy: head and neck. For graduate students and medical students; others by permission of instructor.

B STR 505 Histology in Biomedical Research (3) W Baskin Selected topics in histology, with emphasis on analysis of research literature, methods, and laboratory exposure. Prerequisite: HUBIO 510P or permission of instructor.

CONJ 508 EM Methods and Interpretation (3-5) Holbrook, Wright See Conjoint Courses.

B STR 510 Seminar in Anatomy (1) AWSp Clark, Graney, Hamilton, Rosse Scientific and historical basis of selected studies in biological structure, anatomy, and human development. Original literature used as basis for textbook descriptions is reviewed. Prerequisites: concurrent enrollment in HUBIO 511P, 531P; permission of instructor.

B STR 511 Cell Structure and Function (3) Sp Nameroff Current topics in cell biology with emphasis on experimental approaches and interpretations of hypotheses. Not intended as an introduction or overview of cell biology. Prerequisite: advanced undergraduate or graduate standing. (Offered alternate years.)

CONJ 511 Functional Neuroanatomy (4) W Hendrickson, Smith See Conjoint Courses.

B STR 512 Human Microanatomy (4) A Koehler Lectures and laboratory treating the specialized tissues and organs of the body from the microscopic and ultramicroscopic points of view. Prerequisite: permission of instructor.

B STR 515 Biological X-ray Structure Analysis (3) W Stenkamp Theory of x-ray diffraction, with emphasis on applications to biological systems. Prerequisite: permission of instructor.

B STR 517 Embryology/Developmental Biology Seminar (1) Sp Nameroff Embryology of a region or organ. Topics vary. Emphasis on original literature and developmental principles. Prerequisite: permission of instructor.

B STR 518 Structure of Biological Molecules (2) Sp Adman, Sieker, Stenkamp Three-dimensional structure of biological molecules and the methods used in their elucidation. Provides working vocabulary and acquaintance with current problems and research methods of structural investigations in area of students' choice.

CONJ 520 Anatomy and Autopsy (1 or 2) Mottet, Rosse See Conjoint Courses.

B STR 525 Brain Dissection (2) WSp Sundsten Detailed consideration of the macroscopic anatomy of the human brain (individual study). Prerequisite: permission of instructor.

B STR 530P Gross Anatomy and Embryology for Dental Students (7) A Broderson, Gehrig, Kashiwa Normal gross structures of thorax, abdomen, pelvis, perineum, upper extremity, and neck are discussed, then dissected on human cadavers. The development of each organ system is presented and related to the definitive normal adult structure. Developmental anomalies and diagnostic anatomy are also discussed. For prerequisites, see predoctoral requirements.

B STR 531, 532, 533 Electron Microscopy (1-5, 1-5, 1-5) A,W,Sp Johnson, Luft Theoretical and applied aspects of microscopy in biology, with emphasis on newer methods. Light microscopy and electron optics, the electron microscope in detail, and methods for preparation of biological specimens. Joint with BIOEN 531, 532, 533. Offered on credit/no credit basis only. Prerequisite: permission of instructor. (Offered alternate years.)

B STR 540 Special Problems in Anatomy (1-6, max. 6) AWSpS Special projects in anatomy under sponsorship of faculty member. Prerequisite: graduate, medical, or dental student standing and permission of instructor.

B STR 541P Microscopic Anatomy for Dental Students (4) A Koehler Lecture and laboratory work in microscopic anatomy. For dental students; others by permission of instructor.

B STR 550P Head, CNS, and Embryology for Dental Students (6) W Broderson, Gehrig, Kashiwa Normal structures of head, brain, and spinal cord discussed and dissected on human cadavers. Development of the head and CNS presented to illustrate the definitive normal, as well as anomalous, structures. Fundamentals of diagnostic anatomy. Prerequisite: 530P.

B STR 555 Laboratory Rotation in Biological Structure (*, max. 5) Introduction to experimental design, research methods, and scientific thought in laboratories of faculty members. Provides hands-on experience, an entrance into the literature of the field, and opportunities for discussion with all members of the laboratory. Prerequisite: permission of instructor.

B STR 557 Seminar (1) AWSp Required of graduate students. Offered on credit/no credit basis only. Prerequisite: permission of graduate program adviser.

B STR 560 Neuroanatomical Techniques (2) W Baskin, Byers, Curcio, DeVito, Farr, Harris, Hendrickson, Sherk, Westrum Neuroanatomical techniques and their current applications in neurobiology. LM and EM immunocytochemistry, histochemistry, and autoradiography; axonal transport tract-tracing; intraneuronal recording and labeling; quantitation of CNS receptors; morphometry; computer uses. Protocols provided. Prerequisite: permission of instructor.

B STR 561 Neuroanatomical Techniques Laboratories (*, max. 4) AWSpS Detailed training in modern neuroanatomical techniques provided in laboratories of departmental faculty members to individual students. Discussion of literature related to that method expected. Prerequisites: 560 and permission of instructor.

B STR 567 On the Design of Mammals: A Scaling Approach (1) AWSpS Prothero, Sundsten Guided reading and seminars on the topic of scaling in mammals. Organ system scaling, especially for the central nervous system, as well as energy metabolism and life history parameters such as life span and reproductive rates. Prerequisite: permission of instructor.

B STR 580 Anatomy Teaching Practicum (*, max. 8) AWSp Opportunity for medical student (or other professional student) to gain teaching experience in biological structure and human biology courses, including gross anatomy, histology, and neuroanatomy. May include lecture, laboratory, and conference, depending on student interest and experience. Credit based on course credit in which student is assisting. Prerequisite: permission of course chairperson.

CONJ 585 Surgical Anatomy (1-3, max. 12) Graney See Conjoint Courses.

B STR 591 Seminar on Protein Structures (1, max. 20) AWSp Adman, Sieker, Stenkamp Weekly discussion of current topics in research on molecular structure, usually emphasizing techniques of x-ray

crystallography. Joint with BIOC 591. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

B STR 593 Reproduction and Development Seminar (1, max. 5) AWSp Muller Research conference on current research in gametogenesis, fertilization, and embryogenesis. Cell surface events and mechanisms of cell-cell interaction during reproduction and development in mammals. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

B STR 594 Seminar in Myogenesis (1, max. 5) AWSpS Nameroff Discussion of recent work on the differentiation of skeletal muscle and related cell types. Emphasis on the cell-biological aspects of differentiation both *in vivo* and *in vitro*. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

B STR 595 Skin Biology Seminar (1, max. 5) AWSp Holbrook Presentation, discussion of ongoing multidisciplinary research in basic and clinical problems of adult and fetal skin biology. Genetic diseases of epidermis and dermis, percutaneous absorption in adult and fetal skin, wound healing, cutaneous blood flow, development and prenatal diagnosis of inherited disorders, pigment cell biology. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

B STR 596 Seminar in Experimental Immunohemopoiesis (1, max. 5) WSp Farr, Hamilton, Pollack Critical review of current literature on hemopoiesis, lymphopoiesis, and immunologic function of bone marrow-derived cells as covered in such journals as *J. Exp. Med.*, *J. Immunol.*, *Exp. Hematol.* Participation in detailed analysis and critique of publications selected for presentation and discussion. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

B STR 597 Topics in Neurobiology (1, max. 5) AWSp Harris Presentations by participants of topics in neuroanatomy, neurophysiology, neurochemistry, and other areas relating to the nervous system. Problems of current research interest. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

B STR 598 Biological Structure Research (1) AWSp Presentation/discussion relating to original research, including but not limited to, neurobiology, cellular immunology, cell differentiation, reproductive biology, molecular structure, and their associated methodologies: electron microscopy, histology, x-ray diffraction, tissue culture, morphometric analysis. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

B STR 600 Independent Study or Research (*) AWSpS

B STR 700 Master's Thesis (*) AWSpS

B STR 800 Doctoral Dissertation (*) AWSpS

Conjoint Courses

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

CONJ 340-341-342 Human Anatomy and Physiology (4-4-4) Introductory course integrating gross anatomy, microscopic anatomy, and physiology of the human body. Primarily for nursing and pharmacy students, others by permission of instructor. Coordinator: Department of Physiology and Biophysics. Prerequisites: CHEM 101, 102 or equivalent and permission of instructor.

CONJ 407 Principles of Animal Experimentation (3) W Dennis, Van Hoosier For graduate students and advanced undergraduates; focus on biology and care of experimental animals, animal models of human disease, ethical use of animals in biomedical research and teaching; techniques of experimental surgery. Lectures, demonstrations, and experimental procedures. Prerequisite: permission of instructor.

CONJ 448 Fundamental Immunology Laboratory (2) A Clark Introduction to immunologic techniques. Principles of antigen-antibody interactions and cell-mediated reactions. Medical applications of immunologic methods. Prerequisite: MICRO 441 or 447 or HUBIO 521P, or permission of instructor. Coordinator: Department of Microbiology.

CONJ 475 Alcoholism: A Course for Medical Students and Students in the Allied Health Sciences (2) Sp Walker A lecture course for medical students in the allied health sciences in any year that will cover an introduction to the epidemiology, diagnostic strategies, natural history, physiologic effects, and treatment of alcohol-related disorders.

CONJ 505P Pain Clinic Preceptorship (1) Loeser One morning a week spent observing patient care in either inpatient or outpatient settings at University Hospital; associated readings. Prerequisite: first- or second-year medical student standing.

CONJ 508 EM Methods and Interpretation (3-5) Holbrook, Wight Techniques used in biological transmission and scanning electron microscopy. Practical laboratory experience in research environment, tutorial discussions of cell architecture as related to the functional behavior of cells. Student projects required. Prerequisites: a basic cell biology course and graduate or postdoctoral status in pathology or biological structure.

CONJ 509 Neurochemistry (3) A Stahl Introductory course covering chemistry and metabolism, chemical pathology of disorders of lipid, amino acid, and carbohydrate metabolism, transport phenomena, neurotransmitters, memory, the visual system, and unique proteins of the nervous system. Recommended for graduate and medical students. Knowledge of biochemistry is strongly advised. Prerequisite: permission of instructor. (Offered alternate years.)

CONJ 511 Functional Neuroanatomy (4) W Hendrickson, Smith Lecture and laboratory course in neuroanatomy. Laboratory includes gross human brain and slide material and cat and monkey material. Offered conjointly by the departments of Biological Structure and of Physiology and Biophysics. Prerequisite: permission of instructor. Coordinator: Department of Physiology and Biophysics.

CONJ 512 Introduction to the Anatomical Analysis of Animal Disease (5, max. 10) AWSp Van Hoosier Uses animals in experimental study of disease; introduction to: techniques of animal necropsy, characterization and interpretation of gross and microscopic lesions, correlation of lesions with altered physiological processes, differentiation between naturally occurring and experimentally induced lesions. Prerequisites: PATH 444, 445, or equivalent, and permission of instructor. Enrollment limited to two students per quarter.

CONJ 514 Comparative Pathology Conference (1, max. 6) AWSp Van Hoosier Focus on histopathology of naturally occurring and experimentally induced lesions of primates, laboratory and domestic animals, fish, wildlife, and birds. Participants discuss the lesions and the basic pathogenetic mechanisms that underlie them. Prerequisites: PATH 500 or equivalent and permission of instructor.

CONJ 516 Current Literature in Laboratory Animal Medicine (1, max. 12) Dennis, Van Hoosier Critical evaluation of recent articles on laboratory animal medicine and science. Emphasis on literature dealing with spontaneous diseases of laboratory animals, biology and husbandry, zoonotic diseases, and

animal models of human disease. Experimental design, use of animals in research, and methods of reviewing manuscripts. Prerequisite: permission of instructor.

CONJ 518 Clinical Conference Seminar (1, max. 12) Dennis, Van Hoosier Clinical reports of cases of spontaneous and induced diseases, animal models of human disease, and zoonotic diseases discussed. Disease prevalence and preventive medicine measures. Diagnostic exercises. Prerequisite: permission of instructor.

CONJ 519 Molecular and Cellular Neurobiology (3) Concepts and techniques of molecular and cell biology as applied to understanding development and function of the nervous system. Recommended: biochemistry course or equivalent.

CONJ 520 Anatomy and Autopsy (1 or 2) Students attend autopsies at UW affiliated hospitals. Objectives: (1) demonstration of normal anatomic relationships and features of unfixed cadavers; (2) demonstration of gross anatomical relationships in various pathological states; (3) follow-up of histological findings. Offered as elective concurrent with HUBIO 520P. Prerequisites: HUBIO 510P or equivalent, permission of instructor.

CONJ 525P Preventive Medicine in Primary Care (2) Sp Neighbor Practice of health maintenance is discussed in a seminar format. Goal of course is to help students develop skills in evaluating the usefulness of current and future preventive measures. Coordinator: Department of Family Medicine.

CONJ 530, 531 Diseases of Laboratory Animals (3,3) Van Hoosier Analysis of etiology, pathogenesis, pathology, and disease processes in rodents, lagomorphs, carnivores, and nonhuman primates. Material organized according to etiology (e.g., viral, bacterial, parasitic).

CONJ 540 Animal Models (1) Dennis Naturally occurring and experimentally induced analogs of human diseases in animals with emphasis on diseases in search of animal models, and approaches to identifying new models. Animal models of categorical disease (e.g., cancer, atherosclerosis, gerontology) discussed.

CONJ 550P Clinical Infectious Diseases (3) Stamm, Wilson Lecture series by faculty members from various departments, authorities in the field of clinically important infectious diseases. Lectures, reading assignments, and handouts emphasize epidemiology, clinical manifestations, laboratory findings, diagnosis, treatment, and prevention. Oriented for second-year medical students. Prerequisite: HUBIO 521P or permission of coordinator, Department of Medicine.

CONJ 553P Nutrition for Physicians (2) Basic nutritional concepts directed at second-year medical students. Controversial issues relating to diet and disease, with emphasis on application of scientific reasoning and pragmatism to the search for answers. Focuses on providing practical information relevant to the practice of a physician. Prerequisites: HUBIO 514P, 524P, or equivalent.

CONJ 561 Tumor Biology (2) W I. Hellström Graduate students and interested medical students. The general areas covered are the basis of carcinogenesis, tumor progression and metastasis, virus-induced tumors, tumor genetics, and tumor immunology. Offered conjointly by the departments of Microbiology and Pathology. Prerequisite: permission of Department of Microbiology. (Offered alternate years; offered 1988.)

CONJ 572 Advanced Immunology II—Immunopathology (2) W I. Hellström, K. E. Hellström Graduate students and upper-division undergraduates. In-depth treatment of basic immunology with MICRO 570. Covers the mechanisms concerned with immunological tissue injuries. Prerequisites: MICRO 447 (or

equivalent), biochemistry, genetics, and one quarter of general pathology. Coordinator: Department of Microbiology. (Offered every three years; offered 1987.)

CONJ 585 Surgical Anatomy (1-3, max. 12) AWSp Graney Guided dissection of selected regions, supplemented by conferences. Offered conjointly by the departments of Biological Structure and Surgery. Prerequisite: permission of department. Coordinator: Department of Biological Structure.

CONJ 677P Clinical Allergy and Immunology (*, max. 12) AWSpS Van Arsdell (University Hospital) Clinic and office experience in diagnosing and managing allergic disease. Clinical conferences, hospital rounds on clinical immunology and allergy. Student may elect a flexible program, emphasizing adult or pediatric allergy. Prerequisites: MED 665P or basic clerkships in Departments of Family Medicine or Pediatrics. (Four or six weeks, full-time.)

CONJ 678P Pain Clinic Clerkship (8) Egan, Loeser Full-time, four-week clerkship emphasizing comprehensive care of patients with chronic pain from benign diseases and cancer. Faculty members from multiple departments provide student with didactic and bedside experiences; student member of treatment team. Involves both inpatient and outpatient activities. Prerequisites: completion of human biology series, MED 665P.

CONJ 680P An Introduction to Detoxification and Rehabilitation Programs for Alcoholism (*, max. 16) Sp Walker Supervised introduction to alcoholic detoxification and rehabilitation as they apply to the general physician. Supervised clinical experience in a variety of alcoholism treatment programs; accompanied by a core series of lectures and discussions. (Two, four, or six weeks, full-time.)

CONJ 698P Foreign Medical Student Clerkship (*, max. 24) A limited number of students from foreign medical schools are accepted for individually designed clinical clerkships at available sites after all UW students are accommodated. Prerequisites: completion of all preclinical work at the parent institution and certification from the dean of that institution.

Family Medicine

C408 Health Sciences

Family medicine is the discipline concerned with the continuing and comprehensive care of individuals and their families. The prime instructional goal of the department is the education and training of physicians who will apply the knowledge and skills of this and other medical disciplines in family practice. Implicit in this goal is the necessity for continual development of new knowledge and its application in the clinical activities of the department.

The Department of Family Medicine was founded in 1971 and is involved with instruction of medical students in several ways. These include presentations in the basic curriculum of the first two years, selective clinical clerkships as part of the clinical core curriculum, and other elective courses open to all medical students. A graduate residency program in family practice provides training consistent with the standards of the American Board of Family Practice, the American Academy of Family Physicians, and the Council on Medical Education of the American Medical Association. Active teaching affiliations are maintained throughout the WAMI region at both undergraduate and graduate levels.

Faculty

Chairperson

John P. Geyman

Professors

Geyman, John P., 1976, M.D., 1960, California (San Francisco); family medicine.

Mayer, Jonathan D.,* 1977, ‡(Geography, Health Services), M.A., 1975, Ph.D., 1977, Michigan; urban geography, transportation, medical geography, geographic philosophy and methods.

Phillips, Theodore J., 1970, M.D., 1959, Johns Hopkins; family medicine.

Rosenblatt, Roger A.,* 1977, (Health Services), M.P.H., 1971, M.D., 1971, Harvard; family medicine.

Associate Professors

Berg, Alfred O., 1979, M.D., 1974, Washington (St. Louis); M.P.H., 1979, Washington; family medicine.

Cherkin, Daniel C., 1979, (Research), M.S., 1974, Ph.D., 1978, Washington; epidemiology.

Gordon, Michael J.,* 1973, (Health Services), (Medical Education), † M.A., 1970, Ph.D., 1973, Michigan State; educational psychology.

Leversee, John H., 1975, M.D., 1952, Minnesota; family medicine.

Schneeweiss, Ronald, 1977, M.B.Ch.B., 1964, Cape Town (South Africa); family medicine.

Taylor, Thomas R., 1979, M.B.Ch.B., 1957, Ph.D., 1971, Glasgow (Scotland); family medicine.

Assistant Professors

Amundson, Bruce A., 1980, (Acting), M.D., 1965, Minnesota; family medicine.

Baldwin, Laura A., 1987, (Acting), M.P.H., 1986, Washington; M.D., 1980, Southern California; family medicine.

De Neef, C. Peter, 1985, (Acting), Ph.D., 1971, Maryland; M.D., 1981, Miami; family medicine.

Eggertsen, Sam C., 1982, M.D., 1976, Washington; family medicine.

Ellsbury, Kathleen E., 1982, M.D., 1977, Johns Hopkins; M.S.P.H., 1982, Missouri (Columbia); family medicine.

Ellsworth, Allan J., 1984, ‡(Pharmacy Practice), Pharm.D., 1977, Philadelphia College; clinical pharmacy.

Greer, H. Thomas, Jr., 1977, (Acting), M.D., 1974, Mississippi; M.P.H., 1979, Washington; family medicine.

Hart, L. Gary, 1985, (Research), M.S., 1975, Utah; Ph.D., 1985, Washington; health services research.

Meyer, Barbara A., 1983, M.D., 1976, Michigan; M.P.H., 1984, Washington; family medicine.

Montano, Daniel E., 1984, (Research), (Health Services), M.A., 1979, Ph.D., 1983, Washington; social psychology.

Neighbor, William E., Jr., 1983, (Acting), M.D., 1979, M.P.H., 1985, Washington; family medicine and preventive cardiology.

Stevens, Nancy G., 1982, (Epidemiology), M.D., 1979, M.P.H., 1982, Washington; family medicine.

Taplin, Stephen H., 1985, (Acting), M.D., 1978, California (Davis); M.P.H., 1985, Washington; family medicine.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

FAMED 499 Undergraduate Research (*) AWSpS Taylor Research activities are arranged with faculty members in various areas related to family medicine. Research is generally clinically oriented and centered around patient care. Prerequisite: permission of course coordinator.

FAMED 501P Introduction to Family Medicine: Preceptorship (2½) AWSpS Neighbor Students are introduced to family medicine through preceptorship assignments with practicing family physician clinical faculty and seminars. First-year (occasionally second-year) medical students. Prerequisite: permission of course coordinator.

FAMED 505P Preceptorship in CHAP (1) Baldwin Opportunity to work in variety of projects in community settings to serve disadvantaged populations. Weekly seminar to share experiences and hear community speakers as part of Community Health Advancement Program (CHAP). (Formerly MED P 503P.) Prerequisite: permission of instructor.

FAMED 520P-521P-522P Continuity Clerkship in Family Medicine (0-0-8) Meyer Students spend one morning a week in the office of a family physician participating in the continuous comprehensive care of patients. A weekly lecture/workshop series during the first two quarters covers major topics in primary care and family medicine. Students enroll in all three quarters to gain the benefits of a continuity experience. Prerequisites: HUBIO 513P, 522P, 535P.

CONJ 525P Preventive Medicine in Primary Care (2) Sp See Conjoint Courses.

FAMED 640P Clinical Clerkship in Family Medicine—Boise (8 or 12) Greer, Baldwin Common problems in primary care. Student functions as clerk in community/residency site. Participates in care of assigned patients, using office, hospital, home, community resources; works with faculty/senior residents in intensive experience. Six weeks advised for community sites. Prerequisite: third- or fourth-year student standing. (Formerly FAMED 684P.)

FAMED 641P Clinical Clerkship in Family Medicine—Spokane (8 or 12) For description and prerequisite, see 640P.

FAMED 642P Clinical Clerkship in Family Medicine—Madigan (8 or 12) For description and prerequisite, see 640P.

FAMED 643P Clinical Clerkship in Family Medicine—Tacoma (8 or 12) For description and prerequisite, see 640P.

FAMED 644P Clinical Clerkship in Family Medicine—University Hospital (8 or 12) For description and prerequisite, see 640P.

FAMED 645P Clinical Clerkship in Family Medicine—Group Health (8 or 12) For description and prerequisite, see 640P.

FAMED 646P Clinical Clerkship in Family Medicine—Swedish (8 or 12) For description and prerequisite, see 640P.

FAMED 647P Clinical Clerkship in Family Medicine—Providence (8 or 12) For description and prerequisite, see 640P.

FAMED 648P Clinical Clerkship in Family Medicine—Valley (8 or 12) For description and prerequisite, see 640P.

FAMED 650P Clinical Clerkship in Family Medicine—Anacortes (8 or 12) For description and prerequisite, see 640P.

FAMED 651P Clinical Clerkship in Family Medicine—Omak (8 or 12) For description and prerequisite, see 640P.

FAMED 652P Clinical Clerkship in Family Medicine—Spokane Valley (8 or 12) For description and prerequisite, see 640P.

FAMED 653P Clinical Clerkship in Family Medicine—Anchorage (8 or 12) For description and prerequisite, see 640P.

FAMED 654P Clinical Clerkship in Family Medicine—Ketchikan (8 or 12) For description and prerequisite, see 640P.

FAMED 655P Clinical Clerkship in Family Medicine—Kallispell (8 or 12) For description and prerequisite, see 640P.

FAMED 656P Clinical Clerkship in Family Medicine—Whitefish (8 or 12) For description and prerequisite, see 640P.

FAMED 657P Clinical Clerkship in Family Medicine—Pocatello (8 or 12) For description and prerequisite, see 640P.

FAMED 658P Clinical Clerkship in Family Medicine—Sea Mar Clinic (8 or 12) For description and prerequisite, see 640P.

FAMED 659P Clinical Clerkship in Family Medicine—Country Doctor (8 or 12) For description and prerequisite, see 640P.

FAMED 670P Advanced Preceptorship in WAMI Area (*, max. 24) AWSpS Leversee For third/fourth-year medical students interested in practicing in underserved National Health Service Corps/Indian Health Service sites. Focus on, and attention to, attitudes, knowledge and skills, and community organizations responsible for health-care delivery. Prerequisite: permission of course coordinator.

FAMED 671P Advanced Preceptorship in United States (*, max. 24) AWSpS Leversee For junior or senior medical students interested in experiencing family medicine in community or clinic setting not already established through family medicine curriculum. Prerequisite: prior permission of course coordinator.

FAMED 672P Advanced Preceptorship International (*, max. 24) AWSpS Leversee For senior medical students desiring family medicine experience abroad. Special project deals with influences of social, cultural, educational, and economic forces on health-care delivery. Prerequisite: prior permission of course coordinator.

Human Biology**Course Descriptions**

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only. This sequence is required for all medical students. Other students may enroll by permission of the Assistant Dean for Curriculum, School of Medicine.

HUBIO 500P Medical Practice Preceptorship at WAMI Sites (1, max. 3) AWSpS Personal experience with, and insight into, medical practice situations. Student is stationed with carefully selected clinical faculty members in their offices in accordance with the student's preference of discipline at the WAMI sites. Registration limited to first-year medical students at WAMI sites.

HUBIO 501P Human Biology Special Projects (*) AWSpS Hunt Designed for medical students electing a special study project related to the Introduction to Clinical Medicine or other human biology courses, which are offered during the first and second years in the School of Medicine. Primarily intended for students in remedial or extended programs. Prerequisite: permission of assistant dean for curriculum.

HUBIO 510P Microscopic Anatomy (Histology) (3) A Koehler Lectures and laboratories in microscopic anatomy designed to provide the principles and concepts of histology, to define the morphological characteristics of the cells, tissues, and organs of the human body, and to relate this information to functional processes studied in concurrent and subsequent courses.

HUBIO 511P Gross Anatomy and Embryology (7)

A Rosse Structural organization of human body at the macroscopic level to provide a foundation for physical examination and functional assessment of the human organism. Integrates embryological development with study of the cadaver and examination of the normal living body. Concentrates on exploration of the body cavities and the viscera they contain.

HUBIO 512P Mechanisms in Cell Physiology (5)

A Crill Physiology of the cell membrane, including ionic and electrical potential gradients; active transport, excitability, and action potentials; biophysics of sensory receptors; neuromuscular transmission; muscle energetics and contractility; spinal reflexes and central synaptic transmission; autonomic nervous system; energy metabolism and temperature regulation; epithelial transport; gastrointestinal motility and secretions.

HUBIO 513P Introduction to Clinical Medicine (1)

A Gordon, Lerversee Instruction in communication skills and interview techniques to form the basis for the doctor-patient relationship and for the skills of communicating with patients. The patient profile is obtained. Attention to developing comfort in the physician role.

HUBIO 514P Biochemistry (4)

A Walsh First portion of a coordinated course covering classical molecular and cellular biochemistry, cellular physiology, and molecular genetics. Metabolic interrelationships as they occur in the individual stressed and related to disturbances in disease states.

HUBIO 515P The Ages of Man (3)

A Farrow Physical and psychological development of the whole individual from embryo through old age (including teratology, obstetrics, neonatal adaptation, nutrition, and developmental milestones in childhood and adolescence, middle and old age, and dying). Includes patient presentations, movies, television tapes, and small-group discussions.

HUBIO 520P Cell and Tissue Response to Injury (6)

W Monnat Patterns of cell and tissue response to injury. Mechanisms of cell injury, the inflammatory process, immunology, immunopathology, thrombosis, normal and abnormal growth, neoplasia, clinicopathological correlation.

HUBIO 521P Natural History of Infectious Diseases and Chemotherapy I (4)

W Moseley Pathogenesis and immunity of infectious diseases, natural barriers. Microbiology, epidemiology, clinical manifestations and control of representative bacterial, fungal, parasitic, and viral infectious diseases. Chemotherapeutics and principles of chemotherapy. Sterilization, principles of asepsis, nosocomial and iatrogenic infections and their prevention.

HUBIO 522P Introduction to Clinical Medicine (1)

W Gordon, Lerversee Medical history is introduced and instruction in data collection is begun. Experience in conducting medical interviews with patients to obtain the medical history and patient profile. Special problems related to interviewing are addressed.

HUBIO 523P Introduction to Immunology (2)

Farr Basic concepts such as antigens; antibodies; complement; B- and T-lymphocyte function, including interactions with each other and with accessory cells; immunological tolerance; major histocompatibility complex; and role of these basic concepts in immunopathology (immunodeficiencies, hypersensitivities, autoimmunity, blood transfusion, and transplantation).

HUBIO 524P Biochemistry (2)

W Walsh Second portion of a coordinated course covering classical molecular and cellular biochemistry, cellular physiology, and molecular genetics. Metabolic interrelationships as they occur in the individual are stressed and related to disturbances in disease states.

HUBIO 526P System of Human Behavior I (3)

Sp Vitello Effects of behavioral factors in major management problems faced in medical practice relating to cul-

tural background, social role, sexual identity, and belief systems. Acquisition of skills in analyzing behavior, defining objectives, and designing precise treatment strategies.

HUBIO 530P Epidemiology (2)

Sp Koepsell Community health and disease, including assessment of disease risk and mechanisms of epidemic detection, spread, and control; interpretation of research design, data analysis, bias source; and clinical epidemiology, including evaluation and application of diagnostic tests, natural history of disease, and quantitative aids for clinical decision making.

HUBIO 531P Head, Neck, Ear, Nose, and Throat (5)

Sp D. Graney Gross anatomy (including skull, pharynx, and larynx), audition and balance, physiology and clinical evaluation, maxillofacial disorders, diseases of nasal passages, nasopharynx and oropharynx, accessory sinuses. Physical examination.

HUBIO 532P Nervous System (6)

Sp Hendrickson Integrated approach to normal structure and function of the nervous system, including the eye. Neuropathological examples, as well as clinical manifestations of neurological disease are presented.

HUBIO 534P Natural History of Infectious Disease and Chemotherapy II (2)**HUBIO 535P Introduction to Clinical Medicine (4)**

Sp Pierson Adult screening physical examination is taught through the use of lecture, audiovisual aids, and small-group tutorial, where students in supervised setting practice the physical examination on one other. Further practice in the performance and recording of the patient profile and medical history.

HUBIO 540P Cardiovascular System (5½)

Interdisciplinary approach to cardiovascular medicine, including anatomy, physiology, radiology, pathology, medicine, and surgery. Function of the cardiovascular system in health and disease.

HUBIO 541P Respiratory System (4)

Culver Interdisciplinary approach to the respiratory system, including anatomy of thorax and lungs, ventilation mechanics, blood-gas transport, gas exchange, acid-base balance, and the physiology and pathology of obstructive, restrictive, and pulmonary-vascular diseases.

HUBIO 542P Introduction to Clinical Medicine (2½)

A McArthur Advanced instruction in interview technique, history taking, and physical examination, with emphasis on detection of abnormalities.

HUBIO 543P Principles of Pharmacology I (4)

A Vincenzi Includes general principles of pharmacology and the specific pharmacology of major drugs acting on the autonomic and cardiovascular systems.

HUBIO 544P Endocrine System (2½)

A Brunzell Normal, gross, and microscopic anatomy and physiology of the endocrine system. Illustrations examining the clinical relevance of homeostasis, feedback, and other controlling mechanisms previously learned. Endocrine integration of metabolism. Clinically important endocrine pathophysiology.

HUBIO 545P Reproduction (3½)

A Steiner Normal development of the human reproductive system. Sexual differentiation, puberty, endocrine control of testicular and ovarian function, gamete biology, fertilization, implantation, immunology and endocrinology of pregnancy, labor and delivery, pathology of the male and female reproductive organs, contraception, prolactin and lactation, aging and infertility.

HUBIO 550P Introduction to Clinical Medicine (3½)

W McArthur Continuation of 542 with emphasis on identification of problems and correlation of findings with pathophysiological mechanisms.

HUBIO 551P Gastro-Intestinal System (4)

W Saunders Anatomy of the gastrointestinal system; physiology and pathology of digestion and hepatic function; and physical and laboratory examination.

HUBIO 552P Hematology (3) **W McArthur** Familiarizes students with the basic pathophysiological mechanisms leading to disturbances of red cell, white cell, and platelet production, as well as abnormalities of hemostasis presenting clinical problems. Pathophysiology, rather than minute details of individual disease, is stressed. (Formerly 561P.)

HUBIO 553P Musculoskeletal System (4½)

W Teitz Gross, surface, applied, and x-ray anatomy of system, including entire spine but excluding head and neck. Histology of bone, cartilage, tendon-myotendinous junction and joints. Musculoskeletal trauma and healing. Pathology and clinical manifestations of other degenerative, inflammatory, metabolic, nutritional, and congenital disorders. Physical examination.

HUBIO 554P Genetics (2½)

W Stamatoyannopoulos Review of basic genetic principles and their applications in clinical medicine. Includes human chromosomal disorders; patterns of inheritance, genetic counseling, amniocentesis; pathogenesis of hereditary diseases, monogenic and multifactorial; role of genetics in common diseases; behavioral genetics; drug-gene interactions; and prevention and treatment of genetic diseases, including prenatal diagnosis and population screening.

HUBIO 555P Medicine, Health, and Society (3½)

W Connell Interrelationships between provision of medical care and nonbiological factors that influence health. Includes relative importance of society, environment, and individual choice in determining health status; impact of organizational, economic, and political influences on medical practice and choice; their importance in decision making.

HUBIO 560P Introduction to Clinical Medicine (5)

Sp McArthur Continuation of 550P. Introduction to clinical and laboratory diagnosis.

HUBIO 562P Urinary System (4)

Sp Sherrard Anatomy, physiology, and pathology of the kidney, ureter, bladder, and prostate; pathophysiology and treatment of common fluid and electrolyte problems; renal pharmacology; major clinical urinary system syndromes, with current diagnostic approaches and therapy.

HUBIO 563P System of Human Behavior II (3)

Sp N. Ward Major psychiatric disorders are defined and described, and a systematic approach to differential diagnosis is presented. Conceptual development, pathogenesis, epidemiology, nomenclature, and the terminology used in psychiatry are discussed.

HUBIO 564P Principles of Pharmacology II (3)

Sp Horita Lectures and conferences on drugs that act on the central nervous system. Emphasis on physiological and biochemical mechanisms, with consideration of therapeutic and adverse effects.

HUBIO 566P Systemic Pathology (2)

Sp Mottet Multidisciplinary approach to some diseases that affect more than one organ system (nervous, cardiovascular, respiratory) and that are caused by different mechanisms (congenital, inflammatory, vascular, traumatic, metabolic, neoplastic).

HUBIO 567P Skin System (2)

W Odland Gross and microscopic anatomy. Physiology, protection, temperature control, pigmentation, and photosensitivity. Pathology and genetics of skin abnormalities, including tumors. Introduction to clinical evaluation, including physical examination and illustrating examples of inflammatory, vascular, immunological (including drug hypersensitivity), and neoplastic diseases. (Formerly 556P.)

Laboratory Medicine

NW120 University Hospital

The Department of Laboratory Medicine includes divisions of clinical chemistry, hematology, microbiology,

coagulation, immunology, genetics, virology, information processing, and electroencephalography and neurophysiology. In addition to courses for medical students, the department offers Bachelor of Science in Medical Technology and Master of Science degree programs. The department also provides residency training in clinical pathology for graduate physicians and postdoctoral training in several subspecialty areas of laboratory medicine.

Undergraduate Program

Bachelor of Science in Medical Technology Degree

Medical technology is an interesting and rewarding health science profession. Individuals who enjoy studying the biological, chemical, and physical sciences find personal satisfaction and intellectual reward in employing scientific methods for the diagnosis and evaluation of disease. Advances in medical science and interest in health maintenance have resulted in an exponential growth in the diversity and volume of laboratory procedures. The role of the medical technologist/clinical laboratory scientist has evolved from that of a technician to that of a creative, knowledge-based professional who performs assays, analyzes problems, and helps to evaluate test results.

The medical technology program is a four-year college curriculum supervised by the College of Arts and Sciences in the freshman and sophomore years (pre-professional, 90 credits) and by the Department of Laboratory Medicine in the junior and senior years (professional, 102 credits). Detailed program requirements and application material may be obtained from the Arts and Sciences Advising Office or the Department of Laboratory Medicine.

Admission Requirements: The medical technology professional curriculum consists of seven consecutive quarters of study that must be taken in the School of Medicine. Prerequisite: requirements may be satisfied at the University or at other accredited colleges and universities. Completion of 90 quarter credits or attainment of junior standing must occur prior to admission. Department requirements include preprofessional courses in general and organic chemistry, quantitative analysis, statistics and/or mathematics, and biological sciences. Admission to the professional program requires submission of an application to the Department of Laboratory Medicine by April 15 of the year the applicant plans to enroll. The Allied Health Professions Admission Test is required, and scores from the test should be available by April 15, deadline for application to the program. A grade-point average of 2.00, both cumulative and in required courses, is necessary for admission consideration.

Graduation Requirements: MICRO 441, 442, 443, 444; BIOC 405, 406; LAB M 321, 322, 418, 419, 420, 421, 422, 423, 424, 425, 426, and 427. A grade-point average of 2.00, both overall cumulative and in required courses, is necessary for graduation.

The medical technology curriculum is accredited by the Committee on Allied Health Education and Accreditation. Graduates are eligible and are encouraged to take an appropriate examination to become certified medical technologists/clinical laboratory scientists. Examples of practice in medical technology include service in hospitals and clinics; research in industrial, public health, and medical laboratories; and teaching in hospitals, colleges, and universities.

Graduate Program

The Department of Laboratory Medicine offers a graduate program leading to the Master of Science degree. Each student in the program selects one of the major areas of concentration (e.g., chemistry, coagulation, hematology, immunology, microbiology, virology).

The chemistry concentration is approved by the Commission on Accreditation in Clinical Chemistry. The other pathways have no comparable accrediting agencies.

A thesis based upon independent research in the student's selected area of concentration is required. Course requirements vary with the concentration selected. However, the program is flexible and permits each student (with the help of an adviser) to plan a course of study that meets individual needs. A full-time student normally completes the program in two years. The program prepares qualified candidates for supervisory positions in clinical laboratories and for careers in investigation or teaching in an area of clinical laboratory science.

Admission Requirements

Applicants must have a B.S. or B.A. degree in a field appropriate to the graduate study (medical technology, biochemistry, biology, chemistry, or microbiology) and meet the Graduate School's requirements for admission. The applicant must also be certified as a medical technologist/clinical laboratory scientist, or as a specialist in a particular area of laboratory medicine by one of the national certifying agencies. In addition, applicants must take the Graduate Record Examination aptitude test.

Financial Aid

Research assistantships may be available for second year students. Opportunities for part-time employment in departmental laboratories may be available, and applications will be considered. This program is currently included as one of the regional graduate programs by the Western Interstate Commission for Higher Education (WICHE), which enables residents of twelve Western states to attend the University of Washington as out-of-state graduate students paying resident tuition. The twelve states are Alaska, Arizona, Colorado, Hawaii, Idaho, Montana, North Dakota, New Mexico, Nevada, Oregon, Utah, and Wyoming.

Research Facilities

Each division in the department is equipped with modern facilities for research in its specialty area.

Correspondence and Information

Graduate Program Coordinator
Department of Laboratory Medicine, SB-10

Residency Training Program

The department provides residency training in clinical pathology (laboratory medicine) for graduate physicians in cooperation with the Department of Pathology. Persons who complete the program are eligible for certification by the American Board of Pathology.

Correspondence and Information

Resident Program Director
Department of Laboratory Medicine, SB-10

Faculty

Chairperson

Paul E. Strandjord

Professors

Chatrjian, Gian-Emilio, 1959, (Neurological Surgery), † M.D., 1951, Naples (Italy); electroencephalography and clinical neurophysiology.

Corey, Lawrence, 1977, (Medicine, Pediatrics), (Microbiology and Immunology), † M.D., 1971, Michigan; diagnosis, therapy, and pathogenesis of viral infections.

Detter, James C., 1969, M.D., 1962, Kansas; laboratory diagnosis of genetic disorders, red-cell disorders and laboratory instrumentation.

Gilliland, Bruce C., 1968, (Microbiology), (Medicine), † M.D., 1960, Northwestern; immune complex disorders, hemolytic anemia, complement abnormalities.

Kaplan, Alex, 1960, (Emeritus), Ph.D., 1936, California; clinical chemistry.

Kenny, Margaret A., 1970, (Anesthesiology), Ph.D., 1968, Illinois (Urbana); hormone regulation of electrolyte metabolism, new technologies for in vivo clinical biochemical analysis.

Labbe, Robert F., 1957, (Pediatrics), M.S., 1949, Ph.D., 1951, Oregon State; porphyrin disorders, nutritional biochemistry.

Plorde, James J., 1967, (Microbiology), (Medicine), † M.D., 1959, Minnesota; clinical microbiology, infectious diseases, antibiotic-resistant nosocomial infections.

Schmer, Gottfried, 1969, M.D., 1956, Vienna (Austria); synthesis of artificial organs, molecular engineering of antitumor enzymes.

Schoenkecht, Fritz D., 1967, (Microbiology), † M.D., 1957, Freie (Berlin); *in vitro* antibiotic action, clinical microbiology, nosocomial infections.

Strandjord, Paul E., 1969, M.A., 1952, Minnesota; M.D., 1959, Stanford; clinical chemistry, leadership and management.

Associate Professors

Bauer, Larry A., 1980, †(Pharmacy Practice), Pharm.D., 1980, Kentucky; pharmacokinetics, drug metabolism.

Benjamin, Denis R., 1975, (Pediatrics), (Pathology), † M.B.B.Ch., 1968, Witwatersrand (South Africa); pediatric pathology, laboratory medicine, hematopathology nutrition, circadian rhythms, interpretation of laboratory values.

Clayson, Kathleen J., 1969, M.S., 1968, Minnesota; enzymology in clinical chemistry.

Coyne, Marie B., 1973, (Microbiology), † M.S., 1963, St. Louis; Ph.D., 1965, Kansas State; D.N.A. probes and GLC for rapid identification of mycobacteria and corynebacteria.

Delaney, Colleen J., 1975, M.S., 1967, Ph.D., 1972, Illinois; clinical chemistry, application of 2-D high-resolution electrophoresis to the study of diabetes (types I and II) and alcoholism.

Fine, James S., 1977, M.D., 1972, M.S., 1977, Minnesota; enzymology, medical computer applications.

Minshew, Barbara H., 1974, (Microbiology), M.A., 1970, Ph.D., 1972, Texas Southwest Medical School (Dallas); clinical microbiology, antimicrobial activity and bacterial susceptibility.

Opheim, Kent E., 1977, Ph.D., 1972, Cornell; therapeutic drug monitoring, drug assay development, pediatric clinical chemistry.

Ralsys, Vidmantas A., 1971, M.S., 1965, Illinois; Ph.D., 1969, State University of New York (Buffalo); clinical toxicology, therapeutic drug monitoring.

Schiller, Harvey S., 1972, (Obstetrics and Gynecology), † M.D., 1966, Washington (St. Louis); clinical chemistry, hematology, interpretation of laboratory data.

Smith, Elizabeth K., 1950, (Emeritus), (Research), (Pediatrics), † M.S., 1939, Michigan; Ph.D., 1943, Iowa; pediatric endocrinology, steroid assays for congenital adrenal hyperplasia, metabolic disease testing.

Tenover, Fred C., 1982, (Microbiology), M.S., 1981, Ph.D., 1981, Rochester; molecular biology of plasmids, infectious diseases.

Wilkus, Robert J., 1970, (Medicine), † M.D., 1962, M.S., 1962, Loyola; epilepsy, clinical neurophysiological research in epilepsy.

Assistant Professors

Ashley, Rhoda L., 1982, (Research), Ph.D., 1977, California (Davis); pathogenesis of viral infections, immune response to herpes, rapid diagnosis.

Behrens, Joyce A., 1972, M.S., 1971, Minnesota; clinical hematology and clinical coagulation methodologies.

Chandler, Wayne L.,* 1984, M.D., 1982, St. Louis; neurochemistry, fibrinolysis, clinical chemistry, clinical coagulation, hematology, enzyme kinetics.

Fligner, Corrine L., 1984, ‡(Pathology), M.D., 1976, New Mexico; forensic pathology and forensic clinical toxicology.

Fritsche, Thomas R.,* 1984, (Microbiology), † M.S., 1975, M.D., 1981, Ph.D., 1984, Minnesota; systematics and ecology of animal parasites; medical microbiology.

Haver, Virginia M.,* 1986, Ph.D., 1980, Virginia; clinical chemistry, platelet biochemistry, mechanisms of platelet aggregation.

LeCrone, Carol N.,* 1967, M.S., 1966, Colorado State; thalassemia, hemoglobinopathies.

McGonagle, Lee Anne, 1970, M.P.H., 1969, Michigan; clinical microbiology, procedures for diagnostic bacteriology.

Simrell, Charles R., 1987, ‡(Pathology), M.D., 1978, Florida; hematology and hematopathology.

Swenson, Paul D., 1987, (Acting), Ph.D., 1979, Virginia Commonwealth.

Szabo, LaVerne L., 1970, (Emeritus), M.S., 1970, Washington; general clinical chemistry, heavy metals in clinical chemistry.

Tait, Jonathan F., 1985, M.D., 1983, Ph.D., 1983, Washington (St. Louis); biochemistry of blood coagulation, laboratory diagnosis of genetic disorders.

Toivola, Pertti T., 1986, (Acting), Ph.D., 1972, Washington; clinical chemistry, immunochemistry, trace metals in clinical chemistry.

Wener, Mark H.,* 1981, (Medicine), † M.D., 1974, Washington (St. Louis); diagnostic immunology, immune complex diseases.

Instructors

Cone, Richard W., 1987, (Acting), M.S., 1977, Ph.D., 1980, Stanford; M.D., 1983, Cincinnati; viral nucleic acid detection for diagnosis, viral tumor genesis.

Kidd, Pamela A., 1984, (Acting), (Pathology), † M.D., 1971, Baylor; hematopathology, differentiation of B and T lymphocytes.

Odell, J. Michael, 1987, (Acting), M.D., 1979, California (Los Angeles); pediatric pathology and pathology, flow cytometry.

Lecturers

Anderson, Carol S., 1980, B.A., 1966, Concordia; immunohematology.

Hamernyk, Peggy V., 1968, B.S., 1954, Nebraska; clinical microscopy of urine and body fluids, clinical chemistry.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

LAB M 321 Medical Technology: Introductory Clinical Hematology (5) W Behrens, Hamernyk, LeCrone Lecture-laboratory coverage of the theoretical and practical concepts associated with cellular morphology, instrumentation, quality control, and selected hematological diagnostic studies. Prerequisite: permission of instructor.

LAB M 322 Medical Technology: Introductory Clinical Chemistry (5) A Toivola Lecture and laboratory covering the theoretical and practical concepts associated with testing procedures performed in clinical chemistry. Prerequisite: permission of instructor.

LAB M 418 Topics in Clinical Chemistry (4) Sp Clayson, Toivola Lecture and laboratory exercises covering fundamentals of instrumentation, methodology, and quality control in the clinical chemistry laboratory. Prerequisite: 322.

LAB M 419 Clinical Coagulation (3½) S Behrens Lecture and laboratory covering the theory and pathology of coagulation with inclusion of selected diagnostic procedures. Prerequisite: permission of instructor.

LAB M 420 Clinical Microscopy (3½) S Hamernyk, LeCrone Lecture and laboratory covering urinalysis testing procedures and associated disease entities. Analysis of other body fluids. Methods of microscopic examination by use of bright-field, phase, and polarizing microscopy. Prerequisite: permission of instructor.

LAB M 421 Medical Microbiology (1 or 6) S McGonagle Lecture and laboratory course covering infections of various organ systems and procedures used in a clinical microbiology laboratory to identify the etiologic agents of human infections. Prerequisite: permission of instructor.

LAB M 422 Topics in Hematology and Immunology (3) Sp Behrens Advanced didactic coverage of topics related to clinical laboratory diagnostic procedures in hematology and immunology. Prerequisite: permission of instructor.

LAB M 423 Clinical Chemistry (10) AW Toivola Clinical testing related to protein and amino acid determinations, pancreatic functions and intestinal absorption, renal and liver function, enzymes, electrolytes, and acid-base balance, lipids, toxicology, and endocrinology. Prerequisite: permission of instructor.

LAB M 424 Clinical Microbiology (8) AW McGonagle, Staff Clinical study of techniques used in the diagnostic microbiology laboratory, including specimen evaluation, culture and antibiotic susceptibility testing of clinically significant organisms, and quality-control procedures. Prerequisite: permission of instructor.

LAB M 425 Clinical Hematology (8) AW Behrens, Staff Clinical coverage of automated and manual cell counting, cellular morphology, and testing procedures related to red and white cell disorders. Prerequisite: permission of instructor.

LAB M 426 Clinical Immunohematology (6) AW Anderson, Hamernyk Clinical study of immunohematology of the red cells and hemagglutination techniques. Prerequisite: permission of instructor.

LAB M 427 Selected Studies in Laboratory Medicine (15) Sp Behrens, Clayson, Hamernyk, LeCrone, McGonagle, Toivola Selected study in either one of the major disciplines of laboratory medicine, as well as reports of advances in clinical chemistry. Open to graduate students in laboratory medicine and other medical sciences. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

LAB M 499 Undergraduate Research (*) AWSpS Specific project in clinical laboratory investigation. Offered on credit/no credit basis only.

LAB M 502 Laboratory Medicine Grand Rounds (1, max. 6) AWSp Dettler Grand rounds are concerned with current topics in the field of laboratory medicine. Offered on credit/no credit basis only. May be repeated for credit.

LAB M 510 Clinical Chemistry Research Conference (1, max. 6) AWSp Labbe Ongoing research and development projects in clinical chemistry, as well as reports of advances in clinical chemistry. Open to graduate students in laboratory medicine and other medical sciences. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

LAB M 520 Seminar in Organization and Management in Laboratory Medicine (3) Sp Strandjord, Staff Core course for the Master of Science degree in laboratory medicine. Prerequisite: graduate student standing in laboratory medicine or permission of instructor. (Offered odd-numbered years.)

LAB M 521 Advanced Laboratory Hematology (1, max. 2) AWSp Dettler, Kidd Lectures on laboratory diagnosis in clinical hematology. Emphasis on clinicopathological correlation. For physicians and laboratory medicine graduate students with special interest in diagnostic clinical hematology. Students required to read literature in preparation for the lectures. Prerequisites: graduate or postgraduate standing and permission of instructor.

LAB M 522 Hematopathology (2) W Kidd Lecture series with emphasis on histopathology and cytochemical and immunological markers of hematologic disorders. Offered jointly with PATH 522. Offered on credit/no credit basis only. (Offered even-numbered years.)

LAB M 580P Research Projects in Laboratory Medicine (*) AWSpS Schmer Opportunity for laboratory experience on a research problem related to laboratory medicine. Students investigate new areas of potential clinical importance. Highly variable selection of projects includes chemistry, coagulation, hematology, immunology, microbiology, virology, and computer medicine. Research goals established by instructor in discussion with each student. Prerequisite: permission of instructor.

LAB M 598 Clinical Chemistry Seminar (2) AWSp Delaney, Ralsys Conferences on research and development in clinical chemistry. For postdoctoral students in clinical chemistry and graduate students. May be repeated for credit. Prerequisite: permission of instructor.

LAB M 601 Internship (3-9, max. 9) AWSpS Offered on credit/no credit basis only. Prerequisite: graduate standing in laboratory medicine. Entry card required.

LAB M 677P Clinical Electroencephalography (*, max. 12) AWSpS Chatrian, Wilkus For third- and fourth-year medical students who desire to acquire familiarity with the techniques, interpretive criteria, and clinical applications of electroencephalography, computer-averaged evoked potentials and other clinical neurophysiologic techniques. Prerequisites: MED 680P and permission of instructor.

LAB M 680P Clinical Laboratory Testing: Methods and Interpretation (*) AWSpS Dettler Provides the third- and fourth-year medical student the opportunity to develop the ability to evaluate clinical laboratory data and to gain insight into methodologies, equipment, principles, and quality control in the laboratory.

LAB M 681 Clinical Laboratory Diagnosis (3) W Fine Interpretation of diagnostic laboratory testing. Appropriate testing strategies, principles, problems, and limitations. Lectures-discussions and illustrative case presentations and demonstrations. For third- and fourth-year medical students and graduate students. Recommended: HUBIO 560P or 563P. (Formerly 501.)

LAB M 700 Master's Thesis (*) AWSpS

Medical Education

The objectives of the Division of Research in Medical Education are to discover, disseminate, and apply knowledge of educational theory and practice in medical education. Research seeks to increase the basic fund of knowledge in educational theory and practice in medical education. Through teaching, the educational knowledge base is transmitted to the faculty, fellows, residents, and students. Through scholarly research, teaching, and service, educational expertise is used to enhance the quality of academic programs in medicine and the health sciences.

Faculty

Director

Charles W. Dohner

Professor

Dohner, Charles W.,* 1967, (Education),† M.S., 1957, Kansas State (Pittsburgh); Ph.D., 1966, Ohio State; program evaluation, administration, faculty development.

Associate Professors

Cullen, Thomas J., 1971, (Research), M.Ed., 1970, Ph.D., 1974, Washington; evaluation, adult learning.

Gordon, Michael J.,* 1973, (Health Services), (Family Medicine),† M.A., 1970, Ph.D., 1973, Michigan State; clinical judgment, self-assessment.

Irby, David M., 1977, M. Div., 1971, Union Theological Seminary; Ph.D., 1977, Washington; teacher evaluation, faculty development, planning.

Sobolewski, John S.,* 1973, (Research), (Computer Science),† M.E., 1966, Adelaide (Australia); Ph.D., 1970, Washington State; computer science, medical applications of computers.

Assistant Professors

Carlino, Jan D., 1981, (Research), M.Ed., 1976, Ph.D., 1979, Washington; clinical evaluation, program evaluation.

Rakestraw, Phillip G., 1982, (Research), M.S., 1977, Oregon; Ph.D., 1981, Washington; research in medical education.

Schaad, Douglas C., 1981, (Research), M.Ed., 1974, Ph.D., 1986, Washington; computer science, measurement, evaluation.

Scott, Craig S., 1979, (Research), M.Ed., 1970, Columbia; Ph.D., 1973, Iowa; faculty course evaluation, medical education outcomes, health promotion.

Shaul, William L., 1976, ‡(Health Services, Pediatrics), M.D., 1973, Pennsylvania State; pediatrics.

Strand, Donn A., 1973, (Research), M.Ed., 1972, Seattle Pacific; Ph.D., 1981, Washington; curriculum evaluation, curriculum development.

Instructor

Riley, Katherine K., 1988, M.A., 1975, Santa Clara; Ph.D., 1984, Washington; program evaluation.

Course Descriptions

MEDED 499 Undergraduate Research (*, max. 12) **AWSpS** Scott Investigative research or readings in medical education; topics include clinical reasoning, curriculum development, evaluation, use of computers in medical education, and educational research in medical settings. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

MEDED 510 Topics in Medical Education Research (2-3) AWSpS Selected research topics in medical education. Development of skills in critical analysis and production of original research. Optional: 1 additional credit for seminar focusing on application of issues in education practice. May be repeated for credit. Offered on credit/no credit basis only.

MEDED 520 Teaching Methods in Medical Education (2) W Irby Empirical and theoretical merits of different teaching methods as applied to medical education. Structuring and leading group discussions, using questions, organizing and delivering lectures, identifying styles of clinical supervision, providing constructive feedback, and presenting effective clinical demonstrations. Combines seminar and microteaching.

MEDED 521 Evaluation of Learning in the Health Sciences (3) Sp Carline Basic issues and methods for evaluation of learning: cognitive performance, psychomotor skills, and reasoning abilities in classroom, laboratory, and clinical settings. Practical applications of instruments such as multiple-choice questions, essays, oral examinations, checklists, rating scales, simulations, and patient management problems. Recommended: 520.

MEDED 522 Research in Medical Education (2) W Scott Basic overview of research methods and research design pertinent to educational research in medical education. Development and sequencing of research projects from conceptualization through literature review, proposal development, project implementation, data management, analysis, and write-up. Critical reading of related literature stressed.

Medical History and Ethics**Graduate Program Coordinator**

Keith R. Benson

The Department of Medical History and Ethics offers a program of study leading to the Master of Arts degree. An undergraduate degree is not offered. Students who desire an undergraduate curriculum emphasizing subject matter in medical history may choose the program in history of science, technology, and medicine offered through the Department of History, College of Arts and Sciences.

Special Requirements

Applicants for the Master of Arts program must meet the requirements for admission to the Graduate School and present a background of undergraduate or professional study acceptable to the department. Educational preparation in the natural sciences or such disciplines as anthropology, classics, history, librarianship, philosophy, and psychology may provide suitable preparation for advanced study in the department.

Aspirants to the Master of Arts degree are expected to possess proficiency in historical methods and familiarity with the biomedical sciences. Department requirements include completion of a core of required courses and of a series of approved upper-division or graduate courses in supporting fields of study; demonstration of reading knowledge in one foreign language; satisfactory completion of a general examination (written and oral); and submission of an acceptable thesis with oral defense of the thesis. A minimum of three full-time quarters of residency is required, and it is expected that the entire program will be completed within four to six quarters.

Correspondence and Information

Graduate Program Coordinator
Department of Medical History and Ethics, SB-20

Faculty**Chairperson**

Albert R. Jonsen

Professors

Jonsen, Albert R.,* 1987, (Medicine), M.A., 1956, Gonzaga; S.T.M., 1963, Santa Clara; Ph.D., 1967, Yale; philosophical and historical study of values affecting the practice of medicine and delivery of health care.

Odegaard, Charles E., 1974, (Emeritus), (Education),† Ph.D., 1937, Harvard; history of medical education.

Whorton, James C.,* 1970, Ph.D., 1969, Wisconsin; history of American medicine, public health, alternative healing, pharmacy and biochemistry.

Associate Professors

Benson, Keith R.,* 1981, M.A., (History), 1973, Ph.D., 1979, Oregon State; history of modern American biology, marine biology, and evolutionary biology.

Berryman, Jack W.,* 1975, M.S., 1971, M.A., 1974, Massachusetts; Ph.D., 1976, Maryland; history of exercise and sports medicine.

Lecturer

McCormick, Thomas R.,* 1974, D.Min., 1976, Southern Methodist; biomedical ethics.

Course Descriptions

MHE 401 Historical Development of Medical Thought (3) Survey of the history of medicine from antiquity to the twentieth century, emphasizing concepts and ideas that influenced and were influenced by medicine.

MHE 403 Issues of Life and Death in Historical Perspective (3) Examination, in terms of their historical development and relation to human values, of some critical contemporary issues arising from advances in biology and medical technology. Topics are considered in the context of past and present concepts of life, death, and the individual, and the value judgments that impact ethical dilemmas of modern medicine and society.

MHE 410 Legal Issues in Biology and Medicine (3) Examination of legal issues posed by advances in biology and medicine. Includes informed consent, death definition, euthanasia, organ transplantation, allocation of scarce medical resources, genetic counseling, genetic screening, abortion and contraception, sterilization, artificial insemination, government funding of research, experimentation with human subjects, and the creation of biohazards. Previous exposure to legal studies not required.

MHE 413 The Evolution of Natural Healing (3) Whorton Historical development of systems of medical practice that have presented themselves as "natural" alternatives to conventional medicine. Philosophies and practices associated with botanical healing, homeopathy, hydropathy, phrenology, magnetism, osteopathy, chiropractic, naturopathy, and programs of diet and exercise.

MHE 414 Public Health in Nineteenth-Century America (3) Whorton Analysis of the patterns of epidemic illness (particularly infectious disease) in the United States for the period of the Revolution to the early twentieth century, and of the evolution of concepts and programs of disease prevention.

MHE 417 History of Disease and Public Health (3) Whorton Investigation of the role played by infectious disease in the development of Western civilization, of the theories devised to account for the origin and spread of epidemics, and of the practices adopted and institutions created to combat epidemic disease.

MHE 418 History of American Medicine (3) Whorton Study of the development of the American medical profession from the early colonial period to the twentieth century with attention to both the scientific and cultural factors that have influenced the training, practice, and social standing of physicians.

MHE 419 Science in Civilization: Antiquity to the Scientific Revolution (5) A Benson From preclassical antiquity to the end of the Middle Ages, stressing the growth of scientific ideas, the cultural context in which they take shape, and their relationship to other movements of thought in the history of civilization. Prerequisite: graduate standing.

MHE 421 Science in Civilization: Science in Modern Society (5) W Benson Growth of modern science from the Renaissance to the nineteenth century, emphasizing the scientific revolution of the seventeenth century. Development of methodology and the emergence of new fields of interest and new modes of thought. Prerequisite: graduate standing.

MHE 422 History of Evolution Theory (3) Sp Benson Development of evolution theory from its early-nineteenth-century roots through the work of Charles Darwin. Impact of evolution theory on society and the formulation of the theory in the twentieth century.

MHE 424 Modern Biology in Historical Perspective (3) Sp Benson Two diverse traditions of biology, natural history, and physiology, in their nineteenth-century development and their subsequent merging after Darwin's evolution theory. Emergence of specialty areas in biology after the beginning of the twentieth century. Prerequisite: upper-class standing or permission of instructor.

MHE 430 Medicine and Society in the Age of Reason (3) Detailed consideration of medicine and its institutions during the seventeenth and eighteenth centuries. Emphasis on the interacting forces and ideas leading to the development of scientific and humanitarian medicine.

MHE 431 Medicine During the Nineteenth Century (3) Detailed consideration of the development of the basic and clinical medical sciences during the nineteenth century, emphasizing medical theory and practice.

MHE 435 Medicine and Society in History (3) Explores relationships among disease, medical practice, and society during various periods in the development of Western civilization. Emphasizes the interaction and interdependence of medicine and society, and is intended to provide historical analyses that illuminate this interaction in modern times.

MHE 470 Law and Medicine (3) Surveys the relationship of the legal system to medical practice. Considers the law's efforts to regulate medicine and to profit from medical knowledge, and the roles of participants in the health-care system and of the state. The course does not assume or require any background in law.

MHE 471 History of Forensic Sciences (3) Examination of development, application, and social significance of scientific evidence in criminal cases and civil inquiries. Introduction to the legal system and trial procedures. Issues raised in death investigations, rape and other special researches, forensic psychiatry, and controversial tests and techniques now being considered in adjudicatory processes.

MHE 472 Health Law and Policy (3) Federal, state, local laws, and administrative regulations bearing on social values, policies, funding commitments to health care. Constitutional questions, concerns of access and subsidy, regulatory patterns and styles. Resource allocation and economic controls on development and provision of diagnostic and treatment services and technologies. Prerequisite: 470 or permission of instructor.

MHE 481 History of Sport in American Medical Thought (3) Berryman Rise of American sport as a social institution. Forces and factors in medicine contributing to its emergence and impact upon other aspects of society. Organized sports, public recreation, playgrounds, parks, fitness clubs, physical training and sports clubs; colonial era to present.

MHE 483 The Rise and Development of Sports Medicine (3) Berryman Evolution of medical thought related to exercise as therapy, training for sport participation, and treatment of sport-related injuries. Begins with ancient period, concludes with present. Development of specialization in sports medicine, sport team physicians, preventive medicine, concepts of fitness and wellness as related to exercise prescription, and sports medicine clinics.

MHE 485 Concepts of the Body in Nineteenth- and Twentieth-Century America (3) Berryman Investigation of ideas relating to corporeal self in nineteenth- and twentieth-century America. Identification of physical ideals of manliness/femininity as evolved, how ideals related to surrounding culture, how different bodily activities developed to realize ideals. "Muscular Christianity," athleticism, beauty contests, body building, decorations, cosmetics, beauty, artificial parts, fictional bodies.

MHE 497 Biomedical History Special Electives (*) AWSpS

MHE 498 Undergraduate Thesis (*) AWSpS

MHE 499 Undergraduate Research (*, max. 5) AWSpS Investigative work in history of the biomedical sciences.

MHE 500 Biomedical Historiography (*, max. 6) Emphasis is placed on bibliography and utilization of bibliographic sources. Practice in techniques of organizing and writing history of medicine. Prerequisite: permission of instructor.

MHE 501 Alternative Systems of Medicine (1) Sp Whorton Philosophies and practices of the major alternative systems of medicine. Historical and anthropological analysis of alternative medicine accompanied by presentations by practitioners of systems such as chiropractic, naturopathy, and traditional Chinese medicine. Recommended: enrollment in medical or other health professional school.

MHE 502 History of Dentistry (1) A Overview of history of healing arts as evolved from scientific, religious, and other cultural roots, with emphasis on dentistry, its pioneers, developers, historic trends, and professional societies. Limited to: dental students.

MHE 503 Roots of Medical Culture (1) W Whorton Major elements of thought, practice, and values that have directed the evolution of medicine in Western civilization. Medical culture examined as both an expression and modifier of the culture of its ambient society. Limited to: medical students and others in health professional schools.

MHE 510 Topics in Biomedical History (*, max. 6) Detailed study of topics in biomedical history through lectures, seminars, and discussion. Open to majors and graduate students in medicine, the arts and sciences, and others with appropriate background and interest. Prerequisite: permission of instructor.

MHE 511P Selected Topics in Biomedical Ethics (1) ASp McCormick Ethics course designed especially for first- and second-year medical students, typically arranged so that students may take one, two, or three quarters. Major ethical theories presented, then applied to actual cases in medicine. Seminar-discussion format centered around text and case studies.

MHE 512P The Human Face of Medicine (1) W McCormick Foundation of human values underlying medical practice. Images of physician—motivations for medicine; empathy versus detachment in doctor-patient relationship; health for the health-professional—the art of coping; limits of power—when medicine fails to cure; uses/abuses of technology; physician's role in public health issues; the healing process.

MHE 520 Seminar in the History and Philosophy of Medicine (3) Origins and philosophical foundations of medical sciences. Critical analysis of processes of evaluation and explanation in biomedical sciences. Consideration of evolution and nature of modern biomedical investigation; concepts of life/death, health/disease; philosophical dimensions of clinical medicine. Open to majors, medical students, arts and sciences graduate students, and others.

MHE 521 The Ethical Challenges of Modern Medicine (3) W McCormick Readings and discussion of critical contemporary ethical issues arising from progress in the biomedical sciences and medical technology. Emphasis on the impact of modern biology and medicine upon human values, the relation of medical practices to the moral consensus, and the role and responsibilities of the physician.

MHE 522 Ethical Problems Surrounding Death (3) Sp McCormick Seminar to analyze issues arising in care and treatment of dying patients and their families (e.g., euthanasia, truth telling, right to die, guilt, grief, and hospice care). Values of patient and professional in psychosocial context of terminal care.

MHE 523 Biomedical Ethics and the Life Sciences (3) A McCormick Seminar examining normative issues in medicine today. Emphasis on methods of ethical reasoning about moral dilemmas. Selected case studies to illustrate interface of ethics and medicine and to provide an opportunity for students to test their value assumptions and skills in analyzing a moral dilemma in medicine.

MHE 525 Seminar in the History and Philosophy of Biology (3) Benson Tailored to individual interests in certain areas of the history and philosophy of biology. Open to majors and graduate students in medicine, the arts and sciences, and others with appropriate background and interest.

MHE 530 Seminar in the History of American Medicine (3) Whorton Selected topics in the development of medicine and public health in the United States. Open to majors and graduate students in medicine and the arts and sciences and to others with appropriate background and interest.

MHE 535 Seminar in Medical Jurisprudence (3) Historical development of the intersections of American law and medicine, focusing primarily on questions of licensure and health policy regulation, public health matters, forensic medicine, professional liability, and philosophical issues relevant to life stages. Enrollment restricted to law and medical students and others with appropriate background and interest.

MHE 540 Seminar in the History of Health and Physical Exercise (3) Berryman Selected topics in the development of medical thought as it relates to exercise, sport, and overall well-being. Open to majors and graduate students in medicine, the arts and sciences, and others with appropriate background and interest. Prerequisite: permission of instructor.

MHE 600 Independent Study or Research (*) AWSpS

MHE 700 Master's Thesis (*) AWSpS

Medicine

RR512 University Hospital

Active programs in teaching, research, and patient care are carried on at the University Hospital, Veterans Administration Hospital, Harborview Medical Center, Pacific Medical Center, and the Fred Hutchinson Cancer Research Center. Major affiliations for clinical teaching also exist with Providence Medical Center and Swedish Hospital Medical Center. There are many additional affiliations with community hospitals in Seattle, the state of Washington, and the WAMI region. Medical students, interns, medical residents, and post-doctoral research fellows rotate through these various hospitals and participate in the learning experiences offered at each.

Faculty

Chairperson

Philip J. Fialkow

Professors

Aagaard, George N.,* 1954, (Emeritus), (Pharmacology).† M.D., 1937, Minnesota; clinical pharmacology.

Abrass, Itamar B., 1983, M.D., 1966, California (San Francisco); gerontology.

Adamson, John W., 1969, M.D., 1962, California (Los Angeles); hematology.

Albers, John J.,* 1971, (Research), ‡(Pathology). M.S., 1967, Ph.D., 1969, Illinois; metabolism and endocrinology.

- Beeson, Paul B., 1974, (Emeritus), M.D., 1933, McGill.
- Beknap, Benjamin H., 1971, M.P.A., 1954, Princeton; M.D., 1961, Rochester; metabolism and endocrinology.
- Bierman, Edwin L., * 1962, M.D., 1955, Cornell; metabolism and endocrinology.
- Blackmon, John R., 1962, M.D., 1956, Case Western Reserve; cardiology.
- Blagg, Christopher R., 1966, M.D., 1964, Leeds; nephrology.
- Bleyer, Werner A., 1975, ‡(Pediatrics, Radiation Oncology), M.D., 1969, Rochester; pediatrics, hematology, oncology.
- Bornstein, Paul, * 1967, (Biochemistry), † M.D., 1958, New York.
- Bremner, William J., 1977, (Obstetrics and Gynecology), M.D., 1969, Washington; Ph.D., 1977, Monash (Australia); endocrinology.
- Brown, B. Gregory, 1980, M.D., 1969, Ph.D., 1969, Johns Hopkins; cardiology.
- Bruce, Robert A., 1950, (Emeritus), M.D., 1943, Rochester; cardiology.
- Brunzell, John D., * 1969, M.D., 1963, Washington; metabolism and endocrinology.
- Buchanan, Thomas M., * 1975, (Microbiology), (Pathology), † M.D., 1967, Washington; infectious disease.
- Buckner, C. Dean, 1968, M.D., 1961, Michigan; oncology.
- Burnell, James M., 1950, (Research), M.D., 1949, Stanford; nephrology.
- Butler, John, 1965, M.D., 1957, Birmingham; respiratory diseases.
- Byers, Peter H., * 1977, (Pathology), † M.D., 1969, Case Western Reserve; medical genetics.
- Camerman, Arthur, * 1967, (Research), (Pharmacology), † Ph.D., 1964, British Columbia; neurology.
- Chait, Alan, * 1977, M.Sc., 1973, London (England); M.D., 1974, Cape Town (South Africa); metabolism and endocrinology.
- Cheever, Martin A., 1975, M.D., 1970, Michigan; oncology.
- Chesnut, Charles H. III, * 1973, (Radiology), † M.D., 1966, Florida; nuclear medicine.
- Cobb, Leonard A., 1957, M.D., 1952, Minnesota; cardiology.
- Copass, Michael K., 1973, (Surgery), M.A., 1964, M.D., 1964, Northwestern; neurology/surgery.
- Corey, Lawrence, * 1977, ‡(Laboratory Medicine, Microbiology, Pediatrics), M.D., 1971, Michigan; diagnosis, therapy and pathogenesis of viral infections.
- Counts, George W., 1975, M.S., 1960, Oklahoma; M.D., 1965, Iowa; infectious disease.
- Couser, William, 1982, M.D., 1965, Harvard; nephrology.
- Crill, Wayne E., * 1967, (Physiology and Biophysics), † M.D., 1962, Washington; neurology.
- Dale, Beverly A., * 1972, (Research), (Biochemistry, Oral Biology, Periodontics), Ph.D., 1968, Michigan; keratin biochemistry.
- Dale, David C., 1975, M.D., 1966, Harvard; internal medicine.
- Dodge, Harold T., 1969, M.D., 1948, Harvard; cardiology.
- Eliel, Leonard P., 1977, (Emeritus), M.D., 1940, Harvard; metabolism and endocrinology.
- Ensink, John W., 1960, M.D.C.M., 1956, McGill; metabolism and endocrinology.
- Farrell, Donald F., 1971, M.D., 1965, George Washington; neurology.
- Fefer, Alexander, 1968, M.D., 1964, Stanford; oncology.
- Fialkow, Philip J., * 1965, M.D., 1960, Tufts; medical genetics.
- Figley, Melvin M., * 1958, (Emeritus), (Radiology), † M.D., 1944, Harvard.
- Finch, Clement A., 1949, (Emeritus), M.D., 1941, Rochester; hematology.
- Fujimoto, Wilfred Y., 1970, M.D., 1965, Johns Hopkins; metabolism and endocrinology.
- Gartler, Stanley M., * 1957, (Genetics), † Ph.D., 1952, California (Berkeley); medical genetics.
- Giblett, Eloise R., 1952, (Emeritus), (Research), M.S., 1947, M.D., 1951, Washington; hematology.
- Gilliland, Bruce C., * 1968, (Microbiology), (Laboratory Medicine), † M.D., 1960, Northwestern; hematology.
- Glomset, John A., * 1960, (Biochemistry), † M.D., 1960, Uppsala (Sweden); metabolism and endocrinology.
- Goodner, Charles J., * 1962, (Physiology and Biophysics), M.D., 1955, Utah; metabolism and endocrinology.
- Greene, H. Leon, 1979, M.D., 1969, Johns Hopkins; cardiology.
- Haggitt, Rodger C., 1984, ‡(Pathology), M.D., 1967, Tennessee; gastroenterology.
- Hansen, John A., 1977, M.D., 1970, Stanford; oncology.
- Henderson, Maureen M., * 1975, (Health Services), (Epidemiology), † M.B.B.S., 1949, D.P.H., 1956, Durham (England); internal medicine.
- Hildebrandt, Jacob, * 1966, (Physiology and Biophysics), † M.Sc., 1960, British Columbia; Ph.D., 1966, Washington; internal medicine/physiology and biophysics.
- Hlastala, Michael P., * 1973, ‡(Bioengineering), (Physiology and Biophysics), † Ph.D., 1969, State University of New York (Buffalo); respiratory diseases.
- Holbrook, Karen A., * 1972, ‡(Biological Structure), M.S., 1966, Wisconsin; Ph.D., 1972, Washington; biology.
- Holmes, King K., * 1967, ‡(Epidemiology, Microbiology), M.D., 1963, Cornell; Ph.D., 1967, Hawaii; infectious diseases.
- Hudson, Leonard D., 1973, M.D., 1964, Washington; respiratory diseases.
- Inui, Thomas S., * 1976, (Health Services), † M.D., 1969, Sc.M., 1973, Johns Hopkins; internal medicine.
- Jonsen, Albert R., * 1987, ‡(Medical History and Ethics), M.A., 1956, Gonzaga; S.T.M., 1963, Santa Clara; Ph.D., 1967, Yale; philosophical and historical study of values affecting the practice of medicine and delivery of health care.
- Kennedy, J. Ward, 1966, M.D., 1959, Rochester; cardiology.
- Kirby, William M. M., 1949, (Emeritus), M.D., 1950, Cornell; infectious disease.
- Klebanoff, Seymour J., * 1962, ‡(Microbiology), M.D., 1951, Toronto; Ph.D., 1954, London (England); infectious disease.
- Knopp, Robert H., * 1974, ‡(Obstetrics and Gynecology), M.D., 1964, Cornell; metabolism and endocrinology.
- Koerker, Donna J., * 1974, (Physiology and Biophysics), † Ph.D., 1970, Michigan; endocrinology.
- Lakshminarayan, Sambasiva, 1975, M.B.B.S. (M.D.), 1965, All India Institute of Medical Sciences; pulmonary medicine.
- Lemmark, Åke, 1988, M.D., 1970, Ph.D., 1971, Umeå (Sweden); diabetes.
- Livingston, Robert B., 1982, M.D., 1967, Oklahoma; oncology/radiation oncology.
- LoGerfo, James P., * 1974, (Health Services), † M.D., 1968, Rochester; Ph.D., 1974, Washington; internal medicine.
- Mannik, Mart, * 1966, (Microbiology), M.D., 1959, Case Western Reserve; rheumatology.
- McArthur, James R., 1973, M.D., 1956, Harvard; hematology.
- McDonald, George B., 1973, M.D., 1967, Washington (St. Louis); gastroenterology.
- Mills, Richard P., 1984, ‡(Neurological Surgery, Ophthalmology), M.D., 1968, Yale; ophthalmology.
- Monsen, Elaine R., * 1963, M.S., 1959, Ph.D., 1961, California (Berkeley); nutrition.
- Motulsky, Arno G., * 1953, (Genetics), † M.D., 1947, Illinois; medical genetics.
- Neiman, Paul E., * 1968, ‡(Pathology), M.D., 1964, Washington; oncology.
- Nelp, Wil B., * 1962, (Radiology), † M.D., 1955, Johns Hopkins; nuclear medicine.
- Nute, Peter E., * 1972, ‡(Anthropology), Ph.D., 1969, Duke; anthropology.
- Odland, George F., 1962, (Biological Structure), † M.D., 1946, Harvard; dermatology.
- Omnenn, Gilbert S., * 1971, (Environmental Health), † M.D., 1965, Harvard; Ph.D., 1972, Washington.
- Palmer, Jerry P., 1974, M.D., 1970, Upstate Medical (New York); metabolism and endocrinology.
- Papayannopoulou, Thalia P., 1974, M.D., 1961, D.M.Sc., 1964, Athens (Greece); hematology.
- Paulsen, C. Alvin, 1961, M.D., 1952, Oregon; metabolism and endocrinology.
- Plorde, James J., * 1967, (Microbiology), (Laboratory Medicine), † M.D., 1959, Minnesota; infectious diseases.
- Pope, Charles E. II, 1964, M.D., 1957, Case Western Reserve; gastroenterology.
- Porte, Daniel, Jr., 1963, M.D., 1957, Chicago; metabolism and endocrinology.
- Preston, Thomas A., 1972, M.D., 1962, Pennsylvania; cardiology.
- Ritchie, James L., 1974, M.D., 1967, Case Western Reserve; cardiology.
- Roos, Bernard A., 1985, (Psychiatry and Behavioral Sciences), † M.D., 1967, Chicago; metabolism/endocrinology.
- Rowell, Loring B., * 1964, ‡(Physiology and Biophysics), Ph.D., 1962, Minnesota; regulation of blood flow, exercise physiology.
- Rubin, Cyrus E., 1954, (Pathology), M.D., 1945, Harvard; gastroenterology.
- Saunders, David R., * 1965, M.D., 1957, McGill; gastroenterology.
- Schuffler, Michael D., 1973, M.D., 1966, Illinois; gastroenterology.
- Scribner, Belding H., 1951, M.D., 1945, Stanford; M.S., 1951, Minnesota; nephrology.
- Sherrard, Donald J., 1968, M.D., 1960, Washington; nephrology.
- Silverstein, Fred E., 1973, M.D., 1967, Columbia; gastroenterology.
- Simkin, Peter A., 1968, (Orthopaedics), M.D., 1961, Pennsylvania; rheumatology.
- Singer, Jack W., 1975, M.D., 1968, State University of New York (Downstate); oncology.
- Slichter, Sherrill J., 1967, M.D., 1963, George Washington; hematology.
- Smith, Arnold L., * 1978, ‡(Pediatrics, Microbiology), M.S., 1964, M.D., 1964, Missouri; infectious disease.
- Spence, Alexander M., 1974, (Pathology), † M.D., 1965, Chicago; neurology.
- Stahl, William L., * 1967, (Physiology and Biophysics), † Ph.D., 1963, Pittsburgh; neurology.
- Stamatoyannopoulos, George, 1965, M.D., 1960, Athens (Greece); medical genetics.
- Stamm, Walter E., * 1976, (Epidemiology), M.D., 1971, Harvard; infectious disease.

Storb, Rainier F., 1968, M.D., 1960, Freiburg (Germany); oncology.

Sumi, S. Mark,* 1966, (Pathology),† M.D., 1956, Toronto; neurology.

Swanson, Phillip D., 1964, M.D., 1958, Johns Hopkins; neurology.

Thomas, E. Donnell, 1963, M.A., 1943, Texas; M.D., 1946, Harvard; oncology.

Thompson, Arthur R., 1973, M.D., 1966, Ph.D., 1972, Washington; hematology.

Tompkins, Richard K.,* 1975, (Health Services),† M.D., 1965, Colorado; internal medicine.

Turck, Marvin, 1964, M.D., 1959, Illinois; infectious disease.

VanArsdel, Paul P., Jr., 1953, M.D., 1951, Columbia; allergy.

VanCitters, Robert L.,* 1962, (Physiology and Biophysics),† M.D., 1953, Kansas; cardiology.

Volwiler, Wade, 1949, (Emeritus), M.D., 1943, Harvard; gastroenterology.

Wallace, James F., 1968, M.D., 1961, Washington (St. Louis); internal medicine.

Whitcomb, Michael E., 1988, M.D., 1965, Cincinnati; pulmonary disease.

Woods, Stephen C.,* 1972, ‡(Psychology), Ph.D., 1970, Washington; appetite regulation, obesity.

Associate Professors

Abrass, Christine K., 1984, M.D., 1973, Case Western Reserve; nephrology.

Ahmad, Suhail, 1978, M.B.B.S. (M.D.), 1968, Allahabad (India); nephrology.

Albert, Richard K., 1976, M.D., 1971, Colorado; respiratory diseases.

Applebaum, Frederick R., 1978, M.D., 1972, Tufts; oncology.

Baskin, Denis G.,* 1979, (Research), (Biological Structure),† Ph.D., 1969, California (Berkeley); metabolism and endocrinology.

Belcher, Donald W.,* 1976, ‡(Health Services), M.D., 1962, Pennsylvania; ambulatory medicine.

Benedetti, Jacqueline K.,* 1980, (Research), ‡(Biostatistics), Ph.D., 1974, Washington; infectious disease.

Bird, Thomas D., 1976, M.D., 1968, Cornell; neurology.

Bishop, Michael J., 1979, (Anesthesiology), M.D., 1974, California (San Diego); anesthesiology.

Caldwell, James H., Jr., 1978, M.D., 1970, Missouri; cardiology.

Caplan, Robert A., 1982, (Anesthesiology), M.D., 1977, Yale; comparative medicine.

Charan, Nirmal B., 1981, M.B.B.S. (M.D.), 1968, Christian Medical College (India); respiratory disease.

Childs, Marian T.,* 1968, Ph.D., 1950, California (Berkeley); nutrition.

Collins, Steven J., 1980, M.D., 1973, Columbia; internal medicine.

Cook, Daniel L., 1978, (Research), (Physiology and Biophysics),† M.S.M.E., 1970, M.D., 1977, Ph.D., 1980, Washington; neurology.

Counts, Richard B., 1973, M.D., 1967, Washington (St. Louis); hematology.

Cowan, Marie J.,* 1979, ‡(Pathology, Physiological Nursing), M.S., 1972, Ph.D., 1979, Washington; cardiovascular pathology, electrocardiography.

Culver, Bruce H., 1973, M.D., 1969, Washington; respiratory diseases.

Cummins, Richard O., 1977, M.D., 1972, Case Western Reserve; M.P.H., 1977, Washington; emergency medicine.

Davidson, Robert C., 1968, M.D., 1953, Washington; nephrology.

Deeb, Samir S., 1983, (Research), M.S., 1959, Colorado State; Ph.D., 1964, Illinois; medical genetics, molecular biology.

Dennis, Melvin B., Jr., 1971, (Animal Medicine), D.V.M., 1961, Washington State; comparative medicine.

Deyo, Richard A.,* 1986, (Health Services),† M.D., 1975, Pennsylvania State; M.P.H., 1981, Washington; internal medicine, health services research.

Doney, Kristine C., 1978, M.D., 1972, Michigan; hematology/oncology.

Dorsa, Daniel M.,* 1979, (Research), ‡(Psychiatry and Behavioral Sciences), (Pharmacology),† Ph.D., 1977, California (Davis); gerontology.

Eisenberg, Mickey S., 1978, ‡(Epidemiology), M.D., 1971, Case Western Reserve; M.P.H., 1977, Ph.D., 1978, Washington; emergency medicine.

Farwell, Jacqueline R., 1979, (Neurological Surgery, Pediatrics), M.D., 1972, California (San Francisco); child neurology, especially epilepsy, neonatal neurology, brain tumors in children.

Fihn, Stephan, 1979, M.D., 1972, St. Louis; M.P.H., 1982, Washington; internal medicine.

Fleet, Wendell P., 1971, M.D., 1965, Creighton; internal medicine.

Furlong, Clement E.,* 1977, (Research), (Genetics),† Ph.D., 1968, California (Davis); medical genetics.

Graham, Michael M., 1980, (Radiation Oncology, Radiology),† Ph.D., 1973, California (Berkeley); M.D., 1976, California (San Francisco); nuclear medicine, PET.

Greenberg, Phillip D., 1978, (Microbiology), M.D., 1971, State University of New York (Downstate); oncology.

Griep, Robert J., 1967, (Radiology),† M.D., 1958, Texas; internal medicine/radiology.

Hammond, William P., 1978, M.D., 1972, Tufts; hematology.

Handsfield, H. Hunter, 1979, (Epidemiology), M.D., 1968, Columbia; infectious disease.

Harlan, John M., 1978, (Pathology), M.D., 1978, Chicago; hematology.

Henderson, William R., Jr., 1978, M.D., 1973, California (San Francisco); allergy and infectious disease.

Hirschmann, Jan V., 1976, M.D., 1970, Washington; internal medicine.

Howard, Guy A.,* 1976, (Research), (Oral Biology),† M.S., 1967, Central Washington; Ph.D., 1970, Oregon; mineral metabolism.

Jong, Elaine C., 1979, M.D., 1974, California (San Diego); allergy and infectious disease.

Kiviat, Nancy B., 1980, (Pathology), M.D., 1975, Washington; infectious diseases.

Koepsell, Thomas D.,* 1979, ‡(Epidemiology, Health Services), M.D., 1972, Harvard; M.P.H., 1979, Washington; epidemiology of chronic diseases, particularly seizure disorders, applications of epidemiologic concepts to medical practice.

Larson, Eric B.,* 1977, (Health Services), M.D., 1973, Harvard; internal medicine.

Lee, Minako Y., 1977, (Research), (Biological Structure),† M.D., 1976, Tokyo Women's Medical College (Japan); hematology.

Lee, Sum Ping, 1985, Ph.D., 1978, Auckland (New Zealand); M.D., 1982, Hong Kong; gastroenterology.

Lindner, Armando, 1971, M.D., 1964, Buenos Aires (Argentina); nephrology.

Lipsky, Benjamin A., 1978, M.D., 1973, Cornell; internal medicine.

Longstreth, William T., 1980, M.D., 1975, Pennsylvania; M.P.H., 1982, Washington; neurology.

Lukehart, Sheila A., 1980, (Research), Ph.D., 1978, California (Los Angeles); infectious disease.

Martin, Paul J., 1979, M.D., 1975, Pennsylvania; oncology.

Martin, Thomas R., 1980, M.D., 1973, Pennsylvania; internal medicine.

Mathews, Meredith W., 1979, M.D., 1972, Washington; internal medicine.

Meyers, Joel D., 1977, M.D., 1970, Harvard; infectious disease.

Milner, John E.,* 1966, ‡(Environmental Health), M.D., 1961, Washington; skin diseases related to occupational irritants and allergies.

Milstein, Jerrold M., 1977, ‡(Pediatrics), M.D., 1964, Minnesota; pediatric neurology.

Nardella, Francis A., 1976, M.D., 1968, West Virginia; rheumatology.

Nolan, Charles M., 1980, (Epidemiology), M.D., 1969, Arkansas; infectious diseases.

Olerud, John E., 1977, (Orthopaedics),† M.D., 1971, Washington; dermatology.

Olson, Richard D., 1984, (Research), Ph.D., 1978, Vanderbilt; gerontology/geriatrics.

Oram, John F., Jr., 1975, (Research), Ph.D., 1972, Pennsylvania State; metabolism and endocrinology.

Pagon, Roberta A., 1979, ‡(Pediatrics), (Ophthalmology), M.D., 1972, Harvard; ophthalmology, pediatrics.

Pearlman, Alan S.,* 1978, (Bioengineering), M.D., 1970, Harvard; cardiology.

Pecoraro, Roger E., 1975, M.S., 1969, M.D., 1970, Washington; ambulatory medicine.

Pierson, David J., 1976, M.D., 1969, Johns Hopkins; respiratory diseases.

Price, Thomas H., 1975, M.D., 1966, Johns Hopkins; hematology.

Ramsey, Paul G., 1980, M.D., 1975, Harvard; infectious diseases, internal medicine.

Reddy, Arram L., 1976, (Research), M.Sc., 1964, Osmania; Ph.D., 1972, Pittsburgh; medical genetics.

Robertson, H. Thomas, 1976, M.D., 1968, Harvard; respiratory diseases.

Rockey, Paul H., 1976, (Health Services), M.D., 1970, Chicago; M.P.H., 1978, Washington; internal medicine.

Rosen, Henry, 1977, M.D., 1972, Rochester; allergy and infectious diseases.

Rosenstock, Linda,* 1980, (Environmental Health),† M.D., 1977, M.P.H., 1977, Johns Hopkins; occupational medicine.

Roth, Gerald J., 1984, M.D., 1967, Harvard; hematology.

Schoene, Robert B., 1979, M.D., 1972, Columbia; respiratory diseases.

Schwartz, Robert S.,* 1982, M.D., 1974, Ohio State; gerontology.

Sheehan, Florence, 1981, (Research), M.D., 1975, Pritzker; cardiology.

Siscovick, David S.,* 1987, (Epidemiology),† M.D., 1976, Maryland; M.P.H., 1981, Washington; epidemiology.

Sparkman, Donald R., 1949, (Emeritus), M.D., 1934, Pennsylvania.

Starkebaum, Gordon A., 1978, M.D., 1970, Columbia; rheumatology.

Stevens, Dennis L., 1979, Ph.D., 1967, Montana State; M.D., 1971, Utah; infectious disease.

Stewart, Douglas K., 1971, M.D., 1965, Harvard; cardiology.

Stewart, Patricia S., 1977, M.A., 1965, M.D., 1969, West Virginia; oncology.

Stratton, John R., 1980, M.D., 1973, Yale; cardiology.

Sullivan, Keith M., 1978, M.D., 1971, Indiana; oncology.

Surawicz, Christina M., 1978, M.D., 1973, Kentucky; gastroenterology.

Sybert, Virginia P., 1979, ‡(Pediatrics), M.D., 1974, State University of New York (Buffalo); genetics and dermatology.

Taborsky, Gerald J., Jr., 1979, (Research), M.S., 1973, Ph.D., 1973, Southern California; metabolism and endocrinology.

Torok-Storb, Beverly J., 1979, (Research), M.S., 1971, Edinboro (Pennsylvania); Ph.D., 1975, Pittsburgh; hematology.

Vestal, Robert E., 1977, (Pharmacology), M.D., 1971, California (San Francisco); gerontology.

Weaver, W. Douglas, 1979, M.D., 1971, Tufts; cardiology.

Wilensky, Alan J., 1975, (Neurological Surgery), † M.D., 1967, Western Ontario; Ph.D., 1973, Toronto; neurology.

Wilkus, Robert J., 1970, (Laboratory Medicine), † M.S., 1962, M.D., 1962, Loyola; neurology.

Willson, Richard A., 1973, M.D., 1962, Minnesota; gastroenterology.

Witherspoon, Robert P., 1976, M.S., 1970, M.D., 1970, Baylor; oncology.

Wood, Francis C., Jr., 1981, M.D., 1954, Harvard; metabolism and endocrinology.

Wood, Robert W., 1979, (Health Services), M.D., 1970, Rochester; infectious disease.

Zager, Richard, 1985, M.D., 1969, Northwestern; nephrology.

Assistant Professors

Abkowitz, Janis L., 1983, M.D., 1977, Harvard; hematology.

Aitken, Moira L., 1985, M.B.Ch.B., 1978, Edinburgh (Scotland); respiratory disease.

Anagnostou, Nicholas P., 1986, (Acting), M.D., 1972, Ph.D., 1977, Athens (Greece).

Andress, Dennis L., 1984, M.D., 1978, Oklahoma; nephrology.

Baker, Patricia, 1982, (Research), M.S., 1960, Washington; Ph.D., 1977, Illinois; nephrology.

Bardy, Gust, 1983, M.D., 1977, Northwestern; cardiology.

Barnhart, Scott, 1983, M.D., 1979, George Washington; occupational medicine.

Beard, James C., 1983, M.D., 1976, North Carolina; endocrinology and metabolism.

Beatty, Patrick, 1979, M.D., 1976, Ph.D., 1976, Chicago; oncology.

Bensinger, William I., 1979, M.D., 1973, Northwestern; oncology.

Bomsztyk, Karol, 1984, M.D., 1977, Rochester; nephrology.

Broudy, Virginia C., 1987, M.D., 1980, California (San Francisco).

Buchner, David M., 1984, ‡(Health Services), M.D., 1977, Kansas; M.P.H., 1985, Washington; gerontology, health services.

Buchwald, Dedra S., 1987, (Acting), M.D., 1981, California (San Diego).

Burke, Wylie G., 1985, (Acting), Ph.D., 1974, M.D., 1978, Washington.

Cheung, Marian C., 1975, (Research), Ph.D., 1975, State University of New York (Buffalo); metabolism and endocrinology.

Clark, Joan G., 1985, M.D., 1974, Washington (St. Louis); pulmonary and respiratory disease.

Collier, Ann C., 1985, M.D., 1978, Dartmouth.

Collins, Carolyn, 1986, M.D., 1980, California (San Francisco); oncology.

Crawford, Stephen W., 1984, M.D., 1978, St. Louis; respiratory disease.

Cusack, Barry J., 1982, M.D., 1980, University College (Dublin); gerontology.

Dugowson, Carin E., 1985, M.D., 1976, Illinois.

Failor, R. Alan, 1985, (Acting), M.D., 1977, Mount Sinai; metabolism and endocrinology.

Farrow, James A., 1980, ‡(Pediatrics), M.D., 1973, Baylor; adolescent medicine.

Fleckman, Philip, 1982, M.D., 1973, Washington (St. Louis); dermatology.

Goldberg, Harold I., 1986, M.D., 1977, Stanford; internal medicine.

Hall, Margaret L., 1987, (Acting), M.D., 1981, Washington.

Hickstein, Dennis D., 1984, M.D., 1978, Nebraska; hematology.

Ho, Mary T., 1984, (Acting), M.P.H., 1975, M.D., 1976, Harvard.

Hooton, Thomas M., 1982, M.D., 1973, Texas Southwestern; internal medicine.

Johnson, Richard J., 1986, M.D., 1979, Minnesota.

Kaushansky, Kenneth, 1987, M.D., 1979, California (Los Angeles).

Kent, Daniel L., 1985, M.D., 1978, Rochester; internal medicine.

Kimmey, Michael B., 1982, M.D., 1979, Washington (St. Louis); gastroenterology.

Kirby, Philip K., 1987, (Acting), M.D., 1987, Washington.

Klaff, Leslie J., 1983, M.B.B.Ch., 1971, Witwatersrand (South Africa); Ph.D., 1982, Cape Town (South Africa); metabolism and endocrinology.

Klamet, Jay P., 1987, (Acting), M.S., 1977, M.D., 1980, State University of New York (Buffalo).

Kraning, Kenneth K., 1986, (Research), (Environmental Health), † M.S., 1962, Purdue; Sc.D., 1964, Pittsburgh; dermatology.

Kreiss, Joan K., 1985, (Epidemiology), † M.S.P.H., 1984, California (Los Angeles); M.D., 1978, Washington (St. Louis); infectious diseases.

Krishnamurthy, Shoba, 1981, M.B.B.S., 1974, Bangalore Medical College (India); gastroenterology.

Kudenchuk, Peter J., 1986, M.D., 1979, Washington; cardiology.

Levine, Douglas S., 1985, M.D., 1979, Massachusetts; gastroenterology.

Lipkin, Edward W., 1982, Ph.D., 1977, M.D., 1978, Case Western Reserve; endocrinology.

Martin, Gary V., 1987, (Acting), M.D., 1980, Arizona.

Matsumoto, Alvin, 1983, M.D., 1975, Washington; metabolism and endocrinology.

Maunder, Richard J., 1983, M.D., 1977, George Washington; respiratory disease.

McMullen, William R., 1981, M.D., 1978, Cincinnati; internal medicine.

Mortimer, Joanne E., 1982, M.D., 1977, Loyola; hematology/oncology.

Nielson, Christopher P., 1983, M.D., 1978, California (Los Angeles); gerontology and geriatric medicine.

Olmsted, Stephen F., 1987, (Acting), M.D., 1979, New Mexico.

Oppliger, Ina R., 1987, (Acting), M.D., 1980, Kansas.

Ostenson, Richard C., 1983, M.D., 1974, Washington; internal medicine, oncology.

Ott, Susan, 1983, (Radiology), M.D., 1974, Washington; nephrology.

Otto, Catherine M., 1984, M.D., 1979, Washington; cardiology.

Pearlman, Robert A., (Health Sciences), 1981, M.D., 1975, Boston; M.P.H., 1980, Washington; gerontology.

Perlmutter, Roger, 1984, (Biochemistry), † M.D., 1979, Ph.D., 1979, Washington (St. Louis); medical genetics.

Pesando, John, 1982, M.D., 1974, Ph.D., 1974, Albert Einstein; oncology.

Powell, Jerry, 1982, M.D., 1976, Washington; hematology/oncology.

Press, Oliver W., 1982, Ph.D., 1977, M.D., 1979, Washington; oncology.

Psaty, Bruce M., 1986, (Acting), (Epidemiology), † Ph.D., 1979, M.D., 1981, Indiana; M.P.H., 1986, Washington.

Raghu, Ganesh, 1983, M.B.B.S., 1972, Mysore (India); respiratory disease.

Ralph, David D., 1980, M.D., 1972, Stanford; respiratory diseases.

Raskind, Wendy H., 1982, Ph.D., 1977, M.D., 1978, Washington; medical genetics.

Raugi, Gregory J., 1980, M.D., 1975, Ph.D., 1975, Duke; dermatology.

Reid, Brian J., 1986, Ph.D., 1979, M.D., 1980, Washington.

Sawyer, Thomas K., 1964, M.D., 1962, Vanderbilt; nephrology.

Sayers, Merlin H., 1979, M.B.B.Ch., 1968, Ph.D., 1978, Witwatersrand (South Africa); hematology.

Schellenberg, Gerard D., 1983, (Research), Ph.D., 1978, California (Riverside); neurology.

Shields, Anthony F., 1987, M.D., 1979, Harvard; Ph.D., 1979, Massachusetts Institute of Technology.

Spain, William, 1987, ‡(Physiology and Biophysics), M.D., 1977, Columbia.

Swenson, Erik R., 1985, M.D., 1979, California (San Diego).

Tenover, Joyce E., 1987, Ph.D., 1974, Johns Hopkins; M.D., 1980, George Washington.

Thiagarajan, Perumal, 1986, M.B.B.S., 1974, Tirunelveli Medical (India); hematology.

Thompson, John A., 1985, M.D., 1979, Alabama.

Tyler, Martha L., 1976, ‡(Physiological Nursing), M.S., 1977, Washington; respiratory nursing.

Uhlmann, Richard F., 1983, M.D., 1978, Chicago; M.P.H., 1983, Washington; gerontology.

Weigle, D. Scott, 1984, M.D., 1978, Harvard; endocrinology and metabolism.

Wener, Mark H., 1983, (Laboratory Medicine), † M.D., 1974, Washington (St. Louis).

Widsman, Ellen M., 1987, (Research), (Biostatistics), Ph.D., 1981, Wisconsin—Madison; medical genetics.

Yergan, John, 1980, M.D., 1976, Columbia; M.P.H., 1982, Washington; internal medicine, public health.

Instructor

Stead, Richard B., 1985, M.D., 1979, Stanford; hematology.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

MED 498 Undergraduate Thesis (*) AWSpS For medical students. Prerequisite: permission of department.

MED 499 Undergraduate Research (*) AWSpS Case studies, with laboratory research. For medical students. Prerequisite: permission of department.

MED 505P Preceptorship in Medicine (1) To provide opportunity for first- and second-year medical students to gain personal experience with medical practice situations by being stationed with carefully selected clinical faculty members in their offices. Prerequisite: permission of department. (Formerly MED P 501P.)

MED 531P Human Genetics (*) AWSp *Motulsky* Weekly seminar dealing with a variety of topics in medical genetics given by staff of the Division of Medical Genetics and related departments and divisions. Open to medical students with a good foundation in genetics.

MED 533P Clinical Endocrinology (2) Sp *Wood* Emphasis on the most major and dependable symptoms, signs, laboratory tests, and therapy for clinical endocrinopathies. Patient illustrated. Limited to second-year medical students.

MED 534P Clinical Respiratory Physiology (2) AWSp *Culver, Hlastala* Intermediate-level course in respiratory physiology. Basic physiology, pulmonary function testing, applied physiology to clinical problems, and review of related literature. Covers clinical respiratory physiology in three sequential quarters, but students may register for any single quarter if desired. Prerequisite: permission of instructor. (Twelve weeks.)

MED 535P Prevention of Cardiovascular Disease (2) *Van Citters* Incidence and mortality from cardiovascular disease. Risk factors associated with heart disease. Major epidemiological studies and clinical trials. Controversies in prevention. Approaches to patient education and modification of behavior associated with high risk of cardiovascular disease.

MED 548P Medical Genetics (3) *Motulsky, Stamatoyannopoulos* Intermediate-level course in medical genetics. General human genetics, molecular human genetics, biochemical genetics, immunogenetics, cytogenetics, clinical genetics, syndromology, developmental genetics, fetal medicine, and pharmacogenetics. Prerequisite: third- or fourth-year medical student standing or permission of instructor.

CONJ 550P Clinical Infectious Diseases (3) See Conjoint Courses.

CONJ 553P Nutrition for Physicians (2) See Conjoint Courses.

MED 599P Transfusion Medicine (3) Group discussions and didactic sessions cover broad category of transfusion medicine. Hands-on laboratory experience in red cell serology/compatibility, coagulation, and histocompatibility with emphasis on diagnosis and management of clinical problems. Based at Puget Sound Blood Center. Prerequisite: fourth-year medical student standing; third-year student standing with permission of instructor.

MED 604P Clinical Preceptorship in Internal Medicine (8) AWSpS *Hamon* (Bremerton), *Thorson* (Longview), *Shima* (Forks) Working closely with primary-care physicians, the student is exposed to the private practice of internal medicine in a small community. Operating on a one-to-one basis with an internist, the student evaluates and manages inpatients and outpatients on a primary care, consultative, and emergency basis. Prerequisite: 665P. (Four weeks, full-time.)

MED 640P Dermatology Clinic (*, max. 5) AWSpS *Odland* Students attend dermatology clinic on Monday mornings and Thursday afternoons for twelve weeks. Two half-days per week. Prerequisite: 665P.

MED 641P Clinical Gastroenterology (8) AWSp *Gelfand* (Virginia Mason Hospital) Combined inpatient-outpatient elective in clinical gastroenterology, which includes practical experience in GI endoscopy and liver biopsy. Directed tutorial work. Special arrangements can be made for students with special interests. Prerequisite: 665P. (Four weeks, full-time.)

MED 642P Clinical Oncology (*, max. 24) AWSpS *Buckner, Thomas* (Fred Hutchinson Cancer Research Center) Students functioning as primary physicians are responsible for the workups and daily care of patients receiving marrow transplants, high-dose chemotherapy or immunotherapy on an intensive-care research ward. Emphasis is on the management and

supportive care of patients with pancytopenia and immunosuppression, transplantation biology, cancer chemotherapy, and infectious disease problems. Prerequisite: 665P. (Four or eight weeks.)

MED 644P Management of Sexually Transmitted Diseases (1-3, max. 9) AWSpS *Corey, Handsfield, Holmes, Stamm* Instruction and clinical experience in diagnosis, treatment, and management of sexually transmitted diseases. Instruction in genitourinary physical examination skills; relevant laboratory techniques and management of patients with STDs. Prior to the elective, each student must review a packet of didactic materials. Prerequisites: 665P and SURG 665P.

MED 645P Clinical Endocrinology and Geriatric Medicine (8) AWSpS *Brenner* Students spend one-half time on endocrinology and one-half time on geriatric medicine services. Two one-half-day outpatient clinics per week, plus inpatient endocrinology and geriatric consultation services. Prerequisite: 665P.

MED 649P Genetic Counseling (*) *Bird, Byers, Motulsky, Stamatoyannopoulos* Provides exposure to genetic counseling. Involves attendance at Medical Genetics Clinic, University Hospital, on Monday for assignment of a case and reading; Tuesday morning, student participates in clinical examination of family members and attends genetic counseling session; Tuesday afternoon, student attends genetics clinical conference. Prerequisite: 665P or pediatrics basic clerkship.

MED 650P Advanced Medical Genetics (*, max. 5) S *Stamatoyannopoulos* Summer course intended for third-year students who would like to increase their background in specific areas of medical genetics. Involves seeing patients with the instructor, reviewing the literature, analyzing clinical information, and writing a review on a selected topic. Prerequisite: HUBIO 554P.

MED 665P Clinical Clerkship (*, max. 24) *Ramsey* Third-year medical students assume increasing responsibility for care of hospitalized patients in a teaching-hospital setting. Daily rounds with resident and attending physicians, with lectures and conferences. Progress evaluated by supervising physicians and a written examination. (Twelve weeks, full-time.)

MED 666P Advanced Clinical Clerkship in Internal Medicine—WAMI (12) AWSpS *Ramsey, Wallace* Advanced clinical preceptorship in internal medicine in three small urban communities. Supervised, structured experience in dealing with situations commonly encountered by the practicing internist. Continuity of care and the relationship between care given in the ambulatory setting and in the hospital, as well as by other community health services, is emphasized. Prerequisite: 665P. (Six weeks, full time. Limit: six students.)

CONJ 677P Clinical Allergy and Immunology (*, max. 12) See Conjoint Courses.

MED 678P Clinical Dermatology (8) AWSpS *Odland* Participants in dermatology clinics and inpatient consultations at University Hospital, Harborview Medical Center, Pacific Medical Center and Veterans Administration Hospital. Journal club and clinical conferences each week with entire staff. A continuing series of teaching seminars and weekly dermatopathology conferences. Prerequisite: 665P. (Four weeks.)

MED 679P Clinical Gastroenterology (*, max. 12) AWSpS *Saunders* (University Hospital) Participation in consulting ward rounds, procedures, conferences, and selected clinics with full-time divisional staff at University and Veterans Administration hospitals, and at Pacific and Harborview medical centers, plus directed tutorial work. Prerequisite: 665P. (Four weeks, full-time.)

MED 680P Rheumatology (8) AWSp *Mannik* Full-time inpatient-outpatient clerkship in rheumatology. Clinical experience provided in diagnosis and treatment of rheumatic diseases, utilizing outpatient

clinics and hospitalized patients at the University Hospital and the Harborview Medical Center. Emphasis on concepts in pathophysiology, diagnosis, and treatment of these diseases. In addition to patient contact, reading, seminars, and preceptorial sessions are the methods of instruction. Prerequisite: 665P.

MED 681P Advanced Clinical Endocrinology (*, max. 24) AWSpS *Paulsen* (Pacific Medical Center) Full-time inpatient-outpatient clerkship in clinical endocrinology at Pacific Medical Center. Library review on selected topics in the field and participation in medical clinical research problems optional during this clerkship. Prerequisite: 665P. (Four weeks.)

MED 682P Clinical Cardiology and Electrocardiography (8) AWSpS *Cobb* (Harborview Medical Center), *Eiriksson* (Boise Veterans Administration Medical Center), *Kennedy* (University Hospital), *Chamusco* (Madigan Hospital Medical Center), *Ritchie* (Veterans Administration Hospital), *Preston* (Pacific Medical Center) Clerkship in clinical cardiology-combined inpatient-outpatient assignments, ECG interpretation. Prerequisite: 665P. (Four weeks.)

MED 683P Clinical Respiratory Disease and Critical Care Medicine (8) AWSpS *Culver* Training in respiratory disease diagnosis and pulmonary therapy, with special emphasis on cardiopulmonary function testing and interpretation. Inpatient and outpatient teaching rounds, conferences, and basic science integration. Prerequisite: 665P. (Four weeks.)

MED 684P Clinical Hematology/Oncology (*, max. 24) AWSpS Outpatient and inpatient experience with hematologic/oncologic disorders. The elective includes teaching rounds, conferences, and evaluation of laboratory work. Prerequisite: 665P. (Four weeks.)

MED 685P Clinical Genetics (*, max. 24) *Bird, Byers, Motulsky, Stamatoyannopoulos* Full-time clinical clerkship in medical genetics. Provides extensive exposure to variety of genetic diseases and genetic counseling. Students work in three clinics (Monday, Tuesday, Thursday), response to in-house consultation requests, attend rounds at Children's Hospital and Medical Center and University Hospital and seminars at University Hospital (Wednesday, Friday). Prerequisite: 665P.

MED 686P Clinical Neurology (*, max. 8) AWSpS *Swanson* Inpatient and outpatient experience at University Hospital, Veterans Administration Hospital, Pacific Medical Center, Harborview Medical Center, Virginia Mason Hospital, American Lake Veterans Administration Hospital, or Children's Hospital and Medical Center. Students attend clinical conferences and seminars with neurology staff and become familiar with diagnostic neurological procedures. Prerequisite: 665P. (Four weeks. Limit: ten students.)

MED 687P Ambulatory Medicine Elective (*, max. 12) AWSpS *Brodie* (Harborview Medical Center), *Featherstone* (University Hospital) Students acquire knowledge and skill in dealing with ambulatory patients with problems commonly encountered in the office practice of internal medicine. Prerequisite: 665P. (Minimum: two quarters. Limits: five students at University Hospital, four students at Harborview Medical Center.)

MED 688P Ward Medicine Subinternship (*, max. 24) AWSpS *Emlen* (Pacific Medical Center), *Fleet* (Harborview Medical Center), *R. Jones* (Madigan Hospital Medical Center), *Rosen* (Swedish Hospital Medical Center) Students act in the capacity of interns on the medical wards under supervision of house staff and visiting physicians. They attend all regular medicine rounds and conferences as their schedules permit. Prerequisite: 665P. (Four or six weeks.)

MED 689P Clinical Infectious Diseases (*, max. 12) AWSpS *Kirby* (University Hospital) Students participate in the consulting service throughout the hospital, attend daily plate rounds, conferences, and

seminars. (Four weeks.) *Stamm* (Harborview Medical Center), *Florde* (Veterans Administration Hospital) Participate in consulting service throughout hospital to learn microbiological aspects of infectious diseases through the clinical laboratories. Prerequisite: 665P. (Four weeks.)

MED 690P Cardiology Subinternship (8) AWSps Kennedy Students act in the capacity of interns on the white service under the supervision of house officer. Prerequisite: 665P. (Four weeks.)

MED 692P Clinical Endocrinology and Metabolism (*, max. 12) Inpatient rounds, conferences, and outpatient clinics at University Hospital and Harborview Medical Center (two weeks each). Directed tutorial work in selected aspects of endocrinology and metabolism. Madigan Hospital Medical Center: 600-800 endocrine patients per month in both outpatient clinic and inpatient consult. Flexible schedule possible. Prerequisite: 665P.

MED 693P Nephrology and Fluid Balance (8) AWSps Couser (University Hospital), *Zager* (Harborview Medical Center), *Sherrard* (Veterans Administration Hospital) Students see clinical nephrologic problems under close supervision, participate in nephrology and transplant rounds, see consults with renal fellow and attending, and work up patients in renal clinics, participate in seminars with clerks from all three hospitals. Prerequisite: 665P. (Four weeks.)

MED 695P Clinical Aspects of Aging (*, max. 8) AWSps Silverman (American Lake Veterans Administration Hospital), *Uhlmann* (Harborview Medical Center) American Lake: Pathophysiology and disease processes associated with aging. Harborview: Work with elderly patients as subintern with Senior Care Program. Inpatient and ambulatory setting in nursing homes and patients' homes. Interdisciplinary approach. Prerequisite: 665P.

MED 697P Medicine Special Electives (*, max. 24) AWSps Ramsey Special clerkship, externship, or research opportunities that can at times be made available at institutions other than University of Washington. Faculty can advise students of opportunities. Students wishing to elect this course should obtain from Dean's office a special assignment form at least three months before preregistration. Prerequisite: permission of department. (Two, four, six, or twelve weeks.)

Microbiology

G305 Health Sciences

Microbiology is a natural science that deals with microscopic organisms, including bacteria, viruses, fungi, protozoa, and algae. It is concerned with the nature and properties of these organisms, their effects on man and the environment, and how microorganisms can be exploited to provide useful products.

Undergraduate Program

Bachelor of Science Degree

Admission Requirements: A minimum of 75 credits with overall grade-point average of 2.25 in required chemistry and biology courses. Students should complete departmental requirements in biology and in inorganic and organic chemistry before applying for admission to the major.

Major Requirements: 45 credits in biological science; BIOL 210, 211, 212 (preferred) or an equivalent of 10 to 15 credits in botany or zoology; a minimum of 30 credits in microbiology courses and approved electives, including MICRO 410, 411, 412, 402, 431, 441, 442, 443, and 496 (MICRO 301, 302, 319 cannot be used), a minimum grade-point average of 2.25 in the

entire 30 credits of microbiology and approved electives; PHYS 114, 115, 116 or 121, 122, 123; CHEM 140, 150, 151, 160; CHEM 231, 232 or 231, 235, 236 or 335, 336, 337 (three-quarter sequence preferred); CHEM 321, MATH 124 or 157 or Q SCI 381 or 291. Transfer students must complete at least 15 of the 30 credits of required microbiology courses at this university.

Graduate Program

The Department of Microbiology offers graduate programs leading to the Master of Science and Doctor of Philosophy degrees. Students interested in graduate work should obtain the necessary application forms from the department.

The choice of an adviser and research problem is a matter of mutual consent between the student and a faculty member. The course work taken by a graduate student depends to a certain extent upon the student's background and chosen area of specialization, but, in general, courses are chosen from the fields of microbiology, immunology, biochemistry, genetics, and pathology. Students whose primary interests are in animal virology or immunology are encouraged to take courses in general histology and pathology. The master's degree program without thesis is available on a limited basis. An M.S. degree is not necessarily a prerequisite for the Ph.D. degree.

Applicants are evaluated by a committee that considers the student's grades, scores on the Graduate Record Examination, letters of recommendation, and any other data that might provide an indication of the student's capabilities for success in a career in science.

Students are normally admitted into the graduate program only in Autumn Quarter, and all application materials should be received by the department no later than the preceding February 1. Graduate Record Examination aptitude scores are required as part of the application, and the examination should be taken no later than in December. Three letters of recommendation also must be sent directly to the department.

Students with a variety of academic backgrounds are accepted for graduate study in microbiology, but it is highly desirable that their undergraduate preparation include at least a year of general chemistry and a year of college physics, courses in organic chemistry and quantitative analysis, calculus, one year of biology, and courses in genetics and microbiology.

Students in the Ph.D. program are usually supported by funds from training grants, research grants, or teaching assistantships.

Correspondence and Information

Graduate Program Coordinator
Department of Microbiology, SC-42

Faculty

Chairperson

Eugene W. Nester

Professors

Buchanan, Thomas M., 1975, ‡(Medicine, Pathobiology), M.D., 1967, Washington; microbial pathogenesis. Champoux, James J., 1972, (Genetics), Ph.D., 1970, Stanford; DNA replication, tumor virology. Clagett, James A., 1973, (Periodontics), † M.S., 1966, Ph.D., 1970, Nebraska; cellular immunology-monocyte and lymphocyte differentiation in the bone marrow. Corey, Lawrence, 1977, (Medicine, Pediatrics), (Laboratory Medicine), † M.D., 1971, Michigan; virology, herpes viruses, AIDS virus.

Douglas, Howard C., 1941, (Emeritus), Ph.D., 1949, California (Berkeley); microbiology, immunology and genetics.

Evans, Charles A., 1946, (Emeritus), M.D., 1937, Ph.D., 1943, Minnesota; microbial flora of human skin.

Gilliland, Bruce C., 1968, ‡(Laboratory Medicine, Medicine), M.D., 1960, Northwestern; complement and immunologic mechanisms of injury in human disease and immune complex disorders.

Gordon, Milton P., 1959, ‡(Biochemistry), Ph.D., 1953, Illinois; biochemistry of plant tumors.

Groman, Neal B., 1950, Ph.D., 1950, Chicago; gene flow, evolution, medical microbiology.

Hakomori, Sen-itiroh, 1967, (Biochemistry, Chemistry), (Pathobiology), † M.D., 1952, D.Med.Sci., 1956, Tohoku (Japan); membrane biochemistry as related to neoplasia.

Hellström, Ingegerd E., 1966, (Pathology), M.D., 1964, Ph.D., 1966, Karolinska Institute (Sweden); tumor immunology and transplantation immunology.

Hellström, Karl E., 1966, ‡(Pathology), M.D., 1964, Ph.D., 1964, Karolinska Institute (Sweden); oncology, cancer immunology.

Holmes, King K., 1967, ‡(Epidemiology, Medicine), M.D., 1963, Cornell; Ph.D., 1967, Hawaii; clinical epidemiology and pathogenesis of infectious diseases, specifically sexually transmitted diseases.

Kenny, George E., 1961, ‡(Pathobiology), M.S., 1957, North Dakota; Ph.D., 1961, Minnesota; antigenic structure.

Klebanoff, Seymour J., 1962, ‡(Medicine), M.D., 1951, Toronto; Ph.D., 1954, London (England); host defense mechanisms against bacterial, viral, fungal, and parasitic agents, with particular regard to microbial mechanisms in phagocytes (neutrophils, eosinophils, mononuclear phagocytes).

Mannik, Mart, 1966, ‡(Medicine), M.D., 1959, Case Western Reserve; immunologic mechanisms of tissue injury and characteristics of antigen-antibody complexes.

Nester, Eugene W., 1962, Ph.D., 1959, Case Western Reserve; genetics and biochemistry of bacterial-plant cell interactions.

Florde, James J., 1967, ‡(Laboratory Medicine, Medicine), M.D., 1959, Minnesota; studies of applied diagnosis microbiology and pathogenesis.

Schoenkecht, Fritz D., 1967, (Laboratory Medicine), † M.D., 1957, Freie (Berlin); clinical microbiology; *in vitro* antibiotic susceptibility testing, compromised host microbiology, nosocomial infections.

Sheris, John C., 1959, (Emeritus), M.D., 1950, London (England); medical microbiology, antibiotic action and resistance.

Smith, Arnold L., 1978, ‡(Pediatrics, Medicine), M.S., 1964, M.D., 1964, Missouri; infectious diseases.

Staley, James T., 1971, (Environmental Studies), M.S., 1963, Ohio; Ph.D., 1967, California (Davis); microbial ecology, general microbiology.

Weiser, Russell S., 1934, (Emeritus), Ph.D., 1934, Washington; microbiology and immunology.

Whiteley, Helen R., 1956, M.A., 1947, Texas; Ph.D., 1951, Washington; regulation of transcription in phage-infected bacteria, development biology.

Associate Professors

Clark, Edward A., 1979, Ph.D., 1977, California (Los Angeles); immunology, emphasizing lymphocyte surface molecules and immunologic disease.

Coyle, Marie B., 1973, (Laboratory Medicine), † M.S., 1963, St. Louis; Ph.D., 1965, Kansas State; clinical microbiology, antibiotic susceptibility.

Greenberg, Philip D., 1978, ‡(Medicine), M.D., 1971, State University of New York (Downstate); oncology.

Lara, Jimmie C., 1972, M.S., 1967, California State (Los Angeles); Ph.D., 1970, California (Riverside); microbial physiology and cytology, sporulation and gas vesicle synthesis and regulation.

Linial, Maxine L.* 1974, (Research), (Pathology), Ph.D., 1970, Tufts; retroviral-host cell interactions, retroviral mediated transformation.

Minshew, Barbara H.* 1974, ‡(Laboratory Medicine), M.A., 1970, Ph.D., 1972, Texas (Dallas); surgical infection, antibiotic susceptibility testing, microbial virulence.

Rohrschneider, Larry R.* 1978, (Research), (Pathology), Ph.D., 1973, Wisconsin; oncogens, molecular and cell biology of neoplastic transformation.

Tenover, Fred C.* 1982, ‡(Laboratory Medicine), M.S., 1981, Ph.D., 1981, Rochester; plasmid and infectious disease.

Assistant Professors

Fritsche, Thomas R.* 1984, (Laboratory Medicine), † M.S., 1975, M.D., 1981, Ph.D., 1984, Minnesota; systematics and ecology of animal parasites, medical microbiology.

Katze, Michael G.* 1987, M.S., 1978, Ph.D., 1980, Hahnemann Medical; regulation of viral gene expression at the translational level.

Leigh, John A.* 1985, M.S., 1979, Ph.D., 1983, Illinois; bacterial physiology, genetics, and biochemistry, bacteria-plant interactions.

Lory, Stephen.* 1984, Ph.D., 1980, California (Los Angeles); biochemistry and genetics of microbial virulence factors.

Moseley, Stephen L.* 1985, (Pediatrics), M.S., 1978, Catholic University of America; Ph.D., 1981, Washington; molecular basis of pathogenesis in *E. coli* diarrhea.

Wong, Timothy Chee-Hing.* 1983, Ph.D., 1979, Texas (Dallas); viral gene expression in chronic infections and oncogenesis.

Lecturers

Anderson, Denise G., 1987, M.S., 1985, Washington.

Barnes, Glover W.* 1969, (Urology), † M.A., 1955, Ph.D., 1962, State University of New York (Buffalo); tissue antigens, immunoreproduction and microbiology.

Bicknell, Mary E., 1976, M.S., 1962, Washington; microbiology laboratory teaching.

Cramer, Dorothy I., 1961, (Emeritus), B.S., 1945, Washington; microbiology laboratory teaching.

Fulton, Janis R., 1983, M.S., 1977, Montana State; microbiology, laboratory teaching.

Memmer, Ramona J., 1960, M.S., 1957, Washington; microbiology laboratory teaching.

Parkhurst, Dale J., 1969, B.S., 1960, Washington; microbiology laboratory teaching.

Course Descriptions

Courses for Undergraduates

MICRO 101 The Microbial World (5) W For majors in the social sciences and humanities, but open to pre-majors and to science majors other than biologists. Activities of bacteria, viruses, or other microorganisms and their interactions with humans and their environment are examined and a number of major biological concepts developed. Topic material and inclusion of a laboratory vary with individual instructors. (Currently not offered.)

MICRO 301 General Microbiology (3) ASps Acquaints students with microorganisms and their activities. Topics include microbial cell structure and function, metabolism, microbial genetics, and the role of microorganisms in disease, immunity, and other selected applied areas. Prerequisite: two quarters of chemistry; recommended: a course in biological science.

MICRO 302 General Microbiology Laboratory (2) ASps Anderson, Bicknell, Fulton Laboratory course primarily for students taking 301. Covers a variety of microbiological techniques, with experiments designed to illustrate major concepts of bacteriology, virology, and immunology. No auditors. Prerequisite: concurrent or previous registration in 301 or permission of instructor.

MICRO 319 Laboratory Techniques in Microbiology (1) AWSp Parkhurst Self-instruction laboratory. Student performs the techniques fundamental to microbiology. Instructional material presented in visual, audiovisual, and written form. Not open to those who recently have taken a laboratory in microbiology. Prerequisite: prior or concurrent enrollment in a microbiology course or permission of instructor.

MICRO 320 Media Preparation (2) AWSpS Parkhurst Practical work in the preparation of culture media. Nutritional requirements of microorganisms and sterilization methods are considered. For students expecting to enter vocations involving laboratory work with bacteria. Offered on credit/no credit basis only. Prerequisites: 301 and 302, or equivalent, and permission of instructor.

MICRO 322 Applied Clinical Microbiology (5) AWSp Schoenkecht Practical experience in a clinical or public health laboratory; fifteen hours per week. For students majoring in medical microbiology. Three quarters advance sign-up in G303 Health Sciences recommended. Applicants are selected by interview. Prerequisites: 443 and permission of instructor. (Limit: three students.)

MICRO 402 Fundamentals of General Microbiology Laboratory (3) AW Bicknell, Fulton, Laxson Isolation of a broad range of nonpathogenic bacteria from natural sources, using selective and enrichment techniques, with microscopic and biochemical identification. Related exercises include genetics, quantitation, and growth kinetics. Prerequisite: 410, which may be taken concurrently, or permission of instructor.

MICRO 410 Fundamentals of General Microbiology I (3) A Lara, Whiteley Survey of the microbial world, metabolism, biosynthesis, regulation, growth, structure, and function. Required for students majoring in microbiology; recommended for students majoring in biology. Prerequisites: BIOL 210, 211, 212, and two quarters of organic chemistry.

MICRO 411 Fundamentals of General Microbiology II (3) W Champoux, Groman, Nester Prokaryotic genetics: DNA replication, recombination, and repair; gene expression, movement, and manipulation. Prerequisite: 410 or BIOL 210, or equivalent.

MICRO 412 Fundamentals of General Microbiology III (3) Sp Leigh Structure, biochemical properties, and genetics of the major groups of procaryotes, and viruses. Required for students majoring in microbiology, recommended for students majoring in biology. Prerequisite: 410 or permission of instructor.

UCONJ 420 Biological Safety Practices (1) A For course description, see Interschool or Intercollege Programs.

MICRO 431 Methods in Microbiology (3) Sp Bicknell, Groman, Leigh, Staley Laboratory exercises emphasizing methods used in microbial metabolism, virology, and ecology. Limited to microbiology majors. No auditors. Prerequisites: 402, 410.

MICRO 435 Microbial Ecology (3) Sp Staley Consideration of the various roles that microorganisms, particularly bacteria and bluegreens, play in environmental processes. The interrelationships among microorganisms and the effects of the physical, chemical, and biological properties of their environment are discussed and assessed. Prerequisites: 412 or equivalent, or permission of instructor.

MICRO 440 Introductory Bacteriology for Medical Technologists (1) A Limited introduction to basic microbiology, with focus on structure, metabolism, and genetics of medically important organisms. Prerequisite: medical technology student, or permission of instructor.

MICRO 441, 442 Immunology, Medical Bacteriology, and Virology (3,3) A,W 441: basic immunological concepts, the immune response and disease, host-parasite relationships, and study of pathogenic bacteria. 442: continuation of 441, followed by consideration of pathogenic viruses. Laboratory course, 443, coordinates. Prerequisites: basic biology, organic chemistry and previous or concurrent course work covering prokaryotic cell structure and function (e.g., 410 or 440); 441 for 442.

MICRO 443 Medical Microbiology Laboratory (3) AW Coyle, Memmer, Schoenkecht Required for medical technology students, microbiology majors; elective for medical students. Procedures for isolation and identification of pathogenic bacteria, testing their susceptibility to antibiotics. No auditors. Prerequisites: 441, 442 sequence taken concurrently or HUBIO 521P.

MICRO 444 Medical Mycology and Parasitology (4) Sp Coyle, Fritsche Consideration of medically important fungi and parasites, with emphasis on their biology in relation to disease and its laboratory diagnosis. For medical technology students, microbiology majors, and medical students as an elective. No auditors. Prerequisites: basic biology and permission of instructor.

MICRO 447 Fundamentals of Immunology (2) Clark For undergraduate and graduate students. Synthesis, nature, fate, and activities of antibodies, antigen-antibody interactions, mechanisms of antibody-mediated and cell-mediated immunity, hypersensitivity, genetic control of immune responses, tissue transplantation, tumor immunology, autoimmune disease. Prerequisites: 441 or HUBIO 520P, or equivalent, and upper-division standing.

CONJ 448 Fundamental Immunology Laboratory (2) A See Conjoint Courses.

MICRO 450 Molecular Biology of Viruses (3) Sp Champoux, Wong Introduction to the molecular biology of viruses and virus-host relationships. Designed for advanced undergraduates and graduate students in the biological sciences. Coverage includes bacterial and animal viruses, the nature of infection, the variety of virus-host relationships, and discussion of some models of viral pathogenesis. Prerequisites: 410, 411 and/or GENET 365.

MICRO 495- Honors Undergraduate Research (*) AWSpS Lara Specific problems in microbiology or immunology. Prerequisite: permission of honors adviser.

MICRO 496 Undergraduate Library Research (2) AWSpS Nester Introduction to library research and to the microbiological literature. Topics are assigned and supervised by staff members. Offered on credit/no credit basis only. Prerequisite: permission of instructor; senior standing desirable.

MICRO 497 Microbiology Special Electives (*) AWSpS Special clerkships, externships, or research opportunities are occasionally available at institutions other than the University of Washington. Obtain from the Dean's office a special assignment form and contact the Chairperson of the Department of Microbiology and Immunology at least one month before preregistration. Limited to medical students. Prerequisite: permission of instructor.

MICRO 498 Undergraduate Thesis (*) AWSpS For medical students. Prerequisite: permission of instructor.

MICRO 499- Undergraduate Laboratory Research (*) AWSpS *Lara* Specific problems in microbiology or immunology. Prerequisite: permission of departmental adviser; senior standing desirable. Offered on credit/no credit basis only.

Courses for Graduates Only

MICRO 500 Introduction to Research (*, max. 20) AWSpS *Nester* Introduction to research areas of the faculty and the techniques employed in their investigations. Offered on credit/no credit basis only. Prerequisite: graduate standing in microbiology or immunology or permission of instructor.

MICRO 506 Techniques in Electron Microscopy of Microorganisms (3) Sp *Lara* Techniques used in the preparation of microorganisms for electron microscopy, the operation of the electron microscope, and the photographic reproduction of observations. Offered on credit/no credit basis only. Prerequisites: major in a biological science and permission of instructor. (Offered on demand.)

MICRO 510 Physiology of Bacteria (3) A *Whiteley* Topics of current interest concerning the molecular biology and physiology of bacteria. Prerequisites: 410 and BIOC 440, 441, and 442, or permission of instructor. (Offered alternate years; offered 1988.)

MICRO 512 Physiology of Gene Expression (1, max. 15) AWSpS *Whiteley* Weekly one-hour seminar in which students discuss current literature dealing with selected aspects of microbial physiology. Offered on credit/no credit basis only. Prerequisites: 410, GENET 552, 553, BIOC 440, 441, 442, and permission of instructor.

MICRO 520 Seminar (1) AWSp *Staley* May be repeated for credit. Offered on credit/no credit basis only.

MICRO 522 Current Research in Microbiology (1) AWSp Weekly student and faculty seminar presentations based on the current literature. May be repeated for credit. Offered on credit/no credit basis only. Prerequisite: graduate standing in microbiology.

MICRO 525 Cell Surface Membrane in Cell Sociology and Immunology (2) Sp *Carter, Hakomori* Structure and function of cell surface membranes in relation to various immunobiological and pathobiological phenomena (differentiation, organization, infection, and cancer, etc.). Joint with PABIO 525. Prerequisites: 447, BIOC 440, 441, 442, and permission of instructor.

MICRO 530 Advanced General Microbiology (4) A *Staley* Enrichment, isolation, and comparative morphology and physiology of selected bacteria. Open to qualified undergraduates. Prerequisites: 402, 412, or equivalent, and permission of instructor.

MICRO 532 Seminar in General Microbiology and Microbial Ecology (1, max. 15) AWSp *Leigh* Weekly seminar concerning current research topics in the area of *Rhizobium*-legume interactions. Offered on credit/no credit basis only. Prerequisites: 410, permission of instructor.

MICRO 540 Virology (3) W Lecture-seminar course concerning host-viral interactions. Prerequisite: permission of instructor. (Offered alternate years; offered 1990.)

MICRO 550 Selected Topics in Immunology (2, max. 18) ASP Formal seminar-discussion course for advanced students focused on recent developments in the field of immunology and consisting of literature research and intensive in-depth study of important and timely topics. Two-hour seminars semimonthly and a comprehensive final examination. Offered on credit/no credit basis only. Prerequisites: 447 or equivalent and permission of instructor.

MICRO 552 Pathogenic Microbiology (4) Sp *Groman* Introduction to concepts and techniques of general microbiology, to major groups of infectious agents

affecting the human body, and to mechanisms and models of pathogenesis. Prerequisites: BIOL 210, 211, 212, or equivalent and some basic immunology; for dental students, others by permission of instructor.

MICRO 553 Pathogenesis of Infectious Diseases of Man (4) A *Groman, Lory, Moseley* Mechanisms of microbial infection and pathogenesis explored at the molecular and cellular levels through selected host-parasite models. Prerequisites: 441, 442 or HUBIO 521P, plus basic immunology. (Offered alternate years; offered 1989.)

MICRO 554 Seminar in Molecular and Medical Microbiology (1, max. 15) AWSp *Groman, Lory, Moseley* Weekly one-hour seminar in which recent advances in molecular biology and medical microbiology or the current research of the participants is presented and discussed critically. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

MICRO 555 Advanced Clinical Microbiology (2½) AWSp *Fritzsche, Schoenknecht* Attendance at daily plate rounds of the Division of Clinical Microbiology. Designed to increase understanding of clinical microbiological work and its application to the care of the patient. Offered on credit/no credit basis only. Prerequisites: 443 and permission of instructor.

MICRO 556 Clinical Microbiology Training and Research (*, max. 12) AWSpS Training in clinical microbiology and research. Attendance at daily laboratory rounds in addition to bench-side training and research. For medical students and microbiology graduate students only. Offered on credit/no credit basis only. Prerequisites: 443 and permission of instructor.

CONJ 561 Tumor Biology (2) W See Conjoint Courses.

MICRO 570 Advanced Molecular and Cellular Immunology (4) *Greenberg* Lecture course for graduates, upper-division undergraduates; structure, function of antigens and antibodies, theories of antibody synthesis, subcellular studies of immune response, cellular mechanisms of antibody synthesis, activities of T- and B-cells, mechanisms of cell-mediated immunity, regulation of immune response. Prerequisites: 447 or equivalent, biochemistry, genetics. (Offered alternate years; offered 1989.)

CONJ 572 Advanced Immunology III: Immunopathology (2) W See Conjoint Courses.

MICRO 573 General Immunology Seminar (1, max. 15) AWSp *Clark* Weekly one-hour discussion in which original research results are presented and discussed. Occasional seminars are concerned with review of important topics in immunology, but the emphasis, in general, is on new and original contributions to the field. Offered on credit/no credit basis only. Prerequisites: firm background in immunology and permission of instructor.

MICRO 577 Cellular Immunity (1, max. 10) AWSpS Weekly one-hour seminar in which cellular aspects of myeloid cell differentiation and its role in disease processes are discussed and current research findings presented. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

MICRO 585 Research in Cell and Molecular Biology (1, max. 15) AWSp *Champoux* Weekly research seminar. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

MICRO 599 Topics in Microbiology and Immunology (*, max. 6) AWSpS Current problems in microbiological or immunological research. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

MICRO 600 Independent Study or Research (*) AWSpS Offered on credit/no credit basis only.

MICRO 700 Master's Thesis (*) AWSpS Offered on credit/no credit basis only.

MICRO 800 Doctoral Dissertation (*) AWSpS Offered on credit/no credit basis only.

Neurological Surgery

12 Center, Harborview Medical Center

The Department of Neurological Surgery is dedicated to teaching and research in the entire spectrum of diseases of the central and peripheral nervous system. Instruction in this area is provided for medical students and postgraduate physicians.

The department's medical student instruction includes participation in the human biology curriculum as well as in elective basic science and clinical experiences. These are available at Harborview Medical Center, University Hospital, Veterans Administration Medical Center, Children's Hospital and Medical Center, and Madigan Army Medical Center, including the Epilepsy Center at Harborview. The department also has several course offerings correlating research and clinical problems of the nervous system, including the neuroscience research seminar, and clinical and basic science correlates of the epilepsies.

Selected medical students also may elect research experience within the Department of Neurological Surgery. The department research facilities are housed in the Medical Research Tower of the University Hospital, at Harborview Hall, at Veterans Administration Medical Center, and at the Epilepsy Center at Harborview. Investigations are under way at these institutions in many areas of neurophysiology, in behavioral research, in light and electron microscopic examination of the anatomy of the nervous system, in cerebral vascular physiology and in hemo-oncology.

In addition to undergraduate instruction, a fully certified residency program in neurological surgery is available for selected postgraduate physicians. The seven-year program emphasizes preparation for a career in academic neurosurgery.

Faculty

Chairperson

H. Richard Winn

Professors

Alvord, Ellsworth C.,* 1960, ‡(Pathology), M.D., 1946, Cornell; neuropathology experimental allergic encephalitis.

Canfield, Robert C.,* 1967, ‡(Restorative Dentistry), D.D.S., 1951, Washington; tooth pulp, dental pathways, pain.

Chatrian, Gian E., 1959, (Laboratory Medicine), † M.D., 1951, Naples (Italy); electroencephalography and clinical neurophysiology.

Dodrill, Carl B., 1973, (Psychiatry and Behavioral Sciences), † M.S., 1967, Ph.D., 1970, Purdue; human neuropsychology, epilepsy, electroencephalogram and performance, antiepileptic medications and performance.

Harris, A. Basil, 1967, M.D., 1954, Alabama; neurosurgery, neuroanatomy, microvascular, arteriovenous malformations, epilepsy mechanisms, cortex, biochemical, blood flow.

Kelly, William A., 1962, (Otolaryngology), † M.D., 1954, Cincinnati; neurosurgery, neuroendocrinology, micro-neurosurgery, cerebrovascular, gross surgical anatomy of brain, rheology and endocrinology.

Levy, René H.,* 1970, (Pharmaceutics), † Ph.D., 1970, California (San Francisco); biopharmaceutics, neurophysiology, epilepsy.

Lockard, Joan S.,* 1964, (Psychology), † M.S., 1961, San Diego State; Ph.D., 1963, Wisconsin; primatology, epilepsy, sociobiology, animal models and behavior.

Loeser, John D., 1965, (Anesthesiology), M.D., 1961, New York; pain, neurophysiology.

Maravilla, Kenneth R., 1986, (Radiology), † M.D., 1970, State University of New York (Brooklyn).

Mills, Richard P., 1984, †(Ophthalmology), (Medicine), M.D., 1968, Yale.

Ojemann, George A., 1962, M.D., 1959, Iowa; neurophysiology, organization of higher functions in human brain, language, memory.

Roberts, Theodore S., 1985, M.S., 1952, M.D., 1955, Wisconsin; neurological surgery, stereotaxic surgery, pituitary disease, cerebrovascular disease.

Rubel, Edwin W., * 1986, (Otolaryngology, Physiology and Biophysics), † M.S., 1967, Ph.D., 1969, Michigan State; neurobiology, sensory ontogeny.

Schwartzkroin, Philip A., * 1978, (Physiology and Biophysics), † Ph.D., 1972, Stanford; neurophysiology, epilepsy, CNS development, plasticity.

Shaw, Cheng-mei, 1960, †(Pathology), M.D., 1950, National Taiwan.

Ward, Arthur A., Jr., 1948, (Emeritus), M.D., 1942, Yale; neurological surgery.

Westrum, Lesnick E., * 1966, (Biological Structure), † M.D., 1963, Washington; Ph.D., 1966, University College (London); neuroanatomy, synaptology, plasticity, olfactory and trigeminal systems, dental pathways.

Winn, H. Richard, 1983, (Physiology and Biophysics), M.D., 1968, Pennsylvania; cerebral blood flow regulation.

Associate Professors

Burchiel, Kim J., 1981, M.D., 1976, California (San Diego); neurophysiology, pain, epilepsy, head trauma.

Dikmen, Surreya S., * 1974, †(Psychiatry and Behavioral Sciences, Rehabilitation Medicine), M.A., 1967, Michigan; Ph.D., 1973, Washington; clinical neuropsychology, traumatic head injury, epilepsy.

Farwell, Jacqueline R., 1979, (Medicine), (Pediatrics), † M.D., 1972, California (San Francisco); child neurology, especially epilepsy, neonatal neurology, brain tumors in children.

Fraser, Robert T., 1977, (Rehabilitation Medicine), † M.S., 1972, Southern California; Ph.D., 1976, Wisconsin (Madison); M.P.A., 1984, Seattle; prediction of rehabilitation outcome, program evaluation, brain impairment and vocational potential, brief therapy interventions.

Goodkin, Robert, 1987, M.D., 1964, Chicago; neurologic surgery.

Mateer, Catherine A., * 1980, (Research), (Speech and Hearing Sciences), † M.S., 1972, Wisconsin (Madison); Ph.D., 1977, Western Ontario; human neurophysiology, speech and language pathology, memory, mechanisms of motor control.

Ojemann, Linda M., 1966, M.D., 1960, Illinois; neurology, treatment of epilepsy.

Temkin, Nancy R., * 1977, (Biostatistics), † M.S., 1971, Connecticut; Ph.D., 1976, State University of New York (Buffalo); statistical research.

Wilensky, Alan J., 1975, (Medicine), † M.D., 1967, Western Ontario; Ph.D., 1973, Toronto; neurology, treatment of epilepsy, testing and use of anticonvulsants.

Assistant Professors

Ali-Osman, Francis, 1986, M.Sc., 1978, D.Sc., 1981, Free University (Berlin); cell biology, neurooncology, biochemical pharmacology.

Berger, Mitchel S., 1986, M.D., 1979, Miami; neurooncology, pediatric neurosurgery.

Clemmons, David C., 1986, Ph.D., 1985, Washington; epilepsy rehabilitation, vocational rehabilitation of epileptics.

Cohen, Wendy A., 1987, (Radiology), † M.D., 1975, Harvard.

Esckridge, Joseph M., 1987, (Radiology), † M.D., 1981, Louisville.

Franck, JoAnn E., 1985, (Research), M.S., 1975, Villanova; Ph.D., 1977, Rochester; cellular activity in seizure prone and lesioned animals.

Grady, M. Sean, 1987, M.D., 1981, Georgetown.

Griffin, Brian R., 1985, (Radiation Oncology), † M.D., 1981, Nebraska; radiation oncology.

Mayberg, Marc R., 1985, M.D., 1978, Mayo; cerebrovascular disease, vasospasms, ultrastructure of cerebral arteries.

Russell, Lisa C., 1986, (Research), M.S., 1980, Ph.D., 1980, Tulane; neurophysiology, neuropharmacology.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

NR 498 Undergraduate Thesis (*) AWSpS Winn
Prerequisite: permission of instructor.

NR 499 Undergraduate Research (*) AWSpS Winn
Investigation of special problems as an intimate member of the research team in the neurological surgery laboratories. Research to lead to a thesis, if desired. List of projects available on request. Prerequisite: permission of instructor.

NR 505P Preceptorship in Academic Neurosurgery (1) AWSpS Winn
Opportunity for first- and second-year medical students to observe the research, teaching, and patient-care activities of academic neurosurgery. Prerequisite: permission of instructor.

NR 528P Neurological Surgery Seminar (1) AWSpS Westrum
Biweekly seminar centered around neurological research topics with discussion by staff and students. Prerequisite: HUBIO 532P or permission of instructor.

NR 542 Clinical and Basic Research Correlates of Epilepsy (2) A G. Ojemann, Westrum
Clinical symptoms and treatment of epilepsy; related basic research in neuroanatomy, neurophysiology, neuropsychology, and neuropharmacology of epilepsy. Prerequisite: HUBIO 532P for medical students; permission of instructor for others.

NR 680P Neurological Surgery Clerkship (*, max. 8) AWSpS Kelly
Student serves clinical clerkship as an intimate member of the staff, participating in inpatient and outpatient care, both preoperative and postoperative, involving neurological surgery patients. University Hospital or a University-affiliated hospital may be selected, subject to approval of the department. Prerequisite: HUBIO 563P. (Four weeks.)

NR 681P Seizure Clinic Clerkship (2½) AWSpS A. Wilensky, Staff
Initial evaluation and follow-up of patients with seizure disorders. Definition of medical and social problems and drug therapy are stressed. Alternate forms of therapy are considered. Linear follow-up of patients. Limited contact with inpatients. Specialized contact with specific neurologic problem and experience in prolonged follow-up and management planning for a chronic disease. Prerequisites: MED 665P and permission of instructor.

NR 697P Neurological Surgery Special Electives (*, max. 24) AWSpS Winn
By specific arrangement, for qualified students, special clerkship, externship, or research opportunities can be made available at institutions other than the University of Washington. Students wishing to elect this course should obtain from the Dean's office a special assignment form at least one month before preregistration. Prerequisite: permission of instructor.

Obstetrics and Gynecology

BB607 Health Sciences

The Department of Obstetrics and Gynecology is involved with teaching, patient care, and research in the areas of normal and abnormal human reproduction: growth and development of the fetus, normal and complicated obstetrics, and surgical and medical diseases of the female reproductive system, including endocrinology.

Faculty

Chairperson

Morton A. Stenchever

Professors

Benedetti, Thomas J., * 1979, M.D., 1973, Washington; perinatal medicine.

Bremner, William J., †(Medicine), M.D., 1969, Washington; Ph.D., 1977, Monash (Australia); endocrinology.

Eschenbach, David A., 1973, M.D., 1968, Wisconsin; gynecology and infectious disease.

Figge, David C., 1953, M.D., 1950, Northwestern; gynecologic oncology.

Greer, Benjamin E., 1980, M.D., 1966, Pennsylvania; gynecologic oncology.

Knopp, Robert H., * 1974, †(Medicine), M.D., 1964, Cornell; obstetrics/gynecology, clinical nutrition.

Lein, John N., 1964, M.D., 1955, Washington; government relations.

Mack, Laurence A., 1978, †(Orthopaedics, Radiology), M.D., 1971, Illinois; ultrasonography, computed tomography.

Petra, Philip H., * 1986, (Biochemistry), † M.S., 1962, Ph.D., 1966, Tulane; reproductive biochemistry.

Shepard, Thomas H., * 1955, †(Environmental Health, Pediatrics), M.D., 1948, Rochester; embryology.

Soules, Michael R., 1980, M.D., 1972, California; reproductive endocrinology.

Spadoni, Leon R., 1963, M.D., 1957, Washington; reproductive endocrinology.

Steiner, Robert A., * 1977, (Zoology), (Physiology and Biophysics), † Ph.D., 1975, Oregon; reproductive physiology.

Stenchever, Morton A., 1976, M.D., 1956, Buffalo; gynecology, reproductive genetics, medical education.

Vontver, Louis A., 1969, M.D., 1960, M.Ed., 1970, Washington; medical education, gynecology.

Associate Professors

Brown, Zane A., * 1977, M.D., 1966, Temple; perinatal medicine.

Clifton, Donald K., 1983, Ph.D., 1979, California; reproductive physiology.

Moore, Donald E., 1977, (Epidemiology), M.D., 1967, Case Western Reserve; reproductive endocrinology.

Prince, C. Edward, 1977, M.A., 1949, Kansas; M.D., 1955, Washington; gynecology.

Shy, Kirkwood K., * 1979, (Epidemiology), M.D., 1973, M.P.H., 1979, Washington; gynecology.

Tamimi, Hisham K., 1977, M.D., 1969, Cairo (Egypt); gynecologic oncology.

Assistant Professors

Cain, Joanna M., 1985, M.D., 1977, Creighton; gynecologic oncology.

Chu, Joseph,* 1981, ‡(Epidemiology), M.D., 1975, Georgetown; M.P.H., 1981, Washington; women's health care.

Cotterill, Robert W., 1986, M.D., 1972, Southern California.

Dashow, Edward E., 1986, D.O., 1972, Chicago College of Osteopathic Medicine.

Easterling, Thomas R., 1987, M.D., 1981, North Carolina.

FitzSimmons, John M., 1986, M.D., 1975, Vanderbilt; perinatal medicine.

Hendricks, Susan K., 1985, M.S., 1975, M.D., 1979, Michigan State; perinatal medicine.

Hiller, Sharon L., 1984, (Research), Ph.D., 1982, Washington State; public health and clinical microbiology.

Kuzan, Frank B., 1983, M.S., 1974, Northern Illinois; Ph.D., 1982, Washington State; reproductive physiology.

Muller, Charles H.,* 1983, (Research), (Biological Structure), † M.A., 1972, Colorado; Ph.D., 1976, California (Berkeley); reproductive biology.

Nyberg, David A., 1985, ‡(Radiology), M.D., 1979, Oregon.

Patton, Dorothy L., 1984, (Research), (Biological Structure), M.S., 1973, Puget Sound; Ph.D., 1981, Washington; infertility and infectious disease.

Smith, James R., 1977, M.D., 1956, Case Western Reserve; perinatal medicine.

Wolner-Hanssen, Pal, 1985, Dr.Med., 1974, Basel.

Zarutskie, Paul W., 1984, (Radiology), M.D., 1976, Hahnemann Medical; reproductive endocrinology.

Lecturer

Ek, Marit, 1971, ‡(Pathology), M.B.Ch.B., 1959, Cape town.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

OB GY 498 Undergraduate Thesis (*) AWSpS Vontver By arrangement.

OB GY 499 Undergraduate Research (*) AWSpS Vontver Prerequisite: permission of instructor.

OB GY 579P Obstetric and Gynecologic Investigation (*) AWSpS Vontver The investigation may cover any one of the following fields: uterine muscle physiology, toxemias of pregnancy, hormone assays in obstetrics and endocrinology, obstetric and gynecologic oncology. By arrangement.

OB GY 665P Introduction to Obstetrics and Gynecology, UH-HMC (*, max. 12) AWSpS Vontver Introductory clerkship providing comprehensive medical care and counseling to female patients. Includes management and delivery of obstetrical patients, diagnosis and management of gynecologic diseases, hospital rounds, outpatient clinics, seminars, tutorial, and community health-care agencies for women. Rotation between University Hospital and Harborview Medical Center. Prerequisite: HUBIO 545P. (Six weeks. Limit: six students.)

OB GY 666P Introduction to Obstetrics and Gynecology, Boise (*, max. 12) AWSpS Vontver Clerkship equivalent to 665P offered at Boise, Idaho (WAMI). Includes experience in several private physician offices. Prerequisite: HUBIO 545P. (Six weeks. Limit: two students.)

OB GY 667P Introduction to Obstetrics and Gynecology, Madigan (*, max. 12) AWSpS Vontver Clerkship equivalent to 665P offered at Madigan Hospital Medical Center, Tacoma. Not offered Summer Quarter. Prerequisite: HUBIO 545P. (Six weeks. Limit: five students.)

OB GY 668P Introduction to Obstetrics and Gynecology, Spokane (12) AWSpS Vontver Clerkship, equivalent to 665P, offered at Spokane (WAMI). Includes experience in several private physicians' offices. Prerequisite: HUBIO 545P. (Six weeks. Limit: three students.)

OB GY 669P Introduction to Obstetrics and Gynecology, Swedish (12) AWSpS Vontver Clerkship, equivalent to 665P, offered at Swedish Hospital Medical Center. Prerequisite: HUBIO 545P. (Six weeks. Limit: two students.)

OB GY 670P Introduction to Obstetrics and Gynecology, GH-Central (12) This clerkship is equivalent to 665P but is offered at the Central facility of Group Health Cooperative of Puget Sound in Seattle. Students spend time in delivery room, surgery, and clinic, and have a specific preceptor assigned. Prerequisite: HUBIO 545P. (Six weeks. Limit: two students.)

OB GY 671P Introduction to Obstetrics and Gynecology, Anchorage (12) AWSpS Vontver Clerkship, equivalent to 665P, offered at Anchorage, Alaska (WAMI). Includes experience in several private physicians' offices as well as Providence Hospital and Elmendorf Air Force Base. Prerequisite: HUBIO 545P. (Six weeks. Limit: three students.)

OB GY 672P Introduction to Obstetrics and Gynecology, GH-East (12) This clerkship is equivalent to 665P but is offered at the Eastside facility of Group Health Cooperative of Puget Sound in Redmond. Students spend time in delivery room, surgery, and clinic, and have a specific preceptor assigned. Prerequisite: HUBIO 545P. (Six weeks. Limit: two students.)

OB GY 673P Introduction to Obstetrics and Gynecology, Military, Madigan (12) This clerkship is equivalent to 665P but is offered at Madigan Hospital Medical Center. Students spend time in delivery room, surgery, and clinic, and have a specific preceptor assigned. Prerequisite: HUBIO 545P. (Six weeks. Limit: two students.)

OB GY 680P Clinical Clerkships (*, max. 12) AWSpS Vontver Experience in the specialty clinics of obstetrics and gynecology at University Hospital. Includes dystocia, infertility, endocrinology, oncology, and genetics. By prior arrangement; other options available. Prerequisites: 665P and permission of instructor. (Limit: one student each four weeks.)

OB GY 682P Antenatal High-Risk Obstetrics (8) AWSpS Vontver Four weeks on high-risk antenatal obstetrics ward and clinic. Students responsible for initial workups, daily laboratory evaluations, continuing care of high-risk antepartum patients. Weekly conference with obstetrics attending; presentation of one or more topics per rotation. Excellent coordination with resident and attending staff required to maintain patient-care continuity. (Limit: one student each four weeks.)

OB GY 684P Endocrinology of Reproduction (*, max. 12) AWSpS Vontver The biochemistry of steroids. Steroid metabolism as related to clinical problems. Diagnosis and treatment of endocrine disorders. Case studies with special emphasis on modern methods of investigation. (Limit: one student each four weeks.)

OB GY 685P Obstetrics/Gynecology Preceptorship (*, max. 8) AWSpS Vontver Close working relationship with physician in private practice of obstetrics and gynecology, including: hospital rounds, surgery, deliveries, and office and business aspects of private practice as individually arranged. Forty hours minimum can be arranged to fit schedule not to exceed 8 credits. Prerequisites: 665P or equivalent and permission of instructor. (Limit: two students.)

OB GY 697P Obstetrics and Gynecology Special Electives (*, max. 24) AWSpS Vontver By arrangement, for qualified students, special clerkship or research opportunities can sometimes be made available at other institutions. Students wishing this course should obtain special assignment form one month before preregistration. Department evaluates student performance. Prerequisite: permission of instructor.

search opportunities can sometimes be made available at other institutions. Students wishing this course should obtain special assignment form one month before preregistration. Department evaluates student performance. Prerequisite: permission of instructor.

Ophthalmology

RR801 University Hospital

The Department of Ophthalmology is responsible for the instructional and research programs in diseases of the eye and its adnexae as well as the visual system.

Medical student instruction is provided at all levels, including multiple electives in the clinical years. Graduate physicians are provided with three or four years of residency training at the affiliated hospitals. Patient care is provided under the supervision of full- and part-time faculty physicians at University Hospital, Harborview Medical Center, Pacific Medical Center, Veterans Administration Hospital, and Children's Hospital and Medical Center.

Clinical research programs relate to blinding eye diseases. Laboratory research encompasses neurophysiology of vision, morphology of the retina and visual system, and biochemistry of ocular tissues. Postdoctoral training is offered in all these disciplines, and predoctoral training is offered in morphology.

Faculty

Chairperson

Robert E. Kalina

Professors

Bunt-Milam, Ann, 1971, Ph.D., 1967, Texas Southwestern (Dallas); ophthalmology.

Hendrickson, Anita E.,* 1965, (Biological Structure), † Ph.D., 1964, Washington; ophthalmology.

Kalina, Robert E., 1967, M.D., 1960, Minnesota; ophthalmology.

Mills, Richard P., 1984, (Medicine, Neurological Surgery), M.D., 1968, Yale; ophthalmology.

Rodiek, Robert W., 1978, M.S., 1961, Massachusetts Institute of Technology; Ph.D., 1964, Sydney (Australia); ophthalmology.

Saari, John C.,* 1974, (Biochemistry), † M.S., 1963, Minnesota; Ph.D., 1970, Washington; ophthalmology.

Associate Professors

Kinyoun, James L., 1978, M.D., 1971, Nebraska; ophthalmology.

Pagon, Roberta A., 1975, ‡(Medicine, Pediatrics), M.D., 1972, Harvard; ophthalmology, pediatrics.

Sarthy, P. Vijay, 1985, (Research), (Physiology and Biophysics), M.S., 1967, Mysore (India); Ph.D., 1973, Bombay (India); ophthalmology.

Assistant Professors

Chan, Kwan Y., 1979, (Research), (Anesthesiology), Ph.D., 1977, California (Los Angeles); ophthalmology.

Curcio, Christine A., 1985, (Research), (Biological Structure), † Ph.D., 1982, Rochester; anatomy/ophthalmology.

Karr, Daniel J., 1986, (Pediatrics), M.D., 1978, Miami.

Lindquist, Thomas D., 1987, Ph.D., 1978, M.D., 1981, New Jersey.

Orcutt, James C., 1982, (Otolaryngology), Ph.D., 1976, M.D., 1977, Colorado (Denver); ophthalmology.

Wells, Craig G., 1987, (Acting), M.D., 1979, Oregon.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

OPHTH 488 Undergraduate Thesis (*) AWSpS Rodieck (University Hospital) Thesis-based research in vision and ophthalmology. Elective. Prerequisite: permission of instructor. (Limit: two students.)

OPHTH 499 Undergraduate Research (*) AWSpS Rodieck (University Hospital) Laboratory or clinical research in morphology, biochemistry, immunology, experimental pathology, or clinical studies of the eye and visual system. Prerequisite: permission of instructor. (Limit: two students.)

OPHTH 501P Ophthalmology Preceptorship (1) AWSpS Kinyoun Individualized experiences with one or more of the full-time faculty members of the department covering research, teaching, and patient care. Student observes activities in the clinic, hospital ward, operating room, and research laboratories. Prerequisites: first- and second-year medical student standing and permission of instructor.

OPHTH 681P Ophthalmology Clerkship (4) AWSpS Milam, Mills, Reeh (Harborview Medical Center) Students gain experience in the diagnosis and treatment of common ocular disorders. Basic examination techniques, including tonometry, ophthalmoscopy, and biomicroscopy. Students work with an eye pathologist in gross and microscopic examination of surgical and autopsy eyes. Prerequisite: completion of human biology series. (Limit: one student.)

OPHTH 682P Ophthalmology Clerkship (4) AWSpS Kramar (Pacific Medical Center) Student works with a faculty member in the diagnosis and treatment of ocular diseases in both outpatient and inpatient populations. Experience in common ocular disorders is gained, and neurological and other consultations seen. Prerequisite: completion of human biology series. (Limit: one student.)

OPHTH 683P Pediatric Ophthalmology Clerkship (4) AWSpS Karr (Children's Hospital and Medical Center) Student examines and observes treatment of children with ocular diseases and learns to differentiate trivial from potentially blinding disorders. Programmed text in general ophthalmology furnished. Prerequisite: completion of human biology series. (Two weeks, full-time. Limit: one student.)

OPHTH 685P Ophthalmology Clerkship (4) AWSpS Orcutt (Veterans Administration Hospital) Participation in diagnosis and treatment of medical and surgical ocular disease. Outpatient examinations, inpatient surgery, and neuro-ophthalmologic, retinal, and medical consultations. Basic techniques involved in tonometry, ophthalmoscopy, and biomicroscopy of eye. Prerequisite: completion of human biology series. (Limit: one student.)

OPHTH 686P Ophthalmology Clerkship (4) AWSpS Bortner, Brandt, McEvoy (Group Health Hospital) Diagnosis and treatment of ocular diseases in outpatients. Weekly assignment to Group Health ophthalmologist responsible for the care of walk-in and urgent patients, which may demonstrate findings pertinent to the future practice of primary-care physicians. Examination techniques, including tonometry, ophthalmoscopy, and biomicroscopy. Prerequisite: completion of human biology series. (Limit: one student.)

OPHTH 687P Ophthalmology Clerkship (4) AWSpS Kinyoun (University Hospital) Inpatient and outpatient diagnosis and treatment of eye diseases. Subspecialty clinics include cornea, retina, neuro-ophthalmology, glaucoma, contact lenses, and strabismus. Student attends regularly scheduled conferences in ophthalmic basic and clinical science. Prerequisite: completion of human biology series. (Limit: one student.)

OPHTH 688P Ophthalmology Clerkship (8) AWSpS Kinyoun, Werner Four-week externship at Alaska Native Medical Center in Anchorage. Opportunity to learn and practice common eye examination techniques, including slit-lamp biomicroscopy, tonometry, and funduscopy. Patients seen three days a week; two days spent in the operating room. Prerequisites: completion of human biology series.

OPHTH 697P Ophthalmology Special Electives (*, max. 24) AWSpS Kalina By specific arrangement, for qualified students, special clerkship, externship, or research opportunities can at times be made available at other institutions. Students wishing to elect this course should obtain from the Dean's office a special assignment form at least one month before preregistration. Prerequisite: permission of instructor.

Orthopaedics

BB1043 University Hospital

The Department of Orthopaedics is actively involved in patient care, instruction, and research concerning problems of the musculoskeletal system.

In addition to providing instruction for medical students, the department participates in the teaching program of students in the School of Nursing, the School of Dentistry, and the Department of Rehabilitation Medicine. Selected medical students also may elect research experience in the department. A fully approved residency with opportunities to carry out fundamental research is offered. Residents may work toward the Master of Science degree by meeting the requirements of the Graduate School and the academic unit offering the degree program. Sports Medicine is a division of the Department of Orthopaedics.

Faculty

Chairperson

Frederick A. Matsen III

Professors

Eyre, David R., 1985, (Biochemistry), Ph.D., 1969, Leeds (England); orthopaedics.

Hansen, Sigvard T., Jr., 1969, M.D., 1961, Washington; orthopaedics.

Matsen, Frederick A. III, 1974, (Bioengineering), M.D., 1968, Baylor; orthopaedics.

Simkin, Peter A., 1968, (Medicine), M.D., 1961, Pennsylvania; orthopaedics.

Smith, Nathan J., 1985, (Emeritus), (Pediatrics), M.D., 1945, Wisconsin; pediatrics.

Staheli, Lynn T., 1970, M.D., 1959, Utah; orthopaedics.

Associate Professors

Bigos, Stanley J., 1980, (Environmental Health), M.D., 1975, Missouri; orthopaedics.

Greenlee, Theodore K., Jr., 1971, M.D., 1959, Northwestern; orthopaedics.

Lanzer, William L., 1984, M.Ed., 1971, North Carolina State; M.S., 1975, Rutgers; M.D., 1977, Washington (St. Louis); orthopaedics.

Lippert, Frederick G. III, 1971, M.D., 1965, Vermont; Ph.D., 1971, Karolinska Instit. (Sweden); orthopaedics.

Mack, Laurence A., 1978, (Obstetrics and Gynecology, Radiology), M.D., 1971, Illinois; orthopaedics.

Olerud, John E., 1977, (Medicine), M.D., 1971, Washington; dermatology.

Sandell, Linda J., 1987, M.S., 1971, Denver; Ph.D., 1980, Northwestern; molecular biology.

Teitz, Carol C., 1978, M.D., 1974, Yale; orthopaedics.

Assistant Professors

Anderson, Paul A., 1985, M.S.E., 1975, Michigan; M.D., 1979, Wayne State; orthopaedics.

Benirschke, Stephen K., 1985, M.D., 1979, Case Western Reserve; orthopaedics.

Clark, John M., Jr., 1986, Ph.D., 1975, M.D., 1976, Chicago; orthopaedics.

Conrad, Ernest U., 1986, M.D., 1979, Virginia; orthopaedics.

Henley, Bradford M., 1987, M.D., 1979, Washington; orthopaedics.

Larson, Roger V., 1982, M.D., 1975, Utah; orthopaedics.

Mayo, Keith A., 1987, (Acting), M.D., 1978, Washington; orthopaedics.

Sangeorzan, Bruce, 1986, M.D., 1981, Wayne State; orthopaedics.

Sidles, John A., 1984, Ph.D., 1983, Washington; physics.

Wu, Jiann-Jiu (James), 1985, (Research), M.S., 1972, Illinois State; Ph.D., 1978, Texas A&M; orthopaedics.

Lecturer

Rice, Stephen G., 1977, (Pediatrics), M.D., 1974, Ph.D., 1974, New York; pediatrics.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

ORTHP 494 Athletic Health Care (*, max. 3) AWSpS Marquardt, Rice Prevention and management of athletic injuries. Basic course for coaches, school nurses, medical students. Responsibilities/liability, preseason screening/prevention techniques, conditioning, equipment nutrition, safety, preparedness, injury recognition, emergency procedures, common injuries, record keeping, communication, athletic health care organization. Laboratories, taping, stretching, athletic first-aid, use of ice.

ORTHP 495 Athletic Health Care Administration (3) Organizational management of athletic health-care aspects of operating organized athletic programs. For health professionals, school or community-based administrators/athletic directors/coaches, university-based health educators. Overview; generating awareness; needs assessment; educating coaches, student trainers; establishing central training room; standardization of procedures; record keeping; evaluation. Prerequisite: 494.

ORTHP 498 Undergraduate Thesis (*) AWSpS Eyre Student works directly with a preceptor in selecting a suitable area for laboratory or clinical research in the area of orthopaedics, and develops a thesis for recognition. Prerequisites: HUBIO 553P and permission of faculty mentor. (Twelve weeks.)

ORTHP 499 Undergraduate Research (*) AWSpS Eyre Investigation of pertinent musculoskeletal problems in the orthopaedic laboratories as part of the research group. Prerequisite: permission of faculty mentor. (Twelve weeks.)

ORTHP 585P Sports Medicine (2) Lectures, patient problem presentations, and seminar discussions to explore impact of exercise and sport participation on various body systems. Includes nutritional concerns, biomechanics of certain sports injuries and cardiovascular, pulmonary, and musculoskeletal. Prerequisite: second-year medical student standing.

ORTHP 675P Preceptorship in Orthopaedics (*, max. 4) AWSpS Teitz Student spends full time with the preceptor during all his or her working day in order

to gain a better understanding of the diagnosis and the management of problems of the musculoskeletal system as seen in the private orthopaedic practice. Prerequisites: SURG 665P or HUBIO 553P and permission of department. (Two weeks, full-time.)

ORTHP 676P Pediatric Orthopaedics (*, max. 8) AWSpS Staheli, Staff Acquaints students with all aspects of musculoskeletal problems in childhood. Didactic conferences and seminars, and opportunities for active participation in both inpatient and outpatient care at Children's Hospital and Medical Center, and correlative anatomy and pathology. Prerequisite: SURG 665P or HUBIO 553P. (Four weeks, full-time.)

ORTHP 677P Musculoskeletal Trauma (*, max. 8) AWSp Benirschke, Hansen Harborview Medical Center. Emergency room, wards, operating room, and outpatient clinics. Instruction in general and special clinics, including hand, hip, foot, and fracture, with emphasis placed on physical examination of the patient. Students take correlative anatomy and pathology. Prerequisites: SURG 665P, HUBIO 553P. (Four weeks, full-time.)

ORTHP 680P General Orthopaedic Clerkship (*, max. 8) AWSpS Conrad, Lanzer, Matsen University Hospital: general inpatient and outpatient clinics, general trauma, bone and joint infections, degenerative joint disease, rheumatoid arthritis, and outpatient pediatric. Veterans Administration Hospital (not offered Summer Quarter): musculoskeletal problems, including reconstruction of war injuries. Emphasis is on the diagnosis and the evaluation of functional deficits, anatomic, clinical, and radiographic correlation of disease processes.

ORTHP 697P Orthopaedic External Elective (*, max. 12) AWSpS Teitz Special arrangements can be made for students desiring to take orthopaedic electives at other institutions. Programs generally approved include orthopaedic clerkships at other universities or at large orthopaedic institutes. Prerequisites: HUBIO 553P and permission of department.

Otolaryngology—Head and Neck Surgery

BB1165 University Hospital

The Department of Otolaryngology—Head and Neck Surgery undertakes the teaching of the principles and the practical aspects of the diagnosis and treatment of diseases of the ear, nose, throat, head, and neck to first-, second-, third-, and fourth-year medical students. The department assumes responsibility for the organization and supervision of a residency training program and provides consultation and instruction to interns and members of the residency training program at the University.

Faculty

Chairperson

Charles W. Cummings

Professors

Cummings, Charles W., 1977, M.D., 1961, Virginia; otolaryngology.

Dobie, Robert A., 1975, M.D., 1971, Stanford; otolaryngology.

Donaldson, James A., 1965, M.D., 1954, Minnesota; otolaryngology.

Kelly, William A., 1964, ‡(Neurological Surgery), M.D., 1954, Cincinnati.

Rubel, Edwin W.,* 1986, (Psychology), (Neurological Surgery, Physiology and Biophysics), † Ph.D., 1969, Michigan State; otolaryngology.

Snyder, Jack M., 1970, M.A., 1956, Ph.D., 1970, Washington; audiology.

Weymuller, Ernest A., Jr., 1978, M.D., 1966, Harvard; otolaryngology.

Associate Professors

Duckert, Larry G., 1978, M.D., 1972, Ph.D., 1977, Minnesota; otolaryngology.

Richardson, Mark A., 1980, M.D., 1975, South Carolina; otolaryngology.

Spelman, Francis A.,* 1961, (Research), ‡(Bioengineering, Electrical Engineering), Ph.D., 1975, Washington; otolaryngology.

Sutton, Dwight, 1971, M.S., 1955, Idaho; Ph.D., 1962, California (Berkeley); otolaryngology.

Assistant Professors

Durham, Dianne, 1986, (Research), (Biological Structure), † Ph.D., 1982, Washington (St. Louis); auditory research.

Glenn, Michael G., 1986, M.D., 1981, California (San Francisco); otolaryngology.

Hillel, Allen D., 1983, M.A., 1972, M.D., 1976, Stanford; otolaryngology.

Inglis, Andrew F., Jr., 1987, M.D., 1981, Medical College of Pennsylvania; otolaryngology.

Makielski, Kathleen, 1985, M.D., 1978, Michigan; otolaryngology.

Olish, Lynne, 1986, (Research), (Speech and Hearing Sciences), Ph.D., 1980, Loyola; auditory research.

Orcutt, James C., 1982, ‡(Ophthalmology), Ph.D., 1976, M.D., 1977, Colorado; ophthalmology.

Rees, Thomas S., 1972, M.A., 1969, Redlands; Ph.D., 1972, Washington; audiology.

Schubert, Mark, 1975, ‡(Oral Medicine), D.D.S., 1974, M.S.D., 1981, Washington; oral medicine.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

OTOL 498 Undergraduate Thesis (*, AWSpS Cummings, Rubel) Student works directly with department faculty in selecting a suitable area for laboratory or clinical research in the area of otolaryngology, and develops a thesis for recognition. Prerequisite: permission of instructor.

OTOL 499 Undergraduate Research (*, AWSpS Cummings, Rubel) Research opportunities offered under direction in the area of otolaryngology. May be repeated for credit. (Twelve weeks.)

OTOL 680P Otolaryngology Clerkship (8, max. 24) Four-week clinical rotation at University Hospital, Veterans Administration Hospital, Children's Hospital and Medical Center, Harborview Medical Center, or Pacific Medical Center (one student at each facility). Clinic, operating room, and inpatient experience. Students assigned to hospitals on first day of clerkship according to interests and availability. Prerequisite: human biology series.

OTOL 683P Otolaryngology Externship (*, max. 8) AWSpS Blakeslee (Madigan Hospital Medical Center) Individual externship training at outpatient clinic, where visits average twelve hundred per month, supplemented by inpatient assignments. Students reside at the hospital during externship, using facilities of bachelor officer quarters and hospital mess. Prerequisite: completion of human biology series. (Two or four weeks, full-time.)

OTOL 686P Otolaryngology: Medical and Surgical Aspects (*, max. 12) AWSpS Cummings Clinical in-depth study for the student whose interest lies in pathology of the head and neck. Reasonable flexibility to arrange course content that provides exposure to all aspects of patient care.

OTOL 697P Otolaryngology Special Electives (*, max. 24) AWSpS Cummings By specific arrangement. Special clerkship, externship, or research opportunities can at times be made available at institutions other than the University of Washington. Students wishing to elect this course should obtain from the Dean's office a special assignment form at least one month before preregistration. Prerequisite: permission of instructor.

Pathology

C506 Health Sciences

Pathology is both a basic biological science and a specialty of medicine. As a basic science, it deals with the natural history and mechanisms of initiation and expression of disease processes. In its broadest sense, the study of disease encompasses the entire animal and plant kingdoms. The interests of the department focus on diseases of vertebrates, especially of man. The principal aim of the pathologist is to understand disease manifestations and processes in whatever terms are required. Therefore, the techniques of the pathologist range from those of the physicist and physical chemist through those of the physiologist to the realm of the epidemiologist. Present emphasis in the department is on cellular and molecular pathology, environmental pathology, and analysis of disease by methods of cell and molecular biology, light and electron microscopy, histochemistry and cytochemistry, analytical biochemistry, cell and organ culture, and immunology.

Graduate Program

Peter H. Byers, Graduate Program Coordinator
Thomas N. Wight, Alternate Graduate Program Coordinator

The Department of Pathology offers graduate training in experimental pathology, with an emphasis on the cellular and molecular biological basis of disease, leading to the Doctor of Philosophy degrees in experimental pathology. Students are accepted on a limited basis into the Master of Science degree program. The aim of the graduate program is to train individuals for a career in the scientific investigation of basic disease mechanisms. The program encompasses students and faculty members with diverse interests, which range from investigation of specific disease conditions to the molecular basis of alterations in cell function and of gene expression. Faculty members' interests include the normal and pathological aspects of cardiovascular biology, tumor biology, environmental effects on normal processes, biology of aging, neurobiology, immune response, inflammation and repair, immunopathology and biology of extracellular matrix, as well as fundamental processes that underlie disease, such as regulation of gene expression and protein synthesis, structure and function of oncogenes, viral and nonviral transformation, chromatin structure, mutagenesis and DNA repair, and genetic recombination. The department's graduate faculty comprises forty members, who are located at the Health Sciences Center, Veterans Administration Hospital, Harborview Medical Center, Children's Hospital and Medical Center, and Fred Hutchinson Cancer Research Center. Thirty full-time students are pursuing the Ph.D. degree.

Students in the program are expected to fulfill course work requirements during the first two years. In line with the diversity of faculty members' interests within the department, course requirements are kept to a minimum to provide students with maximum flexibility.

Special Requirements

Prospective candidates are expected to have had undergraduate experience in biology, physics, chemistry, and mathematics and acceptable scores on the Graduate Record Examination, including advanced biology or chemistry. Those wishing to matriculate toward both the M.D. and Ph.D. degrees must gain admission to both the Graduate School and the School of Medicine.

Financial Aid

Funding for students is provided from departmental and University funds, training grants, a variety of institutional fellowships, and research grants of individual faculty members.

Research Facilities

The department emphasizes the cellular and molecular approach to the investigation of the pathogenesis of disease in mammalian species. Special facilities exist for training in electron microscopy; cell, tissue, and organ culture; histochemistry and cytochemistry; analytical biochemistry; immunology; and molecular and cell biology.

Correspondence and Information

Graduate Program Coordinator
Department of Pathology, SM-30

Residency Training Program

The department supervises an internship and residency training program in anatomic pathology and, jointly with the Department of Laboratory Medicine, in clinical pathology for qualified medical doctors. Persons who complete the residency program are eligible for certification by the American Board of Pathology. Dennis D. Reichenbach is program director.

Correspondence and Information

Resident Program Director
Department of Pathology, SM-30

Faculty**Chairperson**

Russell Ross

Professors

Albers, John J.,* 1971, (Research), ‡(Medicine), M.S., 1967, Ph.D., 1969, Illinois; lipoprotein metabolism.

Alvord, Ellsworth C.,* 1960, (Neurological Surgery), M.D., 1946, Cornell; neuropathology, experimental allergic encephalitis.

Benditt, Earl P.,* 1957, (Emeritus), M.D., 1941, Harvard; atherosclerosis, diabetes mellitus, amyloidosis.

Byers, Peter H.,* 1977, (Medicine), † M.D., 1969, Case Western Reserve; extracellular matrix synthesis, genetic disorders of collagen metabolism, secretion of collagen.

Eisenman, Robert N.,* 1976, (Affiliate), (Biochemistry), † Ph.D., 1971, Chicago; viral oncology, oncogenes, retrovirus, multiplication.

Groudine, Mark T.,* 1979, ‡(Radiation Oncology), M.D., 1975, Ph.D., 1976, Pennsylvania; cellular differentiation.

Haggitt, Rodger C., 1984, ‡(Medicine), M.D., 1967, Tennessee; anatomic pathology.

Hellström, Ingegerd E.,* 1966, ‡(Microbiology), M.D., 1964, Ph.D., 1966, Karolinska Institute (Sweden); tumor immunology.

Hellström, Karl E.,* 1966, (Microbiology), M.D., 1964, Ph.D., 1964, Karolinska Institute (Sweden); tumor immunology.

Landolt, Marsha L.,* 1975, ‡(Fisheries), M.S., 1970, Oklahoma; Ph.D., 1975, George Washington; fisheries and wildlife pathology.

Loeb, Lawrence A.,* 1978, ‡(Biochemistry), M.D., 1961, New York; Ph.D., 1967, California (Berkeley); fidelity of DNA replication, molecular basis of mutagenesis, chemical carcinoma.

Martin, George M.,* 1957, (Genetics), M.D., 1953, Washington; somatic cell genetics, pathobiology of aging.

McDougall, James K.,* 1979, (Research), M.Sc., 1970, Ph.D., 1971, Birmingham (England); virology, neoplasia.

Mottet, N. Karl,* 1959, (Environmental Health), † M.D., 1952, Yale; environmental pathology, teratology, toxic effects of mercury and other trace metals.

Narayanan, A. Sampath,* 1971, (Research), M.Sc., 1963, Ph.D., 1967, Madras (India); connective tissue, periodontal disease.

Neiman, Paul E.,* 1968, ‡(Medicine), M.D., 1964, Washington; oncology, leukemia.

Norwood, Thomas H.,* 1974, M.D., 1968, Maryland; somatic cell genetics, pathobiology of aging, mitotic cell cycle regulatives.

Page, Roy C.,* 1967, (Periodontics), † D.D.S., 1957, Maryland; Ph.D., 1967, Washington; connective-tissue pathology, chronic inflammation, immunopathology, periodontal disease.

Reichenbach, Dennis D.,* 1966, M.D., 1958, Washington; cardiovascular pathology.

Ross, Russell,* 1962, ‡(Biochemistry), D.D.S., 1955, Columbia; Ph.D., 1962, Washington; atherosclerosis, connective tissue pathology, wound healing.

Rubin, Cyrus E., 1954, ‡(Medicine), M.D., 1945, Harvard, gastroenterology.

Schwartz, Stephen M.,* 1974, (Bioengineering), M.D., 1967, Boston; Ph.D., 1973, Washington; vascular biology, atherosclerosis, hypertension, cell kinetics, image analysis.

Shaw, Cheng-Mei,* 1980, (Neurological Surgery), M.D., 1950, National Taiwan; neuropathology, immunopathology, trace metal neurotoxicology.

Spence, Alexander M., 1974, (Medicine), † M.D., 1965, Chicago; neuropathology.

Sumi, S. Mark,* 1966, (Medicine), † M.D., 1956, Toronto; neuropathology, neuromuscular disease, neurodegenerative diseases.

Van Hooser, Gerald L.,* 1975, ‡(Animal Medicine), D.V.M., 1957, Texas A&M; veterinary pathology.

Vracko, Rudolf,* 1963, M.D., 1958, Munich (Germany); endocrine pathology, tissue complications of diabetes mellitus, function of basal lamina in tissue repair.

Weintraub, Harold M.,* 1979, (Affiliate), (Zoology), † Ph.D., 1971, M.D., 1973, Pennsylvania; gene regulation and chromosome structure.

Associate Professors

Benjamin, Denis R.,* 1975, (Pediatrics), (Laboratory Medicine), † M.B.B.Sc., 1968, Witwatersrand (South Africa); pediatric pathology.

Bowen-Pope, Daniel F.,* 1982, Ph.D., 1979, California (Berkeley); gene regulation, growth factors and receptors.

Brown, Joseph P.,* 1982 (Affiliate), Ph.D., 1974, Cambridge (England); structure and function of tumor-associated cell-surface proteins.

Chi, Emil Y., 1972, (Research), M.A., 1968, California State (Los Angeles); Ph.D., 1971, California (Santa Barbara); lung pathology, mast cell structure and function.

Cowan, Marie J.,* 1979, (Medicine), (Physiological Nursing), † M.S., 1972, Ph.D., 1979, Washington; cardiovascular pathology, electrocardiography.

Disteche, Christine,* 1980, Ph.D., 1976, Liege (Belgium); molecular genetics, human and mouse cytogenetics.

Galloway, Denise, 1982, (Research), Ph.D., 1976, City, (New York); herpes viruses transformation and latency.

Gelinas Richard E.,* 1985, (Affiliate), Ph.D., 1974, Harvard; expression of human genes in bone marrow cells as one approach to a gene therapy for thalassemia and sickle cell disease.

Geyer, Stanley J., 1984, M.D., 1974, Jefferson Medical; immunogenic aspects of tumor growth.

Gown, Allen C.,* 1979, M.D., 1975, Albert Einstein; human atherosclerosis, immunohistochemistry, cytoskeleton.

Haas, Joel E.,* 1977, (Pediatrics), M.D., 1967, Pittsburgh; pediatric pathology.

Huang, Thomas W.,* 1971, M.D., 1961, National Taiwan; Ph.D., 1973, Washington; pulmonary pathology, renal pathology, structure and function of basal lamina.

Kiviat, Nancy C., 1978, M.A., 1969, M.D., 1975, Washington.

Kocan, Richard M.,* 1978, (Research), ‡(Fisheries), M.S., 1965, Ph.D., 1967, Michigan State; mutagenesis, environmental toxicology, genotoxicity.

Lewis, James B., 1982, (Affiliate), M.A., 1968, Ph.D., 1972, Harvard; molecular biology of adenovirus, oncogenic transformation regulation of eucaryotic gene expression.

Linial, Maxine,* 1974, (Research), ‡(Microbiology), Ph.D., 1970, Tufts; tumor viruses, molecular biology.

Margolis, Robert L.,* 1982, (Affiliate), (Biochemistry), † Ph.D., 1975, Wesleyan; regulation of microtubule assembly and steady behavior mitotic.

Nelson, Alan C., 1987, ‡(Bioengineering, Electrical Engineering), M.A., 1976, Ph.D., 1980, California (Berkeley).

Rabinovitch, Peter S.,* 1981, M.D., 1979, Ph.D., 1980, Washington; cell cycle alterations in cellular aging and neoplastic, flow cytometry.

Reay, Donald T., 1975, M.D., 1963, Utah; M.P.A., 1978, Seattle; forensic medicine.

Reidy, Michael A.,* 1980, (Research), M.Sc., 1972, Guelph (Ontario); Ph.D., 1976, Cambridge; atherosclerosis, vascular endothelial cells, arterial injury and repair.

Rohrschneider, Larry R.,* 1978, (Research), ‡(Microbiology), Ph.D., 1973, Wisconsin; oncogenes, molecular and cell biology of neoplastic transformation.

Sale, George E., 1975, M.D., 1968, Stanford; immunopathology of bone marrow transplantation, graft-versus-host reaction.

Shulman, Howard M., 1977, M.D., 1971, California (Los Angeles); graft-versus-host disease.

Smith, Gerald R.,* 1983, (Affiliate), (Genetics), † Ph.D., 1970, Massachusetts Institute of Technology; molecular biology of genetic recombination and regulation of gene expression.

Thorning, David R., 1975, M.D., 1965, Kansas; anatomic pathology, pulmonary pathology, electron microscopy.

Wiegenstein, Louise L., 1953, (Emeritus), M.D., 1946, Tufts; pathology.

Wight, Thomas N.,* 1978, M.S., 1968, Ph.D., 1972, New Hampshire (Durham); atherosclerosis, ultrastructure, proteoglycan chemistry.

Wolf, Norman S.,* 1968, (Animal Medicine), D.V.M., 1953, Kansas State; Ph.D., 1960, Northwestern; radiobiology, developmental hematology, reticuloendothelial system, laboratory animal disease.

Assistant Professors

Alpers, Charles E., 1986, M.D., 1978, Rochester.

Bryant, Eileen M., 1985, (Research), Ph.D., 1981, Washington; cytogenetics, medical genetics.

Eriksen, Nils, 1952, (Research), Ph.D., 1944, Washington; amyloidosis.

Fligner, Corinne L., 1984, ‡(Laboratory Medicine), M.D., 1976, New Mexico; forensic pathology, forensic and clinical toxicology.

Gajdusek, Corinne M.,* 1981, (Research), (Surgery), † Ph.D., 1972, Colorado; endothelial cells.

Gellinas, Richard E.,* 1985, (Affiliate), Ph.D., 1974, Harvard.

Gordon, David, 1985, M.D., 1979, Harvard; vascular muscle cell differentiation, proliferation.

Hackman, Robert E., 1978, (Research), M.D., 1971, Stanford; marrow transplantation.

Heimark, Ronald L., 1986, (Research), Ph.D., 1976, California (Davis).

Lewis, James B.,* 1982, (Affiliate), M.A., 1968, Ph.D., 1972, Harvard.

Margolis, Robert L.,* 1982, (Affiliate), ‡(Biochemistry), Ph.D., 1975, Wesleyan.

McNutt, Michael A., 1986, M.D., 1987, Minnesota.

Monnat, Raymond J.,* 1982, M.D., 1976, Chicago; somatic mutation, somatic cell and molecular genetics.

Myerson, David, 1985, M.D., 1979, Ph.D., 1979, Albert Einstein; RNA tumor viruses, molecular biology.

Nepom, Gerald T.,* 1982, (Affiliate), Ph.D., 1977, M.D., 1978, Washington.

Price, Lillian M.,* 1985, (Research), (Animal Medicine), V.M.D., 1972, Ph.D., 1983, Pennsylvania; veterinary medicine.

Siebert, Joseph R., 1986, (Research), M.S., 1984, Ph.D., 1985, Washington.

Simrell, Charles R., 1987, (Laboratory Medicine), M.D., 1978, Florida.

Zakian, Virginia A.,* 1982, (Affiliate), Ph.D., 1975, Yale; initiation of DNA replication, eukaryotic chromosome structure.

Instructor

Meek, Rick L., 1983, (Research), Ph.D., 1978, California (Santa Cruz); molecular biology of serum amyloid A, amyloidosis.

Lecturers

Ek, Marit, 1977, (Obstetrics and Gynecology), M.B.Ch.B., 1959, Cape Town (South Africa); surgical pathology, anatomical pathology, gynecological pathology.

Haggitt, Mary J., 1986, M.D., 1979, Tennessee (Memphis).

Lee, Ming-Jong, 1972, M.D., 1963, Gunma (Japan); surgical pathology, anatomical pathology.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

PATH 410 Introduction to Pathology (4) A Wolf Study of causes, processes, and effects of important diseases. Combines basic and systemic pathology. Required for students in medical technology, and physical therapy. Prerequisites for other students: MICRO 301 and/or equivalent courses in human anatomy, human physiology, and microbiology, and permission of instructor or adviser on individual or group basis.

PATH 444 General Pathology (4) W Bowen-Pope, Page Basic pathologic processes that underlie disease, including cell alterations, genetic and developmental pathology, environmental pathology, neoplasia, immunopathology, inflammation, and infection. Correlates the gross, functional, and biochemical alterations. For second-year dental students and graduate students. Requires a reasonable grounding in biological and chemical sciences. Prerequisite for nondental and nonpharmacy students: permission of instructor.

PATH 445 Systemic Pathology (3) A Rabinovitch Survey of pathologic processes affecting organs and systems pertinent to the practice of dentistry. Lectures and demonstrations present a coherent picture of systemic disease. For first-year dental students, graduate students, and others with a reasonable background in biologic and chemical sciences. Prerequisites: 444 and permission of instructor for nondental students.

PATH 498 Undergraduate Thesis (*) AWSpS Elective. Prerequisite: permission of instructor.

PATH 499 Undergraduate Research (*) AWSpS Elective. May be repeated for credit. Prerequisite: permission of instructor.

PATH 500 Principles of Pathology (5) Basic disease processes such as inflammation, neoplasia, cell alteration, and genetic and developmental pathology. Lectures, laboratory exercises, and demonstrations that are important in biologic medical research. For graduate students and advanced undergraduates in the biological sciences. Suitable knowledge of either biochemistry or biological structure is strongly recommended. Prerequisite: permission of instructor.

PATH 501 Cellular Response to Injury (3, max. 9) AWSpS Lecture-seminar. Considerations of current concepts of cellular and subcellular reactions to injury, including neoplasia, as studied by modern techniques of cell biology. Required of all pathology graduate students. Prerequisite: permission of instructor.

PATH 502 Inflammation and Repair (2) Sp Lecture-seminar; a seminar course dealing with an in-depth examination of the processes involved in inflammation and repair. Offered on credit/no credit basis only. Prerequisite: permission of instructor. (Offered even-numbered years.)

PATH 507 Cellular Pathology (2) S Emphasis on application of recent developments and techniques in biology to problems of pathology. Series of lectures by eminent visiting scientists with expertise in the area being discussed. May be repeated for credit. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

CONJ 508 EM Methods and Interpretation (3-5) Halbrook, Wight See Conjoint Courses.

PATH 510 Anatomical Analysis of Disease (*, max. 30) AWSpS The anatomical features of human disease as revealed at surgery or postmortem by gross examination and light microscopy are correlated with chemical and physiologic changes. Prerequisites: graduate student standing and permission of instructor.

CONJ 512 Introduction to the Anatomical Analysis of Animal Disease (5, max. 10) AWSp See Conjoint Courses.

CONJ 514 Comparative Pathology Conference (1, max. 6) AWSp See Conjoint Courses.

PATH 520 Experimental Pathology Seminar (1) AWSpS Loeb, Schwartz Review of current research in various areas of experimental pathology by members of the department and visiting scientists. May be repeated for credit. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

CONJ 520 Anatomy and Autopsy (1 or 2) See Conjoint Courses.

PATH 522 Hematopathology (2) W Kidd Identification of normal lymphocyte and bone marrow subpopulations, diagnosis of leukemias, lymphomas, and benign conditions that resemble them. Emphasis on histopathology, cytochemical and immunological markers. Clinicopathologic correlation. Joint with LAB M 522. Offered on credit/no credit basis only.

PATH 530 Human Cytogenetics (*, max. 4) W Distèche Sources and methods of preparation and identification of human chromosomes. Molecular struc-

ture and mapping of chromosomes. Human cytogenetic pathology: karyotype-phenotype interactions, chromosome breakage, and cancer cytogenetics. Prerequisite: permission of instructor. (Offered odd-numbered years.)

PATH 535 Fundamentals of Human Disease (*, max. 20) Students study human pathology through participation in the autopsy service under direct supervision of a faculty member. They analyze the histologic, cellular, and biochemical aspects of selected cases, and present their observations in weekly seminars. Prerequisites: 444 or 555 and permission of course director; graduate students only.

PATH 536 Microscopy of Environmental Diseases (3) W Mottet Examples of human disease selected to cover major patterns of disease processes. Summaries of clinical and autopsy findings and microscope slides from unusually instructive cases are studied. Case reviewed with graduate faculty member, and gross organ lesions shown. Emphasis on critical evaluation of literature and areas needing search. Prerequisites: 444 or 500 or 555, and permission of instructor.

PATH 551 Experimental and Molecular Pathology (2-5, max. 20) AWSpS Byers, Wight, Staff Introduction to experimental pathology. A tutorial course designed to introduce a graduate student (medical, dental) or senior undergraduate to selected methods and problems through literature surveys and/or laboratory experience. Exploration of causes at the cellular and molecular levels in the study of disease is emphasized. Prerequisite: permission of instructor.

PATH 552 Contemporary Anatomic Pathology (2-5, max. 30) AWSpS Reichenbach Study of recent developments in anatomic pathology. Subject includes areas of basic science and review of systemic pathology. Recent developments and interpretation of these findings are stressed. For pathology residents, fellows, and trainees. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

PATH 555 Environmental Pathology (3) Mottet Selected cases of human diseases caused by environmental chemical exposures and ionizing radiations. Seminar format with active student participation. Cellular and subcellular reaction to chemical injury. Prerequisites: 410 or 444 or HUBIO 520P and permission of instructor; recommended: ENVH 515 or equivalent.

PATH 559 Quantitative Cytometry (1) Schwartz Introduces the new technology involved in analysis of morphologic data via image processing, including morphometry, quantitative absorption cytometry, flow cytometry, and digital image reconstruction. Applications include a wide range of basic biology as well as clinical disciplines. Prerequisite: background in electrical engineering or appropriate biological science.

CONJ 560, 561 Tumor Biology (3,2) See Conjoint Courses.

PATH 560P Analysis of Human Disease (*, max. 10) AWSpS Beginning with a human disease problem, the student individually develops a working hypothesis, discusses the problem with appropriate pathology faculty member, and jointly designs an experiment to test the hypothesis. A written report is required. Prerequisite: second-year medical student standing.

PATH 562P Cardiovascular Pathology Conference (*) AWSpS Reichenbach Course consists of two parts: a laboratory review of gross and microscopic cardiovascular pathology of selected autopsied cases followed by a combined clinical (medical and/or surgical) and pathology conference discussing these cases. Prerequisites: HUBIO 540P and permission of instructor.

PATH 563 Neuropathology (*) AWSpS Alvord, Shaw, Sumi Course consists of ten parts. Conferences on gross neuropathology (brain cutting and clinical

copathologic correlations) held at six hospitals. Weekly neurology or surgical neuropathology conferences, neuropathology slide show, and neuropathology laboratory case studies. Prerequisite: permission of instructor.

PATH 564 Neuropathology Brain Modeling (4) S. Alvord Designed along clinically important, functional, neuroanatomic lines, generally based first on the embryologic development of the most primitive segmental elements (sensory, motor and association cells, and simple reflexes), followed by the more elaborate suprasegmental elements (cerebellum, colliculi, and forebrain).

PATH 571 Neuroanatomic Pathology (*) W. Alvord, Shaw, Sumi The particular diseases occurring in specific parts of the nervous system are considered in terms of the segmental, intersegmental, and suprasegmental components. Clinicopathologic correlations are emphasized. Prerequisite: permission of instructor; recommended as concurrent course: 563.

PATH 572 Neuropathologic Reactions (*) A. Alvord, Shaw, Sumi The reactions of the nervous system, considered in terms of congenital malformations, inflammations, vascular, traumatic, metabolic-toxic, degenerative, and neoplastic diseases peculiar to the nervous system as a whole. Clinicopathologic correlations are emphasized. Prerequisite: permission of instructor; recommended as concurrent course: 563.

PATH 574 Systemic Pathology I (3) Mottet Case examples of human disease correlate clinical findings with gross and microscopic pathology. Etiology, pathogenesis, and interpretation of laboratory tests. Cardiovascular, pulmonary, reproductive and CNS problems to correspond with HUBIO organ systems courses. Students present cases. Prerequisites: HUBIO 520P or equivalent general pathology course, and permission of instructor.

PATH 576 Systemic Pathology II (3) W. Mottet Continuing in the pattern of 574, case examples of gastrointestinal, hematopoietic, lymphoreticular, musculoskeletal, urinary, skin systems, and forensic pathology discussed by students. Relevant laboratory interpretations. Student presentations. Prerequisites: HUBIO 520P or equivalent general pathology course, and permission of instructor.

PATH 584 Neuropathology Brain Modeling Laboratory (4) S. Alvord Clinically important, functional neuroanatomic study based on embryologic motor, sensory, and association cells and simple reflexes, followed by the more elaborate suprasegmental elements (cerebellum, colliculi, forebrain). Three-dimensional neuroanatomical relationships, critical for understanding neuropathology, can best be obtained in constructing a brain model. Prerequisite: 564, which may be taken concurrently.

PATH 600 Independent Study or Research (*) AWSpS Offered on credit/no credit basis only.

PATH 665P Surgical Pathology (*) AWSpS Study of fresh current gross surgical specimens and autopsy specimens and their correlation to a patient's clinical course through observation of pathologists working in a large hospital setting. Prerequisite: permission of instructor.

PATH 666P Renal Pathology Conference (1) AWSpS Conference-seminar on the histopathologic aspects of renal disease. May be taken concurrently with MED 693P. For third- and fourth-year students. Prerequisite: permission of instructor.

PATH 667P Renal Pathology Laboratory (*, max. 6) AWSpS Laboratory elective for third- and fourth-year medical students. Read current literature, review various renal biopsies and urine sediments, and read standard texts prior to a weekly topic-oriented conference. All students earn 1 credit for one-hour seminar per week. May be taken concurrently with MED 693P. Prerequisite: permission of instructor.

PATH 668P Skin Pathology (*) AWSpS Histopathological aspects of skin diseases are presented and discussed in a group-conference type of seminar. Current dermatologic cases also are discussed. Prerequisites: dermatology elective and permission of instructor.

PATH 673P Cardiovascular Pathology (*) W. Reichenbach Spectrum of cardiovascular pathology covered in depth by case studies and gross and microscopic material. Case analysis for presentation, including clinical and gross and microscopic material, prepared outside of class time. Clinicopathologic correlation is emphasized. Prerequisites: HUBIO 540P and permission of instructor and second-year medical student standing.

PATH 679P Pathology Summer Clerkship (*, max. 24) S. Dissection, writeup, and literature review of autopsy and surgical pathology specimens by students. Emphasis on etiology and pathogenesis of disease as a biological process. Designed for students who have not completed organ systems as covered in Human Biology courses. Offered at University Hospital, Harborview Medical Center, Veterans Administration Hospital, Madigan Hospital Medical Center, and Swedish Hospital. Prerequisites: HUBIO 520P and completion of first year of medical school.

PATH 680P Diagnostic Pathology Clerkship—University Hospital (*, max. 24) AWSp Haggitt Medical student participation in dissection and study of autopsy and surgical pathology cases. Cases worked up under senior staff, including dissection, microscopic examination, and literature review. Attendance at pathology conferences and seminars expected. Prerequisite: third- or fourth-year student standing.

PATH 681P Diagnostic Pathology Clerkship—Harborview Medical Center (*, max. 24) AWSp Reay, Reichenbach For description and prerequisite, see 680P.

PATH 682P Diagnostic Pathology Clerkship—Veterans Administration Hospital (*, max. 24) AWSp Vracko For description and prerequisite, see 680P.

PATH 683P Diagnostic Pathology Clerkship—Medical Examiner's Office (*, max. 24) AWSp Mulen For description and prerequisite, see 680P.

PATH 684P Diagnostic Pathology Clerkship—Laboratory Pathology of Seattle (*, max. 24) AWSp LaZerte For description and prerequisite, see 680P.

PATH 685P Diagnostic Pathology Clerkship—Sacred Heart Hospital, Spokane (*, max. 24) AWSp Haas For description and prerequisite, see 680P.

PATH 686P Diagnostic Pathology Clerkship—Overlake Medical Center (*, max. 24) AWSp Coplin For description and prerequisite, see 680P.

PATH 687P Diagnostic Pathology Clerkship—Children's Hospital and Medical Center (*, max. 24) AWSp For description and prerequisite, see 680P.

PATH 688P Diagnostic Pathology Clerkship—Madigan Army Medical Center (*, max. 24) AWSp For description and prerequisite, see 680P.

PATH 689P Diagnostic Pathology Clerkship—Valley Medical Center (*, max. 24) AWSp For description and prerequisite, see 680P.

PATH 690P Diagnostic Pathology Clerkship—Northwest Medical Center (*, max. 24) AWSp For description and prerequisite, see 680P.

PATH 691P Diagnostic Pathology Clerkship—General Hospital of Everett (*, max. 24) AWSp For description and prerequisite, see 680P.

PATH 692P Diagnostic Pathology Clerkship—Group Health Cooperative (*, max. 24) AWSp For description and prerequisite, see 680P.

PATH 697P Pathology Special Electives (*, max. 24) By specific arrangement, students can have clerkships, externships, or research opportunities at institutions other than the University of Washington. Students who wish to elect this course should obtain Special Assignment forms from the Dean's office at least one month before advance registration. Prerequisite: permission of instructor.

PATH 700 Master's Thesis (*) AWSpS

PATH 800 Doctoral Dissertation (*) AWSpS

Pediatrics

RR314 Health Sciences

Pediatrics involves the study of physical and behavioral development of man, in health and disease, from conception to maturity.

Instruction is provided through conjoint courses, lectures, conferences, clerkships, and electives. Faculty members participate in teaching the basic curriculum and offer twenty-four electives, including PEDS 685P (Pediatric General Clerkship), which almost all medical students take. A residency program is offered with a wide variety of electives in addition to traditional hospital inpatient and clinic experience. Postdoctoral training is available in many subspecialty areas of pediatrics. The major teaching hospitals are Children's Hospital and Medical Center, University Hospital, and Harborview Medical Center.

Faculty

Chairperson

Herbert T. Abelson

Professors

Abelson, Herbert T., 1983, M.D., 1966, Washington (St. Louis); hematology-oncology.

Bergman, Abraham B., 1964, (Health Services), M.D., 1958, Case Western Reserve; general pediatrics.

Bernstein, Irwin D., 1973, M.D., 1967, New York; hematology, oncology.

Bleyer, Werner A., 1975, (Medicine, Radiation Oncology), M.D., 1969, Rochester; hematology, oncology.

Chen, Shi-Han, 1972, (Research), M.S., 1963, National Taiwan; Ph.D., 1968, Texas (Austin); pediatric genetics.

Corey, Lawrence, * 1977, † (Laboratory Medicine, Medicine, Microbiology), M.D., 1971, Michigan; laboratory medicine.

Deisher, Robert W., 1949, (Emeritus), M.D., 1944, Washington; adolescent medicine.

Emanuel, Irvin, * 1966, (Epidemiology), † M.A., 1956, Arizona; M.D., 1960, Rochester; M.S.P.M., 1966, Washington; child development and mental retardation.

French, James W., 1970, M.D., 1963, Michigan; pediatric cardiology.

Graham, C. Benjamin, 1965, (Radiology), † M.D., 1958, Washington; radiology, pediatrics.

Guntheroth, Warren G., 1958, M.D., 1952, Harvard; pediatric cardiology.

Guralnick, Michael J., 1986, (Psychology), † M.S., 1964, Ph.D., 1967, Lehigh.

Hayden, Patricia W., 1964, (Radiology), M.D., 1953, Rochester; congenital defects.

Hodson, W. Alan, 1966, M.D., 1959, Manitoba; M.M.Sc., 1964, Ohio State; neonatal biology.

Kelley, Vincent C., 1958, (Emeritus), M.S., 1935, North Dakota; Ph.D., 1942, M.D., 1946, Minnesota; endocrinology.

Labbe, Robert F.* 1957, ‡(Laboratory Medicine), M.S., 1949, Ph.D., 1951, Oregon State; laboratory medicine.

Lemire, Ronald J., 1967, M.D., 1962, Washington; teratology.

Mackler, Bruce, 1957, M.D., 1943, Temple; developmental biology.

Neff, John M., 1981, M.D., 1960, Harvard; infectious disease.

Novack, Alvin H., 1979, (Health Services), M.D., 1958, Temple; general pediatrics.

Ochs, Hans D., 1969, M.D., 1962, Friburg (West Germany); immunology.

Pious, Donald A.* 1964, (Genetics), M.D., 1956, Pennsylvania; developmental biology.

Reichler, Robert J., 1976, ‡(Psychiatry and Behavioral Sciences), M.D., 1961, Albert Einstein; psychiatry.

Robertson, William O., 1963, M.D., 1949, Rochester; general pediatrics.

Robinson, Nancy M.* 1974, ‡(Psychiatry and Behavioral Sciences, Psychology), M.A., 1953, Ph.D., 1958, Stanford; psychology.

Rothenberg, Michael B., 1967, (Emeritus), (Psychiatry and Behavioral Sciences), † M.D., 1954, Case Western Reserve; psychiatry and behavioral sciences.

Ruvalcaba, Rogelio H. A., 1966, M.D., 1957, Universidad de Guadalajara (Mexico); endocrinology.

Scott, C. Ronald,* 1965, M.D., 1959, Washington; pediatric genetics.

Sells, Clifford J.,* 1970, M.D., 1963, Washington; M.P.H., 1968, California (Berkeley); child development and mental retardation.

Shepard, Thomas H. II,* 1955, ‡(Environmental Health, Obstetrics and Gynecology), M.D., 1948, Rochester; embryology.

Shurtleff, David B.,* 1960, M.D., 1955, Tufts; congenital defects.

Smith, Arnold L., 1978, (Medicine, Microbiology), M.S., 1964, M.D., 1964, Missouri; infectious disease.

Smith, Nathan J., 1965, (Emeritus), (Orthopaedics), † M.D., 1945, Wisconsin; orthopaedics, pediatrics.

Stevenson, James G., 1976, M.D., 1970, Baylor; pediatric cardiology.

Tapper, David, 1983, ‡(Surgery), M.D., 1970, Maryland; surgery.

Truog, William E., 1978, M.D., 1973, Chicago; neonatal biology.

Wedgwood, Ralph J., 1962, M.D., 1947, Harvard; arthritis.

Woodrum, David E., 1971, M.D., 1965, Illinois; neonatal biology.

Associate Professors

Benjamin, Denis,* 1975, ‡(Laboratory Medicine, Pathology), M.B.B.Sc., 1968, Witwatersrand (South Africa); laboratory medicine and pathology.

Bennett, Forrest C., 1977, M.D., 1970, Minnesota; child development and handicapped children.

Blumhagen, Joel D., 1977, ‡(Radiology), M.D., 1973, Washington (St. Louis); radiology.

Brewer, David K., 1978, ‡(Radiology), M.D., 1972, Harvard; radiology.

Clarren, Sterling K., 1978, M.D., 1973, Minnesota; congenital defects.

Connell, Frederick A.,* 1976, ‡(Epidemiology, Health Services), M.D., 1972, New York; M.P.H., 1978, Washington; health services.

Fantel, Alan G.,* 1974, (Research), (Environmental Health), M.A., 1969, Oregon; Ph.D., 1974, Washington; embryology, teratology.

Farwell, Jacqueline R., 1979, (Medicine), (Neurological Surgery), † M.D., 1972, California (San Francisco); neurological surgery, pediatrics.

Haas, Joel E.,* 1977, ‡(Pathology), M.D., 1967, Pittsburgh; pathology.

Holm, Vanja A., 1965, M.D., 1954, Karolinska Instit. (Sweden); child development and mental retardation.

Kawabori, Isamu, 1973, M.D., 1966, Washington; pediatric cardiology.

McLaughlin, John F., 1977, M.D., 1970, Northwestern; congenital defects.

Millstein, Jerrold M., 1977, (Medicine), M.D., 1964, Minnesota; pediatric neurology.

Mirkes, Philip E., 1979, (Research), M.S., 1967, Ph.D., 1970, Michigan; teratology.

Murray, Jeffrey P., 1980, ‡(Anesthesiology), M.D., 1974, Rochester; anesthesiology.

Myers, Wayne W., 1975, A.M., 1962, Harvard; M.D., 1966, Rochester; general pediatrics.

Osborne, William R. A., 1975, (Research), M.Sc., 1970, Bristol (England); Ph.D., 1972, Kings (England); pediatric genetics.

Pagon, Roberta A., 1975, ‡(Medicine, Ophthalmology), M.D., 1972, Harvard; ophthalmology, pediatrics.

Pendergrass, Thomas W., 1979, ‡(Epidemiology), M.D., 1971, Tennessee; hematology, oncology.

Redding, Gregory J., 1980, M.D., 1974, Stanford; neonatal biology.

Rivara, Frederick P. II, 1984, ‡(Epidemiology), M.D., 1974, Pennsylvania; M.P.H., 1980, Washington; general pediatrics.

Sanders, Jean E., 1975, M.D., 1970, Iowa; hematology, oncology.

Smith, Elizabeth K., 1957, (Research), (Emeritus), (Laboratory Medicine), M.S., 1939, Michigan; Ph.D., 1943, Iowa; laboratory medicine, pediatrics.

Standaert, Thomas A., 1971, (Research), Ph.D., 1970, Duke; neonatal biology.

Sulzbacher, Stephen I., 1966, ‡(Education), (Psychiatry and Behavioral Sciences), † A.M., 1964, Hollins; Ph.D., 1971, Washington; psychiatry and behavioral sciences.

Sybert, Virginia P., 1979, (Medicine), M.D., 1974, State University of New York (Buffalo); genetics and dermatology.

Tyler, Donald C., 1977, (Anesthesiology), † M.D., 1970, Pennsylvania; anesthesiology, pediatrics.

Wilson, Christopher B., 1979, M.D., 1972, California (Los Angeles); infectious disease.

Assistant Professors

Andrews, Robert G., 1982, M.D., 1976, Minnesota; hematology/oncology.

Bell, Thomas A.,* 1980, (Epidemiology), † M.D., 1971, Tufts; M.P.H., 1974, California (Berkeley); general pediatrics.

Bowden, Raleigh A., 1987, (Acting), M.D., 1987, Washington.

Burns, Jane L., 1986, M.D., 1978, Washington; infectious diseases.

Cotner, Thomas, 1982, (Research), Ph.D., 1978, Massachusetts Institute of Technology; developmental biology.

Davis, Kenneth A., 1979, (Research), Ph.D., 1966, Toronto; developmental biology.

Farrow, James A., 1979, ‡(Medicine), M.D., 1973, Baylor; adolescent medicine.

Hamilton, Brian L., 1981, ‡(Biological Structure), M.D., 1976, Washington; biological structure.

Hays, Ross M.,* 1983, ‡(Rehabilitation Medicine), M.A., 1978, Washington; psychiatry, pediatrics.

Hock, Randy A., 1986, (Acting), Ph.D., 1979, M.D., 1980, Johns Hopkins.

Jackson, J. Craig, 1982, M.D., 1979, Vanderbilt; neonatology and respiratory diseases.

Jaffe, Kenneth M.,* 1982, ‡(Rehabilitation Medicine), M.D., 1975, Harvard; M.R.M., 1982, Washington; rehabilitation medicine.

Karr, Daniel J., 1986, ‡(Ophthalmology), M.D., 1978, Miami.

Krane, Elliot J., 1983, ‡(Anesthesiology), M.D., 1977, Arizona.

Lynn, Anne M., 1981, ‡(Anesthesiology), M.D., 1975, Stanford; anesthesiology.

Marshall, Susan G., 1988, (Acting), M.D., 1980, California (Los Angeles); neonatal and respiratory diseases.

Mayock, Dennis E., 1980, M.D., 1975, Ohio State; neonatology and respiratory diseases.

Mendelman, Paul M., 1985, M.D., 1973, Ohio State; infectious diseases.

Moseley, Stephen L.,* 1985, ‡(Microbiology and Immunology), M.S., 1978, Catholic University of America; Ph.D., 1981, Washington; microbiology.

Murphy, Janet H., 1974, M.B.Ch.B., 1967, Victoria (England); neonatal biology and respiratory disease.

Nugent, Diane J., 1984, M.D., 1977, California (Los Angeles); hematology/oncology.

Quan, Linda, 1976, B.M.S., 1969, Dartmouth; M.D., 1971, Washington; general pediatrics.

Ramsey, Bonnie W., 1979, M.D., 1976, Harvard; general pediatrics.

Rosenbaum, David M., 1983, ‡(Radiology), M.D., 1977, Albert Einstein; radiology.

Rubens, Craig E., 1985, Ph.D., 1978, Medical University of South Carolina; M.D., 1982, Washington; molecular biology and genetics of infectious diseases.

Sherry, David D., 1984, M.D., 1977, Texas Technical; immunology/rheumatology.

Smith, Mark S., 1977, M.D., 1969, Virginia; adolescent medicine.

Sorensen, Gregory K., 1986, ‡(Anesthesiology), M.D., 1978, Nebraska.

Williams, Virginia, 1981, ‡(Anesthesiology), M.D., 1973, Tulane; anesthesiology.

Instructor

Mellins, Elizabeth D., 1983, M.D., 1978, Harvard; development biology.

Lecturers

Holterman, Virgil L., 1977, M.S.W., 1960, Washington; adolescent medicine.

Rice, Stephen G., 1977, (Orthopaedics), † M.D., 1974, Ph.D., 1974, New York; adolescent medicine.

Course Descriptions

Courses numbered with a P are not graduate courses and are restricted to medical student enrollment only.

PEDS 498 Undergraduate Thesis (*) AWSpS Robertson For medical students. Prerequisite: permission of instructor.

PEDS 499 Undergraduate Research (*) AWSpS Robertson Participation in various clinical or basic research programs in progress, specifically: child development, developmental biology, human embryology and teratology, medical genetics, infectious diseases, neonatology, neuroembryology, cardiology, endocrinology and metabolism, immunology, respiratory disease. Prerequisite: permission of instructor.

PEDS 500P Topics in Adolescent Medicine for Medical Professionals (1) WS Farrow Survey course on adolescent health-care topics, including psychological and physical development, sexuality, gynecological problems, chronic illness and hospitalization, acne treatment, office approach. Prerequisites: 665P, MED 665P, and PBSC 665P; postdoctoral medical trainees.

PEDS 501P Survey of Human Growth and Development (1½) AWSp Baker (Clinical Training Unit) Clinical observation and study of normal growth patterns in multiple areas of human development. Observation and increasing participation in patient interview, examination, and treatment plan. Survey of subjects covered in more detail in 502P-503P-504P. Credit not allowed for both 501P and 502P-503P-504P sequence.

PEDS 505P Preceptorship in Pediatrics (1) Robertson To provide opportunity for first- and second-year medical students to gain personal experience with medical practice situations for pediatricians by being stationed with carefully selected clinical faculty members in their offices. Prerequisite: permission of instructor. Enrollment limited. Coordinator: Department of Pediatrics.

PEDS 512P Laboratory in Human Embryology and Teratology (3) W Shepard Teaches and stimulates interest in human teratology and helps the student understand congenital malformations. Informal seminars, laboratory demonstrations, patient presentations, and lectures. For medical or graduate students. Prerequisite: permission of instructor.

PEDS 530P Pioneer Square Adolescent Seminar (1) Clinic-based setting for seminar and interview practice with Pioneer Square adolescents; students learn how to deal with special health problems and other related problems of "street kids" through interviews and observations. Offered on credit/no credit basis only.

PEDS 551P Pediatric Electrocardiography (2) W Guntheroth Brief review of the physiology and physics pertinent to clinical electrocardiography is followed by a presentation of terminology and methods in clinical use. Normal electrocardiograms are studied, followed by abnormal tracings, with emphasis on pediatric material, but including adult material such as myocardial infarction. Prerequisite: HUBIO 540P.

PEDS 611P Pioneer Square Night Clinic (*, max. 3) AWSps Delisher One night per week at free clinic in Pioneer Square area. Adolescent and young adult patients, generally poorly educated with low incomes and histories of inadequate health care. Seminars and interviews in conjunction with clinic focus on impact of nontraditional lifestyles and values on health status of individuals.

PEDS 662P, 663P, 664P, 665P, 666P, 667P, 668P Pediatric General Clerkship (*, max. 24 each) AWSps Robertson General introductory pediatric clerkship. One-half in hospital setting; one-half in outpatient department, clinic, or private office. Location preferences are considered; twelve-week clerkship is broader, permits more individual selection of site. Open to all third- and fourth-year medical students. Prerequisite: HUBIO 563P. (Six or twelve weeks, full time. Limit: twenty-four students.)

PEDS 669P Neonatal Pediatrics—Clerkship (*, max. 24) AWSps Hodson Participation in the activities in the newborn and premature divisions; ward rounds, seminars, conferences, and familiarization with certain laboratory techniques, particularly those relating to acid-base balance. Prerequisite: 665P.

PEDS 670P Pediatric Infectious Diseases (*, max. 24) AWSps A. Smith Students see and work up clinic consultations and present in detail to attending physician. Daily rounds include problem-solving discussions and didactic presentations in broad category of infectious diseases. Opportunity for experience in clinical research and laboratory techniques. Prerequisites: 665P or permission; third- or fourth-year medical student standing. (Limit: one student.)

PEDS 673P Office Practice (*, max. 12) AWSps Robertson Opportunity to observe and function in the private office settings of a number of clinical pediatric faculty and to accompany pediatricians as they pursue their daily activities in the community. Prerequisite: 665P.

PEDS 676P Pediatric Clerkship With the Mentally Handicapped (*, max. 12) AWSps Ruvalcaba (Rainier School), *Hayden* (Fircrest School) Total care involvement with mentally handicapped patients, incorporating general pediatric knowledge of mental retardation and neurology, plus other specialties related to mental deficiencies. Additional information may be obtained from Dr. W. O. Robertson, Children's Hospital and Medical Center. Prerequisite: 665P. (Four or six weeks, full-time.)

CONJ 677P Clinical Allergy and Immunology (*, max. 12) See Conjoint Courses.

PEDS 679P Clinical Problems in Developmental Disabilities (*, max. 12) AWSps Holm Experience in multidisciplinary evaluation and management of the handicapped child. Student performs pediatric evaluations, obtains appropriate consultations, observes additional professional assessments (e.g., psychological testing), and plans rehabilitation program. Opportunity to provide parent counseling. Prerequisite: 665P.

PEDS 680P Pediatric Clinics (*, max. 24) AWSps Robertson, Staff One to ten half-day sessions may be elected each week for twelve weeks in the following areas: general pediatrics, endocrinology, neurology, immunology, arthritis, cardiology, congenital defects and retardation, well-child, teratology, adolescent medicine, allergy, cystic fibrosis, hematology, prematurity, neonatology, and poison control. Prerequisite: 665P.

PEDS 681P Pediatric Genetics (*, max. 24) AWSp Pagon Clinical focus on evaluation and management of children with genetic disorders. Exposure to genetic counseling, the evaluation of children with hereditary structural defects, and diagnosis and management of children with inborn errors of metabolism. Emphasis on genetic mechanisms that cause human disease. Prerequisite: 665P. (Four, six, or twelve weeks.)

PEDS 682P Congenital Defects—Clinical Experience (*, max. 24) AWSps Shurtleff Advanced course in pediatrics providing experience in the clinical diagnosis and management of structural and metabolic congenital defects. Prerequisite: permission of instructor.

PEDS 684P Pediatric Pulmonary Medicine (8) AWSps Redding Respiratory disorders, diagnostic techniques and treatments unique to children in the inpatient, intensive care, and outpatient settings. Application of principles of pulmonary physiology to clinical problems. Students conduct consultations under the supervision of the attending and present a topic of choice. Inpatient rounds and clinics. Prerequisites: 665P, fourth-year medical student standing.

PEDS 685P Pediatric Hematology and Oncology (*, max. 24) AWSps Chard One-on-one teaching plus four weekly didactic sessions. Specific training in techniques and interpretation of bone marrow aspirations, intravenous chemotherapy, transfusions, and laboratory techniques of hematologic evaluation. Self-learning programs available. Prerequisite: 665P. (Two, four, six, or twelve weeks, full-time.)

PEDS 686P Pediatric Cardiology (*, max. 24) AWSps Guntheroth, Staff Emphasis on physical diagnosis and electrocardiography and on clinical knowledge of diagnostic techniques and surgical possibilities for inpatients and outpatients with cardiovascular problems. Opportunity to observe catheterizations and cardiovascular operations. Weekly clinics and twice-daily inpatient rounds. Prerequisite: 665P.

PEDS 687P Advanced Clinical Clerkship in Child Neurology (*, max. 8) AWSps Milstein Advanced course in neurology dealing with neurological disease in children. Both inpatient and outpatient experience are included. Prerequisite: 665P.

PEDS 688P Adolescent Clinic (*, max. 24) AWSp Farrow Advanced pediatric clerkship dealing with special problems of the adolescent. Medical students are offered an experience in a multidiscipline clinic. Prerequisite: 665P.

PEDS 691P Advanced Pediatric Clerkship (*, max. 24) AWSps Robertson, Staff Inpatient and/or outpatient experience with responsibilities comparable to an intern for patient workup, diagnosis, and care. Available at any one, or combination, of affiliated hospitals, including WAMI units in Idaho, Montana, or Washington. Students interested in this option should make arrangements well in advance of registration. Prerequisite: 665P.

PEDS 697P Pediatric Special Electives (*, max. 24) AWSps Robertson By specific arrangement, for qualified students, special clerkship externship or research opportunities at institutions other than University of Washington. The faculty can advise of possible opportunities. Obtain special assignment form from Dean's office at least one month before preregistration. Prerequisite: permission of instructor.

Pharmacology

E401 Health Sciences

Pharmacology is the science that deals with the nature of the interactions between drugs and the biological system, and with the application of these drugs to the treatment of disease. Courses in this field are given for medical, dental, pharmacy, nursing, and graduate students.

Graduate Program

The Department of Pharmacology offers programs leading to the Master of Science and Doctor of Philosophy degrees. The Master of Science degree is not required of all students, although it may be elected by the student or requested by the department.

Master of Science and Doctor of Philosophy Degrees

Admission Requirement: A baccalaureate degree with a major in any of the sciences, such as biochemistry, chemistry, pharmacy, physics, physiology, psychology, or zoology.

Graduation Requirements: Master of Science degree—PHCOL 511, 512, 513, and two 500-level pharmacology courses. Demonstration of competence in pharmacology and a related discipline, such as biochemistry or physiology, and a thesis. A foreign language is not required. Doctor of Philosophy degree—PHCOL 511, 512, 513, 519, and five 500-level pharmacology courses. Passing a comprehensive examination covering general pharmacology and the allied disciplines of physiology and biochemistry. General Examination, dissertation, and Final Examination.

In the first year of the program, students generally are expected to enroll in biochemistry, pharmacology, and physiology courses. For each of the academic quarters of the first year, a student may work with a different faculty member. The purpose of rotating among the faculty is to acquaint the student with the various areas of pharmacology and research under investigation within the department. With this insight, the student should be better able to decide on a thesis or dissertation topic.

In the second year, while becoming more involved with research, the student continues attending courses in pharmacology and supporting disciplines. Immediately after Spring Quarter of the second year, the student will be given the written portion of the General Examination. Within three months after having taken the written portion, the student will be given the oral portion of the General Examination. The student's supervisory committee will then recommend that the student: (1) continue to pursue the doctoral degree, (2) work for a master's degree, (3) undergo reexamination at a later date, or (4) terminate the program.

Continued work in the department for a Ph.D. or M.S. degree usually involves taking advanced biochemistry, pharmacology, and physiology courses and research.

Financial Aid

A limited number of teaching assistantships, research assistantships, and traineeships are available.

Correspondence and Information

Graduate Program Coordinator
Department of Pharmacology, SJ-30

Faculty

Chairperson

William A. Catterall

Professors

Aagaard, George N.,* 1954, (Emeritus), (Medicine),† M.B., 1936, M.D., 1936, Minnesota; clinical pharmacology.

Beavo, Joseph A.,* 1977, Ph.D., 1970, Vanderbilt; metabolic regulation, cyclic nucleotides.

Bowden, Douglas M.,* 1969, ‡(Psychiatry and Behavioral Sciences), M.D., 1965, Stanford; primate models of human neuropsychiatric disorders.

Camerman, Arthur,* 1967, (Research), (Medicine),† Ph.D., 1964, British Columbia; x-ray crystallography.

Catterall, William A.,* 1977, Ph.D., 1972, Johns Hopkins; molecular pharmacology.

Horita, Akira,* 1954, (Psychiatry and Behavioral Sciences),† M.S., 1951, Ph.D., 1954, Washington; neuropsychopharmacology.

Juchau, Mont R.,* 1969, M.S., 1963, Washington State; Ph.D., 1966, Iowa; developmental pharmacology, drug metabolism.

Krebs, Edwin G.,* 1948, (Biochemistry),† M.D., 1943, Washington (St. Louis); regulation and properties of protein kinases, role of protein phosphorylation in cellular control processes.

Loomis, Ted A.,* 1947, (Emeritus), M.S., 1941, Ph.D., 1943, Buffalo; M.D., 1946, Yale; toxicology and neuromuscular pharmacology.

Storm, Daniel R.,* 1978, M.S., 1967, Washington; Ph.D., 1971, California (Berkeley); regulation of cyclic nucleotide metabolism, bacterial toxins, neuropharmacology, molecular pharmacology of membranes.

Vincenzi, Frank,* 1967, M.S., 1962, Ph.D., 1965, Washington; membrane transport, autonomic and cardiovascular pharmacology.

Associate Professors

Dorsa, Daniel M.,* 1979, (Research), (Psychiatry and Behavioral Sciences), (Medicine),† Ph.D., 1977, California (Davis); neuropharmacology, neurochemistry.

Halpern, Lawrence M.,* 1965, Ph.D., 1961, Albert Einstein; neuropharmacology.

McKnight, G. Stanley,* 1979, Ph.D., 1976, Stanford; hormonal regulation of gene expression.

Nathanson, Neil M.,* 1979, Ph.D., 1975, Brandeis; molecular biology of neurotransmitter receptors.

Watson, Eileen L.,* 1972, (Research), (Oral Biology),† Ph.D., 1970, Utah; pharmacophysiology.

Assistant Professors

Chavkin, Charles,* 1984, Ph.D., 1982, Stanford; endogenous opioid peptide effects on neuronal physiology and opioid receptor regulation.

Hinds, Thomas R., 1974, (Research), Ph.D., 1972, Oregon State; molecular pharmacology of membranes.

Lai, Henry C., 1981, (Research), Ph.D., 1977, Washington; neuropsychopharmacology, biological effects of low-level microwaves.

Meier, Kathryn E., 1986, (Research), Ph.D., 1981, Wisconsin (Madison); mechanisms of cellular signal transduction, protein phosphorylation, phospholipid metabolism, receptor regulation, adrenergic receptors.

Moon, Randall T.,* 1985, Ph.D., 1982, Washington; molecular biology and functions of cytoskeletal structures.

Omielinski, Curtis J.,* 1983, ‡(Environmental Health), Ph.D., 1980, Washington; molecular toxicology.

Course Descriptions

PHCOL 401 General Pharmacology I (2-4) A Juchau, Storm Principles governing drug-receptor interactions, dose-effect relationships, drug absorption, distribution, metabolism, and excretion. Drug toxicity, tolerance, allergy, and drug-induced mutagenesis and carcinogenesis. Drugs utilized as antimicrobial agents and cancer chemotherapeutic agents. Prerequisites: organic chemistry, introductory anatomy, physiology, and biochemistry. For pharmacy students and other undergraduates.

PHCOL 402 General Pharmacology II (3 or 4) W Nathanson General pharmacology of drugs affecting the autonomic and central nervous systems. For pharmacy students and other undergraduates. Prerequisite: 401 or permission of instructor.

PHCOL 403 General Pharmacology III (3 or 4) Sp Beavo, McKnight General pharmacology of drugs affecting the endocrine and cardiovascular systems. For pharmacy students and other undergraduates. Prerequisites: 401, 402, or permission of instructor.

PHCOL 434 General Pharmacology (4) A Halpern, Watson Lectures and demonstrations concerning the action of drugs on physiological and pathological processes with special emphasis on agents of special importance in the practice of dentistry. For dental students.

PHCOL 498 Undergraduate Thesis (*) AWSpS For medical students. Prerequisite: permission of instructor.

PHCOL 499 Undergraduate Research (*) AWSpS Participation in departmental research projects. Open to medical students. Prerequisite: permission of instructor.

PHCOL 507 Pharmacology Seminar (1) AWSp Presentation of comprehensive reports on recent medical and scientific literature in fields of current importance. Research progress reports, and reports on results of completed research. Prerequisite: permission of instructor.

PHCOL 511 General Pharmacology I (4) A Juchau, Storm Consideration of principles governing drug-receptor interactions, dose-effect relationships, drug absorption, distribution, metabolism, and excretion. Introduction to drug toxicity, tolerance, allergy, and drug-induced mutagenesis and carcinogenesis. Drugs utilized as antimicrobial agents and cancer chemotherapeutic agents. Prerequisites: graduate standing, organic chemistry, biochemistry, and introductory anatomy and physiology.

PHCOL 512 General Pharmacology II (4) W Nathanson General pharmacology of drugs affecting the autonomic and central nervous systems. Emphasis on current research approaches to understanding the basic mechanisms of drug action. For graduate students. Prerequisite: 511 or permission of instructor.

PHCOL 513 General Pharmacology III (4) Sp Beavo, McKnight General pharmacology of drugs affecting the endocrine and cardiovascular systems. Prerequisites: 511, 512, or permission of instructor.

PHCOL 514 Current Topics in Pharmacology (1) AWSp McKnight Current research related to the mechanisms of drug action presented in a seminar format. Presentations include relevant background material as well as detailed experimental results taken from current research articles. Open to medical and graduate students. Prerequisite: permission of instructor.

PHCOL 515 General Pharmacology Laboratory (3) AWSp Juchau Selected laboratory experiments in pharmacology for demonstration of basic principles of drug actions. Autonomic nervous system, central nervous system, and cardiovascular drugs are employed in both intact and isolated mammalian systems. One lecture and one four-hour laboratory per week. Prerequisite: permission of instructor.

PHCOL 519 Introduction to Laboratory Research in Pharmacology (4) AWSpS Krebs Students become familiar with, and assist in, the performance of research on ongoing projects in designated laboratories. Emphasis on currently employed methodology and techniques. For first-year graduate students in pharmacology to provide a basis for future independent research.

PHCOL 527 Drug Metabolism (3) W Juchau, Nelson Considerations of the biochemical mechanisms for the biotransformation of drugs and foreign compounds. Open to medical and graduate students. Joint with MEDCH 527. Prerequisite: one year graduate, medical, or dental biochemistry, or permission of instructor. (Offered odd-numbered years.)

PHCOL 528 Neuropsychopharmacology (2) A Halpern, Horita Advanced review and discussion of biochemical and pharmacodynamic mechanisms underlying the central nervous system actions of psychotropic, analgesic, sedative, and antiepileptic drugs. Prerequisites: 511, 512, 513, or permission of instructor. (Offered even-numbered years.)

PHCOL 529 Membrane Pharmacology (2) W Catterall, Nathanson, Vincenzi Advanced consideration of the fundamental properties of biological membranes and the mechanisms of drug and hormone action on enzymes, drug and hormone receptors, and ion transport systems in the plasma membrane of cells. Prerequisites: 511, 512, 513, BIOC 440, 441, or 531 or permission of instructor. (Offered even-numbered years.)

PHCOL 530 Pathways of Receptor Action (2) A Beavo, Krebs, Storm Advanced consideration of the molecular events between drug or hormone binding to receptors and the resulting responses. Roles played by cyclic nucleotides and other second messengers. Adenylate cyclase, phosphoinositide-mediated regulation, phosphodiesterases and protein kinases. Prerequisites: 511, 512, 513, or permission of instructor. (Offered odd-numbered years.)

PHCOL 531 Control of Gene Expression (2) Sp McKnight, Moon Advanced discussion of hormone-receptor interactions, structure of active genes, molecular events leading to altered gene expression, post-transcriptional and posttranslational mechanisms of regulating protein abundance and assembly into subcellular structures. Prerequisite: permission of instructor. (Offered odd-numbered years.)

PHCOL 533 Molecular Toxicology (2) A Omielinski Advanced discussion of molecular mechanisms whereby chemical, physical, and biological agents produce their harmful effects on biological tissue. Joint with ENVH 533. Prerequisites: 401, 402, 403, or 511, 512, 513; or ENVH 511, 515; or permission of instructor. (Offered even-numbered years.)

PHCOL 534 Neuropeptide Pharmacology (2) Sp Chavkin, Dorsa Advanced consideration of the pharmacology and neurochemistry of peptides in the central nervous system. Biosynthesis, distribution, and neurochemical and behavioral effects of neuropeptides with special emphasis on endogenous opiate and gut-brain peptides. Prerequisites: 401, 402, 403, or permission of instructor. (Offered even-numbered years.)

PHCOL 550 An Overview of Faculty Research (1) A Reviews research topics currently being studied in pharmacology. Student reads articles published on each topic. Offered on credit/no credit basis only. Prerequisite: first-year student standing in pharmacology.

PHCOL 600 Independent Study or Research (*) AWSPs

PHCOL 697P Pharmacology Special Electives (*) AWSPs By specific arrangement, for qualified students, special clerkship, externship, or research opportunities can at times be made available at institutions other than the University of Washington. The faculty can advise student of opportunities. Students electing this course should obtain from the Dean's office a special assignment form at least one month before preregistration.

PHCOL 700 Master's Thesis (*) AWSPs**PHCOL 800 Doctoral Dissertation (*) AWSPs**

Physiology and Biophysics

G414 Health Sciences

Physiology deals with the processes, activities, and phenomena incidental to, and characteristic of, life and living organisms. Based upon zoology, physics, chemistry, and mathematics, physiology interlocks closely with the other basic medical sciences—biological structure, biochemistry, pharmacology, and pathology—and with psychology. For this reason, physiology appeals to students with diverse backgrounds and goals. Courses in this field are given for medical, dental, pharmacy, nursing, and graduate students.

Biophysics emphasizes the physical aspects of organs and control systems studied by the instruments and methods of thinking used by physicists.

Graduate Program

The Department of Physiology and Biophysics offers advanced instruction and training leading to both the Master of Science and Doctor of Philosophy degrees. Students aspiring only to the M.S. degree are rarely accepted. A separate degree is not offered in biophysics, although students entering the biophysics program pursue a somewhat different course, emphasizing more advanced mathematics and physics than those following the classical physiology pathway. Studies leading to the doctoral degree require about five years. The first year is spent in acquiring a broad knowledge of physiology by means of a sequence of courses covering the field and a group of laboratory rotations. After selection of a special area of study, the second year is spent taking advanced seminars in the area of specialization and developing a thesis proposal. After admission to candidacy, the latter years are spent in pursuing the area in depth and completing an original research project.

For students wishing a program equally distributed between physiology and psychology, an interdisciplinary Ph.D. degree program in these subjects is administered by the Physiology-Psychology Group of the Graduate School (see Physiology-Psychology). The curriculum emphasizes the overlap areas between experimental psychology and physiology, especially neurophysiology.

Special Requirements

Applicants for the classical physiology program should have a baccalaureate degree in biology, physics, mathematics, psychology, engineering, or chemistry. Those accepted to the biophysics training program should have a baccalaureate degree in physics, mathematics, engineering, or physical chemistry.

Graduate Record Examination scores are required as part of the application.

Students are normally admitted to the graduate program in the Autumn Quarter. Initial review and selection takes place by March 15. Because the department is able to accept only a small number of students each year, often no additional students can be accepted after this initial review. Therefore, applications and all relevant material should be submitted by January 15 to ensure full consideration.

Research Facilities

The department is well equipped to provide instruction and research training in cellular and molecular physiology, neurophysiology, membrane biophysics, cardiovascular physiology, and respiratory physiology. The faculty also is active in researching muscle biophysics, temperature regulation, endocrinology, reproduction, and physiological psychology. The facilities of the Regional Primate Research Center, adjacent to the department, sometimes are available to qualified trainees who need to use primates in their research.

Correspondence and Information

Graduate Program Coordinator
Department of Physiology and Biophysics, SJ-40

Faculty

Chairperson

Wayne E. Crill

Professors

Almers, Wolfhard,* 1974, Ph.D., 1971, Rochester; skeletal muscle physiology.

Anderson, Marjorie E.* 1971, (Rehabilitation Medicine),† Ph.D., 1969, Washington; physiology of basal ganglia and cerebellum.

Berger, Albert J.* 1977, M.A., 1965, Ph.D., 1967, Princeton; Ph.D., 1976, California (San Francisco); neural and chemical control of respiration.

Binder, Marc D.* 1978, M.S., 1972, Ph.D., 1974, Southern California; organization of spinal reflexes.

Brenzelmann, George L.* 1969, Ph.D., 1967, Washington; temperature regulation, cutaneous blood flow.

Crill, Wayne E.* 1967, (Medicine),† M.D., 1962, Washington; properties of spinal and cortical neurons, mechanism of repetitive firing of CNS neurons.

Detwiler, Peter B.* 1976, Ph.D., 1970, Georgetown; physiology of sensory receptors, retina.

Feigl, Eric O.* 1969, M.D., 1958, Minnesota; cardiovascular physiology; coronary and cerebral circulation.

Fetz, Eberhard E.* 1969, Ph.D., 1966, Massachusetts Institute of Technology; cortical regulation of movement.

Fuchs, Albert F.* 1969, M.S., 1961, Drexel; Ph.D., 1966, Johns Hopkins; oculomotor physiology, vision.

Goodner, Charles J.* 1962, ‡(Medicine), M.D., 1955, Utah; endocrinology, carbohydrate metabolism, diabetes.

Gordon, Albert M.* 1964, Ph.D., 1961, Cornell; skeletal muscle physiology.

Hildebrandt, Jacob.* 1966, (Medicine),† M.Sc., 1960, British Columbia; Ph.D., 1966, Washington; respiratory physiology.

Hille, Bertil.* 1968, Ph.D., 1967, Rockefeller; receptors and channels of excitable membranes.

Hlastala, Michael P.* 1973, (Bioengineering), (Medicine),† Ph.D., 1969, State University of New York (Buffalo); respiratory physiology, inert gas analysis of respiratory function.

Hornbein, Thomas F.* 1963, (Anesthesiology),† M.D., 1956, Washington (St. Louis); respiratory physiology adaptive to high altitudes.

Kehl, Theodore H.* 1965, (Computer Science),† M.S., 1958, Ph.D., 1961, Wisconsin; computer application in physiology.

Kennedy, Thelma T.* 1961, M.S., 1949, Ph.D., 1955, Chicago; cerebellum, motor unit properties.

Koerker, Donna J.* 1974, (Medicine),† Ph.D., 1970, Michigan; endocrinology, intermediate metabolism of carbohydrates.

Patton, Harry D., 1947, (Emeritus), Ph.D., 1943, M.D., 1946, Yale; neurophysiology, motor systems.

Rowell, Loring B.* 1964, (Medicine), Ph.D., 1962, Minnesota; regulation of blood flow, exercise physiology.

Rubel, Edwin W.* 1986, (Psychology), (Neurological surgery, Otolaryngology),† M.S., 1967, Ph.D., 1969, Michigan State; auditory physiology, developmental psychology.

Scher, Allen M.* 1954, Ph.D., 1951, Yale; electrophysiology of heart, baroreceptor reflexes.

Schwartzkroin, Philip A.* 1978, (Neurological Surgery),† Ph.D., 1972, Stanford; properties of hippocampal neurons.

Schwindt, Peter C.* 1978, M.S., 1965, Massachusetts Institute of Technology; Ph.D., 1972, Washington; properties of spinal and cortical neurons, mechanisms of repetitive firing and convulsive activity.

Smith, Orville A.* 1959, M.A., 1950, Ph.D., 1953, Michigan State; central regulation of cardiovascular function.

Stahl, William L.* 1967, (Medicine),† Ph.D., 1963, Pittsburgh; neurochemistry of brain ATPase systems.

Steiner, Robert A.* 1977, (Zoology), (Obstetrics and Gynecology),† Ph.D., 1975, Oregon; reproductive physiology.

Stirling, Charles E.* 1968, Ph.D., 1966, State University of New York (Upstate); epithelial transport mechanisms.

Teller, Davida Y.* 1965, (Psychology),† Ph.D., 1965, California (Berkeley); vision, psychophysics, development of vision.

Towe, Arnold L.* 1957, Ph.D., 1953, Washington; cerebral cortical networks.

Van Citters, Robert L.* 1962, (Medicine),† M.D., 1953, Kansas; cardiovascular physiology.

Wiederhielm, Curt A.* 1964, (Emeritus), Ph.D., 1961, Washington; microcirculation, capillary exchange.

Winn, H. Richard, 1983, ‡(Neurological Surgery), M.D., 1968, Pennsylvania; cerebral blood flow.

Young, Allan C., 1951, (Emeritus), M.A., 1932, British Columbia; Ph.D., 1934, Toronto; control of respiration, blood gases.

Associate Professors

Bothwell, Mark A.* 1985, Ph.D., 1975, California (Berkeley); molecular and cellular physiology.

Carlson, Steven S.* 1985, Ph.D., 1975, California (Berkeley); molecular and cellular physiology.

Cook, Daniel L., 1978, (Research), (Medicine),† M.S.M.E., 1970, M.D., 1977, Ph.D., 1980, Washington; insulin secretion.

Cunningham, Susanna L.* 1978, ‡(Physiological Nursing), M.A., 1969, Ph.D., 1977, Washington; hormonal regulation of circulation, hypertension.

Freund, Peter R., 1980, ‡(Anesthesiology), M.A., 1971, Brown; M.D., 1971, Columbia; temperature regulation, vasomotor control, physiology/biophysics.

Landau, Barbara B., 1964, (Emeritus), (Biological Structure),† M.S., 1949, Wisconsin; Ph.D., 1970, Georgetown; physiology of hibernation.

Modell, Harold I., 1975, ‡(Radiology), Ph.D., 1971, Mississippi (Jackson); respiration, imaging.

Sarthy, P. Vijay, 1980, (Research), ‡(Ophthalmology), M.S., 1967, Mysore (India); Ph.D., 1973, Bombay (India); molecular biology, neurobiology.

Skahen, Julia G., 1946, (Emeritus), (Biological Structure),† M.S., 1928, Washington; Ph.D., 1940, Chicago; endocrinology.

Assistant Professors

Langer, Thomas, 1985, (Research), M.S., 1971, Ph.D., 1976, Washington; neuroanatomy.

Spain, William, 1987, (Medicine), M.D., 1977, Columbia.

Lecturers

Becker, Winifred J., 1970, B.S.N., 1964, Duchesne.

Taylor, E. Renella, 1968, M.N., 1968, Washington.

Course Descriptions

CONJ 340-341-342 Human Anatomy and Physiology (4-4-4) See Conjoint Courses.

P BIO 405-406 Human Physiology (4-4) A,W Intensive coverage of physiology through lectures, demonstrations, and conference. Autumn Quarter: neurophysiology from basic properties of membrane through reflexes and cardiovascular, gastrointestinal, and renal physiology. Winter Quarter: respiratory, endocrine, and reproductive physiology, sensory and motor systems. Required for first-year dental students and graduate nursing students. Also offered for graduate students. Entry card required.

P BIO 424 Vision and Its Physiological Basis (5) A Teller Phenomena of human vision, including spectral sensitivity, color vision, acuity and spatial vision, light and dark adaptation, and binocular vision. Emphasis on correlation of human visual functioning with known optical, biochemical, physiological, and anatomical substrates. Joint with PSYCH 424. Recommended: background in some physical or biological science.

P BIO 498 Undergraduate Thesis (*) AWSpS For medical students. May be repeated for credit. Prerequisite: permission of instructor.

P BIO 499 Undergraduate Research (*) AWSpS For medical students. May be repeated for credit. Prerequisite: permission of instructor.

P BIO 503 Physiological Systems (4) S Fetz Introduction to linear systems and electronic circuits. Topics include basic circuit theory; step and sinusoidal response of first- and second-order linear systems (RLC circuits, mechanical and hydraulic systems); bode plots; Fourier analysis and Laplace transforms; kinetics; operational amplifier circuits. Associated laboratory exercises. Prerequisites: beginning calculus, permission of instructor.

P BIO 505 Cell Physiology (3) A Cell membranes, membrane proteins, ion channels, ion pumps. Bioelectricity, with emphasis on action potentials in neurons, axons, and cardiac muscle. Signal transduction and intracellular signaling with emphasis on synaptic transmission, sensory receptors, and control of intracellular calcium. Cell motility with emphasis on muscle. Prerequisite: permission of instructor.

P BIO 506 Advanced Physiology (3) Neurophysiology: properties of neurons, neuron integration, sensory systems, motor systems, and autonomic nervous system. Endocrinology: hormone receptors and transduction mechanisms, reproduction, pancreatic endocrine function, adrenal thyroid, and parathyroid function. Temperature regulation.

P BIO 507 Advanced Physiology (3) Respiration physiology: alveolar ventilation, pulmonary mechanics, and regulation of respiration. Acid-base balance. Renal physiology. Cardiovascular physiology: electrical activity of the heart, cardiac muscle properties, cardiac cycle, microcirculation, regional circulation and integration.

P BIO 508 Introduction to Laboratory Research in Physiology (2-5) Stahl Students participate in the performance of ongoing projects in designated re-

search laboratories. Emphasis is on experimental design, methodology and techniques. For first- and second-year graduate students in physiology and biophysics to provide a basis for future independent research.

CONJ 509 Neurochemistry (3) A See Conjoint Courses.

CONJ 511 Functional Neuroanatomy (4) W See Conjoint Courses.

P BIO 512 Cardiovascular-Renal Physiology (*) A Rowell Considers the function of the heart and blood vessels from a cellular and organ point of view, including the regulation of flow to various organs. Integrates much of this material into a consideration of the cardiovascular system. Students may earn an additional ½ credit that will include renal physiology.

P BIO 513 Respiratory Physiology and Acid-Base Balance (2) A Hlastala Introduction covering, in moderate depth, metabolism, respiratory gas transport, lung mechanics, neural and chemical control, and acid-base regulation, primarily as related to humans. Prerequisites: elementary physics and biology, and permission of instructor.

P BIO 515 Neurobiology Proseminar (4) Guided survey of the experimental neurobiology literature. Course conducted as seminar, with discussion of assigned papers. May be repeated for credit. Prerequisite: permission of instructor.

P BIO 516 Physiological Proseminar (7) Guided survey of the experimental literature. Course conducted as seminar with oral analysis of assigned papers and topics. Prerequisite: permission of instructor.

P BIO 518 Research Topics in Cardiovascular Physiology (1) WSp Feigl Graduate students and faculty members present and discuss current literature and research. May be repeated for credit. Prerequisite: permission of instructor.

P BIO 519 Membrane and Muscle Biophysics Seminar (1) Sp Almers Detailed discussion and study of current topics in cell membrane function and muscle contraction. May be repeated for credit. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

P BIO 520 Physiology Seminar (*) AWSpS Selected topics in physiology. May be repeated for credit. Prerequisite: permission of instructor.

P BIO 521 Biophysics Seminar (*) AWSpS Selected topics in biophysics. May be repeated for credit. Prerequisite: permission of instructor.

P BIO 522 Selected Topics in Respiratory Physiology (1-3) AWSpS Hildebrandt Advanced seminar on selected topics, including pulmonary mechanics, gas exchange, lung fluid balance and circulation, control of respiration. Prerequisite: permission of instructor.

P BIO 523 Heat Transfer and Temperature Regulation (2-5) S Brangemann Thermal exchange between the body surface and the environment. Heat production and distribution within the body. Properties of cutaneous and deep temperature receptors. Neural integration and homeothermy. Prerequisite: permission of instructor. (Not offered every year.)

P BIO 525, 526, 527 Readings in Advanced Physiology and Biophysics (*,*,*) A,W,SpS Guided study of the experimental literature of physiology and biophysics. Essays are written and discussed with the staff. Emphasis is placed on critical analysis, accuracy of expression, bibliographical technique, and other factors of good scholarship. Each course may be repeated for credit. Prerequisite: permission of instructor.

P BIO 530 Synapse and Reflex Seminar (4) A Binder Guided survey of the literature pertaining to reflex and synaptic physiology. Course is conducted as semi-

nar with students giving oral reports on assigned topics. Prerequisites: 515 and permission of instructor. (Not offered every year.)

P BIO 535 Operative Techniques in Neurophysiology (2-5) S Smith Decerebration, laminectomy, cortical ablation, stereotaxic lesions, cardiovascular surgery, chronic electrode implants, anesthesiology. Aseptic procedures and animal care. Prerequisite: permission of instructor.

P BIO 539 Sensory Systems I (3) Binder Reading and analysis of primary sources in sensory neurophysiology. Receptor mechanisms and the somatosensory system are covered. Prerequisites: 506 and CONJ 511 or equivalent. (Not offered every year.)

P BIO 540 Sensory Systems II (3) Fuchs Neural processing of visual information and auditory information. Selected topic, such as visual acuity, is introduced by behavioral papers on infants and adults. Neural structures involved in elaborating the sensory property (visual acuity) examined in papers using neurophysiological techniques. (Not offered every year.)

P BIO 541 Motor Systems I: Peripheral Mechanisms (3) Binder Critical reading and discussion of research papers on the current physiology of the motor unit, afferent inputs and segmental interneurons that control motor units. Prerequisites: 506 and CONJ 511 or equivalent and permission of instructor. (Not offered every year.)

P BIO 542 Motor Systems II: Brainstem Mechanisms (3) Anderson, Fuchs Critical discussion of research papers and resulting concepts regarding the roles of various brainstem systems in controlling somatic and ocular movements. Prerequisites: 506 and CONJ 511 or equivalent and permission of instructor. (Not offered every year.)

P BIO 543 Motor Systems III: Cerebral Cortex and Cerebellum (3) Fetz, Kennedy Critical reading and discussion of classical and current papers on motor cortex, corticospinal, corticopontine, and corticobulbar systems; on cerebellar circuitry and function, and cerebellar relations. Prerequisites: 506 and CONJ 511 or equivalent and permission of instructor. (Not offered every year.)

P BIO 544 Properties of Neurons (3) A Schwandt Critical reading and discussion of papers on passive, active, and integrative properties of single invertebrate and mammalian neurons. Provides understanding of how a variety of cellular mechanisms contribute to neuronal discharge patterns. Prerequisites: 506 and CONJ 511 or equivalent and permission of instructor.

P BIO 545 Physiology of Vision (3) Sp Teller Selected readings from recent literature on vision and visual systems. Prerequisite: permission of instructor.

P BIO 546 Advanced Topics in Biophysics (1½, max. 8) Hille In-depth lectures by biophysics faculty members reviewing topics in membrane excitability, transport, and muscle contractility. Offered on credit/no credit basis only. Prerequisites: 506 and CONJ 511 or equivalent.

P BIO 547 Readings in Cell Physiology (2 or 3, max. 15) Hille Reading and discussion of research literature on excitable cells. Emphasis on membrane excitability, transport, and muscle contractility. A literature research paper may be written for additional credit. Prerequisites: 506 and CONJ 511 or equivalent.

P BIO 549 Plasticity in the Vertebrate Nervous System (2) Sp Schwartzkroin Emphasis on mammalian CNS. Examples of anatomical, pharmacological plasticity chosen from literature. Structure changes during development and in adult (hippocampus, spinal cord, nerve-muscle) studied and as correlates of learning. Students responsible for leading class discussion of one topic. Offered on credit/no credit basis only. Prerequisites: graduate-level courses in neurophysiology and neuroanatomy; understanding of basic neuronal mechanisms.

P BIO 550 Cortical Potentials (4) Towe Properties of continuous and evoked potentials and their interactions, including the biophysics of their cellular origin. Prerequisites: 516 and permission of instructor.

P BIO 551 Scientific Inference (2) WSPs Binder Lectures, discussions, reading, and exercises to illuminate principles of scientific inference and their use and misuse in scientific research. Formal analysis of inference and deduction, hypothesis structure and testing, applications of statistical inference, heuristic modeling, and experimental design. Prerequisite: 506 or HUBIO 512P or permission of instructor.

P BIO 552P Practicum in Scientific Inference (*, max. 6) Binder Library research leading to a manuscript tracing the scientific foundations and hypotheses underlying a contemporary medical procedure, treatment, or viewpoint. Prerequisite: 551 or HUBIO 512P.

P BIO 559 Integrative Neurophysiology (3) Sp Towe Interpretation of neurophysiological phenomena from comparative, biophysical, and evolutionary standpoints. Prerequisite: permission of instructor.

P BIO 560 Contraction of Skeletal Muscle (*) Gordon Selected topics on muscle contraction. Consideration of different types of muscle. Reading of original papers. Presentations by students and faculty. Prerequisite: permission of instructor. (Not offered every year.)

P BIO 594 Neurological Study Unit (2) AW Crill Faculty and student discussion of neurological topics illustrated with clinical cases or demonstrations include the following: physiology, neuroanatomy, neurology, neuropathology, neurosurgery, and psychiatry. May be repeated for credit. Offered on credit/no credit basis only. Prerequisite for medical students: HUBIO 532P.

P BIO 600 Independent Study or Research (*) AWSps

P BIO 700 Master's Thesis (*) AWSps

P BIO 800 Doctoral Dissertation (*) AWSps

Psychiatry and Behavioral Sciences

BB1644 Health Sciences

The department offers course work, clinical training, and research opportunities for undergraduate students, medical students, graduate physicians, and graduate students in allied health programs such as psychology, social work, and psychiatric nursing.

A biobehavioral approach is emphasized, which incorporates intrapersonal, interpersonal, and sociocultural factors. Intrapersonal factors include emotion, perception, cognition, psychodynamics, neurochemistry, neuroanatomy, neurophysiology, and the developmental and aging processes. Interpersonal factors focus upon dyadic, familial, and group interactions. Sociocultural factors include the cultural, social, institutional, and community systems as well as the environment and epidemiology of health and disease.

Undergraduate Program

A variety of courses in the behavioral sciences and psychiatry are available to students during their undergraduate years. Included among these are psychosocial growth and development, aging and adult development, preventive methods for mental health, cross-cultural mental health, clinical psychiatry, and behavioral medicine.

Graduate Program

The medical school curriculum is divided into a core (basic) curriculum and an elective curriculum. The Department of Psychiatry and Behavioral Sciences offers

material covering learning theory, cognition, memory, perception, neuropharmacology, social growth and development, epidemiology of health and disease, psychopathology, psychotherapy, and neuropsychiatry and behavioral medicine, as well as the development of interviewing skills and assessment techniques within the core curriculum. Its elective program includes a variety of clinical experiences and advanced didactics and seminars designed to further the knowledge and skills developed during the basic curriculum. In addition, the department encourages research and other scholarly pursuits by students in areas of interest to them. Stipends are available for research studies.

Residency Training in Psychiatry

A four-year residency for medical school graduates approved by the American Psychiatric Association prepares physicians for Specialty Board Certification in Psychiatry. Clinical rotations on various inpatient, outpatient, and consultation/liaison services are augmented by individual supervision and didactic lectures. With the program's eclectic emphasis, residents become proficient in areas of psychotherapy, psychopharmacology, and community liaison with patients of all ages. Fellowships in child, geriatric, and community psychiatry are available.

Clinical Psychology Internship

A one-year internship in clinical psychology approved by the American Psychological Association is offered as an interdepartmental program. This internship is open to candidates for the doctorate in clinical psychology from graduate programs approved by the American Psychological Association. Postdoctoral fellowships for advanced clinical and research training in behavioral medicine are also accepted.

Faculty

Chairperson

Gary J. Tucker

Professors

Becker, Joseph,* 1965, (Psychology).† M.A., 1952, George Washington; Ph.D., 1958, Duke; psychology.

Bowden, Douglas M.,* 1969, (Pharmacology), M.D., 1965, Stanford.

Carr, John E.,* 1963, (Psychology).† M.A., 1958, Ph.D., 1963, Syracuse; clinical psychology.

Chapman, C. Richard,* 1971, (Psychology), (Anesthesiology).† M.A., 1968, Ph.D., 1969, Denver; psychology.

Croake, James W., 1975, M.Ed., 1963, Central Washington; Ph.D., 1966, Washington State.

Doerr, Hans O.,* 1967, (Psychology).† M.S., 1962, Ph.D., 1965, Florida State; clinical psychology.

Dunner, David L., 1978, M.D., 1965, Washington (St. Louis).

Dworkin, Samuel F.,* 1974, (Oral Medicine).† D.D.S., 1958, Cert., 1963, Ph.D., 1969, New York; dentistry and clinical psychology, pain, psychosomatic and illness-related behavior.

Hampson, John L., 1960, (Emeritus), M.D., 1946, Johns Hopkins.

Heiman, Julia R., 1980, Ph.D., 1975, State University of New York (Stony Brook); clinical psychology.

Holmes, Thomas H., 1949, (Emeritus), M.D., 1943, Cornell.

Horita, Akira,* 1954, (Pharmacology).† M.S., 1951, Ph.D., 1954, Washington; biochemical and autonomic pharmacology.

Johnson, Merlin H., 1955, M.D., 1947, Iowa.

Kogan, Kate L., 1956, (Emeritus), M.A., 1935, Ph.D., 1943, Columbia.

Martin, Donald C.,* 1972, ‡(Biostatistics), M.S., 1961, Ph.D., 1968, Florida State; statistical computing, randomization tests, approximations for probability functions.

Martin, Joan C.,* 1972, (Psychology), M.S., 1962, Ph.D., 1965, Florida State; experimental psychology.

Prinz, Patricia N.,* 1976, (Physiological Nursing), Ph.D., 1969, Stanford; pharmacology.

Raskind, Murray A., 1973, M.D., 1968, Columbia.

Reichler, Robert J., 1976, (Pediatrics), M.D., 1961, Albert Einstein.

Robinson, Nancy M.,* 1974, (Pediatrics, Psychology), M.A., 1953, Ph.D., 1958, Stanford; psychology.

Roos, Bernard A., 1985, (Medicine).† M.D., 1967, Chicago.

Rothenberg, Michael B., 1967, (Emeritus), (Pediatrics).† M.D., 1954, Case Western Reserve.

Streissguth, Ann P., 1963, M.A., 1959, California (Berkeley); Ph.D., 1964, Washington; psychology.

Townes, Brenda D.,* 1961, (Anesthesiology, Psychology), M.A., 1958, Mills; Ph.D., 1970, Washington; psychology.

Tucker, Gary J., 1985, M.D., 1960, Case Western Reserve.

Walker, R. Dale, 1977, M.D., 1972, Oklahoma.

Associate Professors

Armstrong, Hubert E., 1966, (Education, Psychology), Ph.D., 1963, Syracuse; clinical psychology.

Arnett, Carol D., 1988, Ph.D., 1976, Maryland; medicinal chemistry.

Avery, David H., 1980, M.D., 1972, Washington (St. Louis).

Barnes, Robert F., 1977, M.D., 1973, Utah.

Borson, Soo, 1979, M.D., 1969, Stanford.

Calsyn, Donald A., 1980, Ph.D., 1979, Washington; educational psychology.

Carlin, Albert S., 1964, M.A., 1961, Ph.D., 1964, Syracuse; clinical psychology.

Chaney, Edmund F., 1978, Ph.D., 1976, Washington; clinical psychology.

Chen, Andrew C. N., 1980, (Research), (Psychology), (Oral Medicine).† M.S., 1971, Ph.D., 1980, Washington; neuropsychophysiology.

Chiles, John A., 1973, M.D., 1966, Pennsylvania.

Cox, Gary B.,* 1972, (Research), (Social Work), Ph.D., 1970, Duke; psychology.

Dikmen, Sureyya S.,* 1974, ‡(Neurological Surgery, Rehabilitation Medicine), M.A., 1967, Michigan; Ph.D., 1973, Washington; neuropsychology.

Doerfl, Carl B., 1973, (Neurological Surgery).† M.S., 1967, Ph.D., 1970, Purdue; clinical psychology.

Donovan, Dennis M., 1981, M.A., 1972, Western Washington; Ph.D., 1980, Washington; clinical psychology.

Hommer, Daniel W., 1987, M.D., 1976, Albert Einstein College of Medicine.

Hunt, D. Daniel, 1977, M.B.A., 1977, Pennsylvania; M.D., 1973, Cornell.

Katon, Wayne J., 1979, (Family Medicine), M.D., 1976, Oregon.

Klingbeil, Karl S., 1969, ‡(Social Work), M.S.W., 1960, Washington; violence in society, particularly with reference to family violence, health-care systems.

Linehan, Marsha M.,* 1977, ‡(Psychology), M.A., 1970, Ph.D., 1971, Loyola (Chicago); behavior assessment and therapy, suicide and parasuicide, assertion training, behavior therapy with women.

Maiuro, Roland D., 1978, Ph.D., 1978, Washington (St. Louis); clinical psychology.

Maxim, Peter E., 1973, M.D., 1966, Ph.D., 1971, Stanford.

McCauley, Elizabeth A., 1979, Ph.D., 1973, State University of New York (Buffalo); clinical and development psychology.

Meltzoff, Andrew N.,* 1984, ‡(Psychology), Ph.D., 1976, Oxford; social and early speech language development and their interaction.

Neppe, Vernon M., 1986, M.D., 1973, M.Med., 1979, Ph.D., 1981, Witwatersrand (South Africa); medicine.

Ries, Richard K., 1978, M.D., 1975, Northwestern.

Roy-Byrne, Peter P., 1986, M.D., 1978, Tufts.

Samson, Herman H.,* 1977, (Psychology), Ph.D., 1968, Waterloo; behavioral pharmacology addictive processes.

Scher, Maryonda, 1955, M.D., 1954, Washington.

Schwartz, Pepper J.,* 1972, ‡(Sociology), (Women Studies), M.A., 1968, Washington (St. Louis); M.Phil., 1970, Ph.D., 1974, Yale; family human sexuality, field methods.

Spain, David H.,* 1968, ‡(Anthropology), (Social Work), M.A., 1962, Ohio State; Ph.D., 1969, Northwestern; psychocultural anthropology, African studies, research methods.

Sulzbacher, Stephen I., 1966, (Education), (Pediatrics), † A.M., 1964, Hollis; Ph.D., 1971, Washington; special education.

Terl, Linda, 1984, Ph.D., 1980, Vermont; clinical psychology.

Trupin, Eric W., 1974, M.A., 1973, Ph.D., 1974, Wyoming; psychology.

Turner, Judith A., 1980, (Rehabilitation Medicine), † M.A., 1975, Ph.D., 1979, California (Los Angeles); clinical psychology.

Varley, Christopher K., 1978, M.D., 1973, Washington.

Veith, Richard C., 1977, M.D., 1973, Washington.

Verhulst, Johan, 1978, (Psychology), M.D., 1964, Louvain (Belgium).

Vitaliano, Peter P.,* 1977, (Psychology), M.S., 1973, Ph.D., 1975, Syracuse; psychology.

Vitiello, Michael V.,* 1977, (Psychology), Ph.D., 1980, Washington; psychology.

Ward, Nicholas G., 1975, M.D., 1973, Cornell.

Wilson, Lawrence G., 1973, M.D., 1966, Kansas.

Womack, William M., 1969, M.D., 1961, Virginia.

Assistant Professors

Benjamin, G. Andrew H., 1985, (Acting), M.A., 1982, J.D., 1984, Ph.D., 1985, Arizona; clinical psychology.

Borland, Andrew C., 1986, (Acting), M.D., 1972, Loma Linda.

Buffington, Veronica E., 1985, (Acting), M.S., 1976, Eastern Washington; Ph.D., 1981, Washington; physiological psychology.

Centerwall, Brandon S., 1987, (Acting), M.D., 1979, California (San Diego); M.P.H., 1980, Tulane.

Cohen, Seth A., 1985, (Acting), M.D., 1981, Northwestern.

Dager, Stephen, 1983, M.D., 1978, Nebraska.

Dubach, Mark F., 1985, Ph.D., 1983, Washington; anthropology.

Egan, Kelly J., 1980, (Rehabilitation Medicine), † M.A., 1968, Texas Technical; Ph.D., 1981, Washington; clinical psychology.

Fehrenbach, Peter, 1983, M.A., 1977, Ph.D., 1981, Missouri; clinical psychology.

Hyde, Thomas S., 1977, (Research), Ph.D., 1969, Minnesota; psychology.

Jacobsen, Andrea, 1986, (Acting), Ph.D., 1972, Johns Hopkins; M.D., 1976, California (Irvine).

Jemelka, Ronald P., 1986, (Acting), Ph.D., 1983, Texas (Austin); educational psychology.

Khan, Arifulla, 1984, M.B.B.S., 1975, Bangalore (India).

Kivlahan, Daniel R., 1984, (Psychology), M.A., 1979, Ph.D., 1983, Missouri (Columbia); clinical psychology.

Kolden, Rolf S., 1987, (Acting), M.A., 1968, Harvard; M.D., 1976, Case Western Reserve.

Lampe, Thomas H., 1983, M.D., 1977, Indiana.

Lipscomb, Patricia A., 1984, (Acting), M.A., 1970, Ph.D., 1973, Alabama; M.D., 1977, Miami.

McCann, Barbara S., 1986, M.S., 1982, Ph.D., 1984, Rutgers; psychology.

McFall, Miles E., 1985, M.A., 1979, Ph.D., 1981, Montana; clinical psychology.

Mitchell, Jeffrey R., 1980, M.D., 1971, Maryland.

Murburg, M. Michele, 1982, M.D., 1978, Albert Einstein.

Reid, Mary M., 1987, (Acting), M.A., 1983, Ph.D., 1985, Notre Dame.

Risse, Steven C., 1983, M.D., 1978, Wisconsin.

Romano, Joan, 1984, M.S., 1974, Ph.D., 1982, Pittsburgh; clinical psychology.

Speltz, Matthew L., 1981, (Psychology), M.A., 1975, Western Washington; Ph.D., 1980, Missouri; clinical psychology.

Syrjala, Karen L., 1985, (Acting), M.A., 1980, Boston College; Ph.D., 1982, Boston; clinical psychology.

Tietjen, Anne M., 1987, (Acting), Ph.D., 1978, Cornell.

Umlauf, Robert L., 1986, M.A., 1980, Ph.D., 1984, Missouri (Columbia); clinical psychology.

Unis, Alan S., 1987, M.D., 1976, Pittsburgh.

Wilkinson, Charles W., 1984, (Research), Ph.D., 1977, California (Santa Barbara); physiological psychology.

Instructor

Brown, Keith A., 1987, M.D., 1983, California (San Diego).

Lecturers

Backus, Frank I., 1988, M.D., 1982, Washington.

Brinkley, John R., 1975, M.D., 1973, Wisconsin.

Dagadakis, Christos S., 1979, M.D., 1974, M.P.H., 1975, Washington; M.D., 1974, Washington.

Wright, Robert G., 1959, M.D., 1954, Rochester.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

PBSCI 451 Principles of Personality Development (2) Sp Doerr Development of the personality from infancy through advanced age traced to its physiologic, experiential, and cultural sources with emphasis on psychodynamic concepts and behavior.

PBSCI 452 Clinical Psychiatry (2 or 3) Sp Teaches the process of diagnosing psychiatric illness through learning psychiatric terminology and diagnostic criteria; practicing, identifying, and organizing data of observed interviews; becoming comfortable relating to people with psychiatric illness. Designed for students preparing for allied health and behavioral sciences careers. Prerequisite: permission of instructor.

CONJ 475 Alcoholism: A Course for Medical Students in the Allied Health Sciences (2) Sp See Conjoint Courses.

PBSCI 498 Undergraduate Thesis (*) AWSpS Opportunity to complete work on psychiatric research projects or to pursue a specific psychiatric topic in depth, for instance, through library research. May be repeated for credit. Prerequisite: permission of responsible faculty member. (Four or six weeks, full-time, or equivalent part-time.) Entry card required.

PBSCI 499 Undergraduate Research (*, max. 15) AWSpS Opportunities are available for participation in a wide variety of ongoing research in the behavioral sciences and clinical psychiatry, or for the development of an individual investigative project under the supervision of a faculty sponsor. May be repeated for credit. Prerequisite: permission of faculty sponsor. (Two, four, six, or twelve weeks.) Entry card required.

PBSCI 525P Forensic Issues in Mental Illness (3) Sp Goldenberg Concentration on major areas in psychology and law (e.g., criminal, civil); several outside speakers from professional, legal, judicial, and psychiatric communities; lectures followed by discussion groups; and case presentations. Background in psychopathology and diagnosis recommended. For medical students, graduate students in the allied health sciences, and advanced law students.

PBSCI 530P Developmental Psychoanalytical Therapy (2) Sp Schimmelbusch Continuation of study of mental functioning from a developmental point of view. How failures of psychological development lead to various psychiatric pathological states and how psychoanalytic treatment reinstitutes normal development. Prerequisite: 535.

PBSCI 535P Basic Concepts of Modern Psychoanalysis (2) A Schimmelbusch Childhood developmental stages studied in light of inborn and environmental determinates. Correlating developmental phases with all aspects of adult personality functioning. A hierarchy of different models of the mind used to explicate personality functioning on a clinical case discussion level. Prerequisite: medical or graduate student standing, or permission of instructor.

PBSCI 539 Interviewing and Case Formulation (2, max. 6) Becker, Carlin, Thorpe Emphasis on learning interviewing skills and content to administer such recent psychodiagnostic procedures as DSM III and the Research Diagnostic Criteria. Case formulation and presentation and treatment planning receive secondary emphasis. Joint with PSYCH 539. Offered on credit/no credit basis only. For graduate students in psychology, nursing, social work, and anthropology, and for advanced medical students.

PBSCI 540P Physiology of Emotions (*) AWSp Holmes Seminar based on discussion of selected readings or original articles from psychophysiology and psychosociologic literature. Designed to orient and interest students for participation in current or future research projects and clinical medicine. For medical students; graduate students by permission of instructor. Entry card required.

PBSCI 544 Etiology and Epidemiology of Alcoholism (2) A Walker Intensive survey of case definition and etiological concepts pertaining to alcoholism; alcohol as a risk factor in disease and methods of measurement; unique problems of applying epidemiological research methodologies to study of alcohol and other drugs. Prerequisites: graduate standing in social, behavioral, or biological sciences and permission of instructor.

PBSCI 547P Families and Family Therapy (2) Verhulst Theoretical and practical seminar with review of literature and discussion of videotapes of families in therapy, including: family through history, what is a healthy family? the developmental stages, evaluation of families in distress, couple therapy, family therapy, nonspecific and specific systems of intervention. Fourth-year medical students.

PBSCI 548P Aging and Adult Development (1-3) ASp Vitiello Aging in Western technologically advanced societies frequently involves losses in status, stamina, and economic and social supports. Consideration given to losses among the aged. Students select projects in the area of aging and work at their own levels of expertise and sophistication. Seminar format with guided reading.

PBSCI 549P Assessment of the Older Patient (1) W Reiffner, Wu Seminar focuses on a special methodology for studying cognitive and affective dysfunction in the elderly and basic methods for diagnosis, management, and assessment of change during treatment. Open to medical students and graduate students in the allied health sciences. Prerequisites: HUBIO 563P and permission of instructor.

PBSCI 553 Dynamics of Psychopathology and Introduction to Psychotherapy (2) W Hunt Psychopathologic phenomena and defense structure traced to developmental history of individual with attention to constitutional and organic causes. Approaches to treatment via psychotherapy discussed in context of guest interviews of patients and videotaped segments of therapy.

PBSCI 555 Research Methods in Psychiatry and Behavioral Sciences (3) Sp Vitaliano Course includes four areas: scientific method (operationalism); psychometrics (reliability); design of psychiatric experiments/studies; psychiatric epidemiology. Prerequisite: first- or second-year medical student or graduate student standing.

PBSCI 557 Behavioral Medicine (2) W Vitiello Theory and technique of behavioral medicine and behavioral modification as applied to medical practice. Behavioral techniques in management of various chronic and acute disorders. Open to second-, third-, and fourth-year medical students and graduate students in clinical psychology; others by permission of instructor.

PBSCI 558P Psychosocial Growth and Development (2) A Landesman Current theories and research related to children's development, with emphasis on the interaction of biological, psychosocial, and cognitive factors. Open to medical students and to advanced undergraduate students.

PBSCI 562P Principles of Hypnosis (2) Sp Dworkin History and theory of hypnosis. Induction techniques. Application to the treatment of emotional and physical problems. Medical and dental students. Entry card required.

PBSCI 570P Integrated Psychobiology of Brain-Behavior Function (2) WSp Chen Biochemical, genetic, pharmacologic, and physiologic factors influencing behavior are studied in a seminar with guided reading. Emphasis on brain-behavior integration. Open to medical students and graduate students with permission of instructor.

PBSCI 575P Community Psychiatry Seminar (2) AWSp Trupin Preparation for mental-health work in community agencies: cultural, social, and economic factors in mental illness and provision of services; history of community mental health; direct and indirect intervention; consultation and supervision; agency organization and leadership; psychiatric epidemiology; prevention; forensic psychiatry. Lectures, readings, case discussions.

PBSCI 578 Affective Disorders: Theory and Research (2) W Becker Causes, sustainers, correlates, and consequences of affective disorders, including biological and psychosocial factors. Joint with PSYCH 578. Offered on credit/no credit basis only. Prerequisites: graduate or professional student standing or permission of instructor; graduate course in psychopathology and personality recommended. (Offered alternate years; offered 1987.)

PBSCI 579 Treatment of Affective Disorders: Methods and Evaluation (2) W Becker Differential diagnosis of depression and depressive subtypes; with emphasis on psychodynamic, cognitive-behavioral, and combined forms of psychological treatment of less severely incapacitated patients. Some discussion of biological approaches as alternative or adjunctive treatments in severe, psychotic, and endogenous-like depressions. Joint with PSYCH 579. Prerequisites: see 578. (Offered alternate years.)

PBSCI 591P Seminars and Conferences in Psychiatry (*) AWSpS A variety of topics that can be arranged to accommodate the particular interests of students. Prerequisite: permission of responsible faculty member. Entry card required.

PBSCI 592P Behavioral Science Study Unit (*) AWSp A variety of topics is presented under the sponsorship of the Department of Psychiatry and Behavioral Sciences, with participation of faculty members from departments throughout the University. May be repeated for credit. Open to medical and graduate students. Entry card required.

PBSCI 664P Basic Clerkship in Ambulatory Services, HCMHC, or Clinic II (12) AWSpS Brinkley Opportunity to experience ambulatory services. Focus on improving interviewing skills and developing an interviewing style and content appropriate to patients with psychiatric dysfunction; gaining familiarity with psychopharmacology; exposure to problems seen in psychiatric emergency medicine. (Six weeks, full-time, or twelve weeks, half-time. Limit: two students.)

PBSCI 665P Basic Clinical Clerkship (8, max. 24) AWSpS Backus, Brinkley, Hunt, Loebe, Ries Inpatient and outpatient clerkship in psychiatry. Students have primary responsibility under the direction of attending psychiatrists and residents for diagnosis and care of patients at University Hospital, Harborview Medical Center, or Veterans Administration Hospital. Emergency room, crisis intervention, and consultation service experiences appropriate to patients with psychiatric dysfunction, gaining familiarity with psychopharmacology; exposure to psychiatric emergency medicine. (Six weeks, full-time, twelve weeks, half-time.)

PBSCI 666P WAMI Psychiatry and Behavioral Sciences Clerkship (12) AWSpS Wreggit Rotation aims to increase student's skills in basic psychiatry, social psychiatry, transcultural psychiatry, and office management. Orientation is around the diagnosis, treatment, and clinical management of White, Aleut, Indian, and Eskimo children and adults in outpatient and community settings. Third-, fourth-year medical students. Prerequisite: HUBIO 563P. (Limit: three students.)

PBSCI 670P Clerkship in Consultation-Liaison Psychiatry (*, max. 24) Katon, Wilson Assessment of patients with major psychosocial problems associated with physical disease, including: problems stemming from the way the illness is perceived and experienced, liaison with other clinical disciplines on complex diagnosis and treatment of problems. Does not fulfill requirement for basic clerkship (664P, 665P, 666P) in psychiatry.

PBSCI 672P Elective Clerkship in Primary Care Psychiatry at Boise VAMC (8 or 12) Assessment and treatment of patients with acute psychiatric problems in a primary care/rural setting. Consultation work on general medicine and surgery; assessment and dealing with outpatient psychiatric problems as they initially present. Initial evaluations, crisis intervention strategies, and brief therapies stressed. Prerequisites: 664P, 665P, 666P.

PBSCI 673P Outpatient Psychiatry Elective (*, max. 24) AWSpS Brinkley Offered at HCMHC, the primary outpatient psychiatric facility for Harborview Medical Center. Students function as subinterns, conducting diagnostic interviews, initiating and managing pharmacotherapeutic treatment regimens, and providing crisis intervention, under the supervision of the full-time attending at Psychopharmacology Clinic. Prerequisite: 664P, 665P, or 666P.

PBSCI 675P Clerkship in Consultation/Liaison Psychiatry American Lake (8 or 12) Ahbel, Harris Assessment and treatment of patients with acute and chronic medical illness: COPD, cardiac disease, cancer, neural diseases such as M.S., Huntington's chorea, and blindness. Psychosocial implications for

patients, families, and impact on staff. Prerequisite: 664P, 665P, or 666P. (Four to six weeks, full-time.)

PBSCI 676P Inpatient Clerkship in Psychiatry at American Lake VA (8 or 12) Cheah, Verhey For medical students with a defined interest in psychiatry who wish to develop their knowledge and skills in the evaluation, management, and treatment of a wide range of acute and chronic psychiatric conditions requiring inpatient hospital treatment. Prerequisite: 664P, 665P, or 666P.

PBSCI 677P Alcohol and Drug Treatment Clerkship at American Lake VA (8 or 12) Cheah, Sauer Student assists in every phase of the substance-abuse treatment, including admission interviews, patient evaluation problem identification, group and individual psychotherapy, assertiveness training, anger control, human sexuality, medical evaluation and treatment, couples therapy, discharge and aftercare planning. Experience primarily clinical. Prerequisite: 664P, 665P, or 666P.

PBSCI 678P Clerkship in Psychiatric Long-Term Care and Rehabilitation (*, max. 12) Cheah, Zemcuznikov, Zimmers Two- or six-week clerkship provides learning experiences in rehabilitation of long-term psychiatric patients with medical illness. Multidisciplinary team approach, working with families affected by catastrophic illness, diagnostic skills. Spectrum of diseases (cardiovascular, Huntington's, organic brain syndrome) is such that physical rehabilitation is not an emphasis.

PBSCI 680P Clerkship in Emergency Psychiatry (*, max. 24) Dagadakis Emphasis on clinical evaluation, acute management, and treatment planning for individual patients. Experience in coordinating these activities with other emergency room personnel, and various hospital and community resources. Emphasis on skills useful to physicians in any specialty. Third- and fourth-year medical students only. Prerequisite: either 664P, 665P, or 666P.

CONJ 680P An Introduction to Detoxification and Rehabilitation Programs for Alcoholism (*, max. 16) See Conjoint Courses.

PBSCI 685 Geriatric Psychiatry Clerkship (*, max. 12) Reiffner Two-, four-, or six-week elective. Participation in the evaluation and care of older persons with psychopathology, such as intellectual impairment and depression, in a variety of settings. Emphasis on improving clinical skills regarding diagnosis and treatment of common behavioral problems in the elderly. Prerequisite: 664P, 665P, or 666P.

PBSCI 696P Advanced Clerkship in Child Psychiatry (12 or 24) AWSpS Varley Provides students an opportunity to participate in evaluations and treatment in both outpatient and inpatient settings. Experiences in specialized clinics are also available. It is suggested that the student contact the instructor prior to enrollment. Prerequisite: 664P, 665P, or 666P. (Six or twelve weeks, full-time. Limit: two students.)

PBSCI 697P Psychiatry Special Electives (*, max. 24) Hunt By special arrangement, clerkships, externships, and research opportunities can be made available at the University and other institutions. Students obtain permission from Dr. Hunt before obtaining a special assignment form from the Dean's office one month before advance registration. Students contact affiliating institutions. Does not fulfill the requirement for a basic clerkship in psychiatry. Entry card required.

Radiation Oncology

NN111 University Hospital

Radiation oncology is the branch of clinical medicine that utilizes high-energy radiation to treat disease, usually cancer. The department consists of three divisions:

clinical oncology, medical radiation physics, and experimental cancer biology. Training programs are offered in all three divisions. Research programs in the Department of Radiation Oncology are aimed at the physical and biological mechanisms of interactions between ionizing radiations and normal and malignant tissues.

Faculty

Chairperson

Thomas W. Griffin

Professors

Bleyer, Werner A., 1975, ‡(Medicine), (Pediatrics), M.D., 1969, Rochester; pediatrics, hematology, oncology.

Griffin, Thomas W., 1976, M.D., 1970, Nebraska (Omaha); therapeutic radiology.

Groudine, Mark T., 1979, (Pathology), M.D., 1975, Ph.D., 1976, Pennsylvania; molecular biology.

Krohn, Kenneth A., 181, (Chemistry), (Radiology), † Ph.D., 1971, California (Davis); nuclear medicine.

Laramore, George E., 1979, M.S., 1966, Ph.D., 1969, Illinois (Urbana); M.D., 1976, Miami; therapeutic radiology.

Rasey, Janet S., 1972, M.S., 1965, Oregon State; Ph.D., 1970, Oregon; radiation biology.

Wootton, Peter, 1964, B.Sc. (Hon.), 1944, Birmingham (England); medical radiation physics.

Associate Professors

Eenmaa, Juri, 1971, M.S., 1966, Southern California; Ph.D., 1971, Washington; medical radiation physics.

Graham, Michael M., 1980, (Medicine), (Radiology), † M.A., 1969, Ph.D., 1973, California (Berkeley); M.D., 1976, California (San Francisco); nuclear medicine.

Shuman, William P., 1979, (Radiology), † M.D., 1973, New York (Upstate); ultrasound and computed tomography.

Assistant Professors

Griffin, Brian R., 1985, (Neurological Surgery), † M.D., 1981, Nebraska; therapeutic radiology.

Jacky, Jon P., 1984, (Research), Ph.D., 1977, Washington; medical radiation physics.

Kalet, Ira J., 1982, (Computer Science), M.A., 1967, Ph.D., 1968, Princeton; particle physics.

Livesey, John C., 1985, (Acting), Ph.D., 1982, Minnesota; radiation biology.

Pelton, James G., 1984, (Acting), M.D., 1981, Nebraska; therapeutic radiology.

Russell, Kenneth J., 1985, M.D., 1979, Harvard; therapeutic radiology.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

R ONC 489 Undergraduate Research (*, max. 24) B. Griffin, Laramore, Livesey, K. Russell Opportunities in clinical or laboratory investigation in radiation oncology. Participation of medical students in ongoing projects or new projects designed for the students. Offered on credit/no credit basis only. Prerequisites: medical student standing and permission of Dr. Griffin.

R ONC 505, 506 Radiological Physics I, II (3,3) Eenmaa, Wootton Application of physical concepts, methodology, and instrumentation in the study, production, and mensuration of ionizing radiations and their interactions with biological materials. Joint with RAD S 505, 506. Prerequisite: permission of instructor.

R ONC 517 Radiation Dosimetry (3) A Eenmaa, Kalet Examines the interactions of ionizing radiations with matter and the physical principles involved in their measurement in greater depth than does 505. For students contemplating a career in research concerned with ionizing radiation; assumes a sound background in physics. Joint with RAD S 517. Prerequisite: permission of instructor.

R ONC 695P Clinical Cancer Management (*, max. 8) AWSps B. Griffin Supervised participation in clinical management of the patient with cancer. Includes clinical evaluation, planning of treatment and follow-up examination of patients. Daily teaching conferences. Prerequisite: MED 665P or permission of instructor. (Four weeks.)

Radiology

RR215 University Hospital

Diagnostic radiology is a branch of clinical medicine that uses information obtained from imaging modalities, and, more recently, data acquired from NMR spectroscopy, to detect and to characterize states of disease. Historically, X rays were the first and the primary energy source utilized for these purposes; X rays continue today to be a mainstay of this discipline. More recently, the armamentarium has grown to include diagnostic ultrasound, computed tomography, nuclear magnetic resonance, and positron emission tomography. In nuclear medicine, one of radiology's major specialties, radionuclides are employed for both diagnostic and therapeutic purposes. The Department of Radiology consists of two clinical divisions, diagnostic radiology and nuclear medicine. Both sections are ably supported by technologists and faculty members in the field of radiation physics. Instruction in radiology is provided for medical students and residents as well as for other physicians. The faculty and its teaching and research activities are represented in each of the hospital facilities with the University.

Faculty

Chairperson

Albert A. Moss

Professors

Bassingthwaite, James B., 1975, ‡(Bioengineering), M.D., 1955, Toronto; Ph.D., 1964, Mayo Graduate School of Medicine; computer analysis of transport mechanisms in blood tissues.

Ben-Menachem, Yotam, 1988, (Medicine), M.D., 1960, Afulah (Israel); trauma/angiography.

Chesnut, Charles H. III, 1973, (Medicine), † M.D., 1966, Florida; nuclear medicine.

Figley, Melvin M., 1958, (Emeritus), (Medicine), † M.D., 1944, Harvard; general and chest radiology.

Goldman, Martin L., 1987, M.D., 1966, Northwestern; angiography/interventional radiology.

Graham, C. Benjamin, 1965, (Pediatrics), † M.D., 1958, Washington; pediatric, neonatal radiology.

Harley, John D., 1975, M.D., 1966, Washington (St. Louis); general radiology and angiography.

Hayden, Patricia W., 1964, ‡(Pediatrics), M.D., 1953, Rochester; pediatric nuclear medicine.

Krohn, Kenneth A., 1981, (Chemistry), (Radiation Oncology), † Ph.D., 1971, California (Davis); radiochemistry.

Loop, John W., 1961, (Environmental Health), M.D., 1952, Harvard; general radiology and neuroradiology.

Mack, Laurence A., 1978, (Obstetrics and Gynecology, Orthopaedics), M.D., 1971, Illinois; ultrasonography, computed tomography.

Maravilla, Kenneth R., 1986, M.D., 1970, State University of New York; neuroradiology.

Moss, Albert A., 1984, M.D., 1967, State University of New York (Syracuse); gastrointestinal radiology, computed tomography.

Nelp, Wil B., 1962, (Medicine), † M.D., 1955, Johns Hopkins; nuclear medicine.

Nelson, James A., 1986, M.D., 1961, Harvard; gastrointestinal radiology, imaging research.

Rohrmann, Charles A., Jr., 1975, M.D., 1966, Washington; gastrointestinal radiology.

Associate Professors

Baron, Richard L., 1986, M.D., 1976, Washington (St. Louis); computed tomography, gastrointestinal radiology.

Blumhagen, Joel D., 1977, (Pediatrics), M.D., 1973, Washington (St. Louis); pediatric radiology, ultrasound, nuclear medicine.

Brewer, David K., 1978, (Pediatrics), M.D., 1972, Harvard; pediatric radiology, angiography, computed tomography.

Godwin, J. David, 1986, M.D., 1971, Stanford; pulmonary radiology.

Graham, Michael M., 1980, (Medicine), (Radiation Oncology), † M.S.E.E., 1966, M. Biorad., 1969, Ph.D., 1973, California (Berkeley); M.D., 1979, California (San Francisco); nuclear medicine, PET.

Griep, Robert J., 1967, (Medicine), † M.D., 1958, Texas; nuclear medicine.

Lewellen, Thomas K., 1972, (Electrical Engineering), Ph.D., 1972, Washington; medical imaging physics.

Marglin, Stephen I., 1980, M.D., 1968, Yale; chest and oncologic radiology.

Modell, Harold I., 1986, (Research), (Physiology and Biophysics), Ph.D., 1971, Mississippi; physiology.

Phillips, Leon A., 1965, (Emeritus), M.D., 1952, Yale; general radiology, urology.

Shuman, William P., 1979, (Radiation Oncology), † M.D., 1973, New York (Upstate); ultrasound, computed tomography and MRI.

Vincent, Lawrence M., 1986, M.D., 1977, Kansas; ultrasound, computed tomography.

Williams, David L., 1975, Ph.D., 1971, Washington; radiation physics.

Assistant Professors

Cerqueira, Manuel, 1983, M.D., 1976, New York; nuclear medicine.

Cohen, Wendy, 1987, M.D., 1975, Harvard; neuroradiology.

Coldwell, Douglas M., 1987, Ph.D., 1975, Rice; M.D., 1979, Texas; angiography/interventional radiology.

Dalley, Robert W., 1987, M.D., 1982, Utah; neuroradiology.

Eary, Janet J., 1986, M.D., 1980, Michigan State; nuclear medicine.

Eskridge, Joseph M., 1987, M.D., 1980, Kentucky; neuroradiology.

Goodsitt, Mitchell M., 1986, Ph.D., 1982, Wisconsin; medical physics, ultrasound, computed tomography.

Grierson, John R., 1987, (Research), Ph.D., 1983, British Columbia; chemistry.

Haynor, David R., 1985, Ph.D., 1971, California (Berkeley); M.D., 1979, Harvard; computed tomography/ultrasound.

Jacobson, Arnold F., 1987, Ph.D., 1980, Wisconsin; M.D., 1980, Illinois; nuclear medicine.

Kapoor, Rajesh, 1986, (Research), Ph.D., 1979, Lancaster (England); biochemistry.

Mercker, Janis P., 1980, (Acting), M.D., 1976, Washington; pediatric radiology.

Nance, Dale R., 1985, (Acting), M.D., 1976, Baylor; angiography/interventional radiology.

Needell, William M., 1987, (Acting), M.D., 1982, Hahnemann Medical College; neuroradiology.

Ott, Susan M., 1982, ‡(Medicine), M.D., 1974, Washington.

Peterson, Ingrid M., 1986, M.D., 1978, Stanford; abdominal imaging.

Richards, Todd L., 1985, Ph.D., 1984, California (Berkeley); physics.

Richardson, Michael L., 1984, M.D., 1975, Baylor; bone and joint radiology.

Rosenbaum, David M., 1983, (Pediatrics), M.D., 1977, Albert Einstein; pediatrics.

Rowberg, Alan H., 1982, (Bioengineering), M.D., 1970, Washington; M.S., 1974, Johns Hopkins; medical imaging and computing.

Saarninen, Allan O., 1987, (Research), Ph.D., 1986, Washington; management information systems.

Schwartz, Alan N., 1985, (Acting), M.D., 1977, Mount Sinai (New York); general radiology.

Sirota, Paul S., 1985, (Acting), M.D., 1979, Colorado; nuclear medicine.

Teefey, Sharlene A., 1985, M.D., 1980, Hawaii (Honolulu); ultrasound, computed tomography.

Wang, Keith Y., 1986, Ph.D., 1972, California (Santa Barbara); M.D., 1982, Miami; ultrasound/computed tomography.

Weinberger, Edward, 1985, (Acting), M.D., 1979, Harvard; pediatric radiology.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

RADGY 488 Undergraduate Thesis (*) AWSp Rosenbaum Supervised clinical and/or laboratory research in the broad field of medical imaging, culminating in a thesis. The thesis will be submitted to Dr. Rosenbaum for suitable recognition.

RADGY 499 Undergraduate Research (*) AWSpS Rosenbaum Opportunity to gain research experience and direct participation in either clinical or basic sciences investigation in diagnostic radiology and/or nuclear medicine. Written exposition of the results of this experience will be submitted to Dr. Rosenbaum.

RADGY 508 Physical Aspects of Medical Imaging (2) A Goodsitt Quantitative physical principles of medical imaging are presented for electromagnetic and sonic radiation. X-ray imaging; sources, image formation, and information extraction, for CT as well as conventional systems; theory of ultrasound and resonance imaging. Joint with RAD S 508. Prerequisites: RAD S 505, 506.

RADGY 580P Nuclear Medicine Technique, Physics, and Instrumentation (2½) S Lewellen Provides familiarization with basic nuclear phenomena and with the instrumentation used in the practice of nuclear medicine. There are discussions and laboratory exercises. Practical experience in instrument operation and sample counting are provided. Prerequisite: permission of instructor.

RADGY 600 Independent Study or Research (*) AWSpS Prerequisite: permission of instructor.

RADGY 693P Introduction to Clinical Radiology (8) AWSpS Rosenbaum Medical imaging. Emphasis on gaining in-depth understanding of criteria recommended for selection of radiologic examination and the perceptual skills needed for preliminary interpretation of the more commonly encountered studies. Includes lectures, film reading, case related conferences, and independent study. Prerequisite: completion of Human Biology series. (Not offered in June, July, or December.)

RADGY 694P Advanced Clinical Clerkship (8) AWSpS Rosenbaum For students who have completed 693 or its equivalent and who wish to obtain more comprehensive and/or more specialized experience in the field of medical imaging. Prerequisites: 693 and permission of instructor.

RADGY 696P Nuclear Medicine Clerkship (*, max. 12) Nelp Daily participation at University Hospital nuclear medicine clinic emphasizing technical performance, diagnostic interpretation, and clinical relevance of nuclear imaging. Daily clinical teaching conferences of the division. Four- and six-week clerkships can be preplanned in areas such as pulmonary, cardiovascular, renal, bone, computer analysis. Prerequisite: permission of instructor.

RADGY 697P Radiology Special Electives (*, max. 24) Rosenbaum Radiologic training in a nonaffiliated institution. Permission and arrangements must be made at the time of registration through direct communication between the student and the education coordinator in Radiology. A written outline from a preceptor at the intended site required. Prerequisite: permission of radiology education coordinator.

Rehabilitation Medicine

BB919 Health Sciences

The Department of Rehabilitation Medicine provides instruction for medical students, interns, and residents in a comprehensive approach to rehabilitation problems. This includes special diagnostic and evaluative procedures; methods and rationale in the application of principles of occupational therapy, physical therapy, prosthetics and orthotics, and other health professions; and advanced investigation of special problems encountered in the field. In addition, the department conducts a residency training program for the specialty of physical medicine and rehabilitation.

The department offers curricula leading to the following degrees: Bachelor of Science in Occupational Therapy, Master of Science in Occupational Therapy, Bachelor of Science in Physical Therapy, Master of Physical Therapy, Bachelor of Science in the field of prosthetics and orthotics, and a Master of Science for residents in physical medicine and rehabilitation who wish to enter the academic field.

Occupational Therapy

Head

Elizabeth M. Kanny

Occupational therapy is a health profession that provides services to persons whose lives have been disrupted by physical illness or injury, social or emotional difficulties, congenital or developmental problems, or the aging process. Occupational therapists use activities with specific goals, or "occupation," in helping people of all ages to prevent, reduce, or overcome disabilities. The activities may be as basic as bathing, dressing, or eating, or as complex as operating a computer with modified control switches.

Today's occupational therapists work in clinical practice, administration, education, research, private practice, and many other areas. Work settings include rehabilitation centers, hospitals, public and private schools, home health agencies, community mental health centers, private practice, nursing homes, drug and alcohol abuse centers, vocational rehabilitation centers, physicians' offices, industrial clinics, hospices, and wellness programs. In addition, occupational therapists may become involved in academic or clinical teaching and in research.

Services may include training in self-care activities; design, fabrication, and application of splints; sensorimotor activities; therapeutic group activities; selection and use of adaptive equipment; adaptation of physical environments; therapeutic activities to enhance functional performance; and work evaluation and training.

The program in occupational therapy leading to a Bachelor of Science degree awarded by the School of Medicine is accredited by the American Occupational Therapy Association and the American Medical Association. The program includes two years of professional course work and six months of supervised, full-time clinical training. Graduates are eligible to become registered occupational therapists after passing the National Certification Examination for occupational therapists. Some states, including Washington, require state licensure, as well.

Admission Requirements: Students are admitted to the baccalaureate program at the junior level; however, some applicants have completed three or more years of college work or may hold a baccalaureate degree before applying to the program. The admission process occurs once each year for the Autumn Quarter of each year; the application deadline is February 15. Preprofessional requirements prior to entrance include completion of the College of Arts and Sciences proficiency and general education requirements and completion of the following prerequisite course work, which may be counted toward distribution requirements:

Physical Sciences: CHEM 101, General Chemistry (5 credits), or CHEM 140, General Chemistry (4); PHYS 114, General Physics (4); PHYS 117, General Physics Laboratory (1).

Biological Sciences: B STR 301, General Anatomy (6); ZOOL 118, Survey of Physiology (5).

Social Sciences: PSYCH 101, Psychology as a Social Science (5 credits); PSYCH 305, Deviant Personality (5); PSYCH 306, Developmental Psychology (5); SOC 110, Survey of Sociology (5).

Students must have earned a minimum grade-point average of 2.50 on a minimum of 25 credits in the prerequisite courses listed above and have a cumulative grade-point average of 2.50 in order to be eligible to apply. Detailed program requirements and selection process information may be obtained from the curriculum office.

Graduation Requirements: The following courses must be completed satisfactorily in the scheduled sequence, beginning Autumn Quarter, only at the University: RE-HAB 320, 322, 332, 380, 414, 417, 442, 444, 445, 446, 447, 448, 468, 469, 470, 473, 477, 481, 482, 483, 484, 485, and 496.

The University grade-point system is used in student evaluation. A student must maintain a cumulative grade-point average of 2.50 in all required professional course work to maintain satisfactory standing and to graduate. The student must attain a minimum grade of 2.0 in all required courses, with the exception of one course grade allowed between 1.7 and 1.9 or be required to repeat that course at the next offering.

At the end of any academic quarter in which a student's performance falls below the scholastic requirement, he or she is placed on academic probation and is allowed two additional consecutive quarters to raise the grade-point average to 2.50. A student who fails to meet the above scholastic requirements is dismissed from the program and advised to transfer to an alternative major or withdraw from the University.

Physical Therapy

Head

JoAnn McMillan

Physical therapy is a direct form of professional patient care that can be applied in most disciplines of medicine, especially neurology, orthopaedics, pediatrics, geriatrics, and sports medicine. The principal objective of physical therapy is to restore or improve function in muscles that, for one reason or another, do not perform as they should. Muscle restoration is only part of the work of physical therapy. Equally important is a rebuilding of self-confidence and the creation of a desire to return to a normal active life. Other primary objectives of physical therapy are the preventing of disability and pain and the aiding of those who must adapt to permanent disability.

As a consequence of the scope of the profession, physical therapists function in a variety of settings, the most familiar being the hospital. Physical therapists also plan, provide, and supervise evaluation and direct patient care in outpatient clinics, rehabilitation centers, home-care agencies, schools, extended-care facilities for the elderly, voluntary health agencies, and private practices. The physical therapist may be found anywhere that quality health care is needed. Increasingly, physical therapists are becoming involved in basic and clinical research; in the academic community, either as full-time faculty members or as supervisors of clinical education; and as consultants in local, state, and federal health-planning activities.

Physical therapists function in compliance with the licensing laws and ethical principles that govern the practice of physical therapy. The steps to licensure as a physical therapist vary slightly from state to state, but all physical therapists graduate from an accredited curriculum of physical therapy that includes a specific period of clinical training. As physical therapy relates to twenty-four of the twenty-seven medical specialties, the education program is broad in scope, including a heavy dose of physical and social sciences. The physical therapist evaluates the patient's problem by testing such factors as range of joint motion, muscle strength, posture and gait, pulmonary function, sensation and sensory perception, orthotic and prosthetic fit, reflexes and muscle tone, and functional skills. The results of these evaluations are reported to the patient's physician, with whose approval the physical therapist plans, provides, and monitors an appropriate patient-care program. Some of the procedures used may include short-wave diathermy, ultrasound, cold, electrical stimulation, massage, traction, joint mobilization, biofeedback, therapeutic exercise, and training in the use of orthotic, prosthetic, and other assistive devices, such as crutches, canes, and wheelchairs.

As with all professionals in health fields, physical therapists are responsible for subscribing to a program of continuing education. Some therapists also develop the knowledge and skills of a specialist via continuing education and concentrated practice in one area, such as cardiopulmonary disease. A formalized mechanism for certifying specialists is being implemented by the national professional association, the American Physical Therapy Association.

The University baccalaureate program in physical therapy is fully approved by the American Physical Therapy Association Commission on Accreditation in Education.

Admission Requirements: Detailed program requirements and selection process information may be obtained from the curriculum office. Students are urged to request this information early, because the deadline for receipt of applications is February 15. At the time of entrance to the program (Autumn Quarter), applicants must be legal residents of Washington (as defined by the University administration code) or of Idaho, Alaska, Montana, Oregon, Hawaii, Wyoming, or Nevada. Requirements prior to entrance include completion of the College of Arts and Sciences proficiency and distribution requirements and completion of the following prerequisite course work, which may be counted toward distribution requirements:

Physical Sciences: CHEM 140, 150, General Chemistry (4, 4 credits); PHYS 114, 115, 117, 118, General Physics and Laboratory (10).

Biological Sciences: B STR 301, General Anatomy (6 credits); ZOOL 118, Survey of Physiology (5); MICRO 301, General Microbiology (3); MICRO 302, General Microbiology Laboratory (2).

Social Sciences: PSYCH 101, Psychology as a Social Science (5 credits); plus one additional psychology or psychiatry course (only 2 credits from the additional course may be counted toward the prerequisite grade-point average).

Students must have earned a minimum grade-point average of 3.00 on a minimum of 28 credits of the preceding courses and have a cumulative grade-point average of 2.70 in order to be eligible to apply. Admission is competitive, based on a demonstrated academic ability and apparent aptitude for physical therapy. Returning students who previously dropped out of the program must reapply and are subject to the same review process as that used for all other applicants.

In recent years, while the professional phase of the entry-level professional program is designed to begin with the junior year of a four-year baccalaureate curriculum, the majority of applicants have completed three or more years of college work before being accepted into this program. Many of the students admitted hold the baccalaureate degree in another discipline. To be competitive, applicants must arrange for a strong and general program of prerequisite course work that includes the specific courses listed above. The physical therapy professional organization is currently considering a revision in proposed standards for accreditation of entry-level programs. It is possible that changes in the program requirements at the University may be made in the future to accommodate professional initiatives. Students are encouraged to contact the physical therapy curriculum office for information updated yearly.

Graduation Requirements: The following courses must be completed satisfactorily in the scheduled sequence, beginning Autumn Quarter only, at the University: REHAB 320, 321, 322, 332, 404, 405, 413, 415, 416, 442, 443, 444-445, 451, 452, 460, 463, 466-467, 471, 472, 475, 476, 480, 495; PATH 410; B STR 431.

Student Evaluation

The University grade-point system is used. A student in the professional phase of the curriculum must maintain a cumulative grade-point average of 2.50 in all required courses for satisfactory standing and for graduation. At the end of any academic quarter in which a student's performance falls below that point, he or she is placed on academic probation. Once on academic probation, a student is allowed two additional consecutive quarters to bring his or her curriculum grade-point average to 2.50. A student not meeting the above standard is dropped from the curriculum and advised to transfer to an alternate major within the University or to withdraw from the University.

Any grade of less than 2.0 in a professional curriculum course necessitates repetition of that course if recommended by the physical therapy faculty and approved by the Advisory and Evaluation Committee.

Prosthetics and Orthotics

Head

Alan J. Dralle

The prosthetist-orthotist is a member of a professional medical team devoted to the evaluation and treatment of physically handicapped persons. He or she is responsible for the designing and fabricating of prosthetic and orthotic devices (artificial limbs and braces) and for helping handicapped patients of all ages to enjoy more functional and independent lives.

Bachelor of Science Degree

Admission Requirements: Students are admitted to this curriculum at the junior level. Preprofessional requirements for admission include completion of the College of Arts and Sciences proficiency requirements, as well as the distribution requirements with a minimum of 20 credits each in the humanities, natural sciences, and social sciences with a 2.00 cumulative grade-point average on a 4.00 scale, and completion by the end of Autumn Quarter or semester of the year prior to expected admission into the program of a minimum of 22 quarter credits of the 36-41 credits in the following prerequisite courses (or their equivalent for transfer students) with a minimum grade-point average of 2.50: BIOL 101-102 (10 credits) or MICRO 301, 302 (3, 2); note that CHEM 102 is prerequisite for microbiology; PHYS 114, 115, 117, 118 (10); B STR 301 (6); ZOOL 118 (5); PSYCH 101 (5).

At the time of application, a student must submit a reasonable plan for completion before the date of expected entry into the program of the balance of the prerequisite courses listed above. If, by the time of expected entry into the program, the student has not completed all prerequisite courses with a minimum grade-point average of 2.50 as well as a total grade-point average of 2.00, that student will not be admitted to the program.

Graduation Requirements: The following courses must be taken in the scheduled sequence, beginning Autumn Quarter only, at the University of Washington: REHAB 320, 321, 332, 340, 341, 342, 343, 414, 420, 421, 423, 427, 428, 429, 430, 442, 443, 444-445, 451, 452.

In student evaluation, the University grade-point system is used with the exception that a grade below 2.0 in any required professional course is not acceptable. Satisfactory scholarship requires the maintenance of a cumulative grade-point average of 2.50 in the required courses, which is the basis for promotion and graduation.

Graduate Program

The graduate programs in rehabilitation medicine lead to the following degrees: Master of Rehabilitation Medicine, Master of Science (Rehabilitation Medicine, Occupational Therapy or Physical Therapy), and Master of Physical Therapy.

Master of Rehabilitation Medicine Degree

An applicant for the Master of Rehabilitation Medicine program must have an M.D. degree and be currently enrolled or have completed residency training in the specialty of physical medicine and rehabilitation. The purpose of the program leading to the Master of Rehabilitation Medicine degree is to train academicians in the field of physical medicine and rehabilitation. Students must earn a minimum of 36 credits. A minor is taken in one of the related medical sciences: general medical science, biophysics-physiology, or psychology. A special, in-depth project is required as part of the master's degree program.

Master of Science Degree (Rehabilitation Medicine)

The Master of Science degree (rehabilitation medicine pathway) requirements include all of those stated above for a Master of Rehabilitation Medicine degree. In addition to those requirements, more extensive research and a formal thesis are required.

Special Requirements: Requirements for admission to the program leading to the Master of Science degree (rehabilitation medicine pathway), in addition to the requirements of the Graduate School, include an M.D. degree from an approved medical school. Students must be concurrently enrolled, or have completed an approved residency program, in physical medicine and rehabilitation, or, in exceptional cases, students who

have successfully finished a three-year residency program in a related specialty can be accepted into the program.

Master of Science Degree (Occupational Therapy)

The Master of Science degree in occupational therapy is designed for registered occupational therapists. Core courses focus on the development of research and teaching. Independent study options and electives offer flexibility that allows students to meet individual objectives. Completion of a data-based thesis is required. Full-time students generally complete the course work in three to four quarters. The additional time to complete the thesis requirement varies.

Special Requirements: The applicant for admission to the program leading to the degree of Master of Science (occupational therapy pathway) must be a graduate of an approved occupational therapy program. A year of professional experience is desirable. Detailed information on the program and admission requirements is available.

Graduation Requirements: All students must meet the minimum requirements for a master's degree as outlined in the Graduate Study and Research section of this catalog. In addition, students must satisfactorily complete core courses required by the occupational therapy program and a data-based thesis.

Master of Science Degree (Physical Therapy)

The program of study leading to the degree of Master of Science (physical therapy pathway) has been designed to prepare physical therapists to assume a career in teaching and administration within the field. An emphasis of the curriculum is preparation for research and contribution to the professional literature; therefore, a thesis is a requirement of this plan. Opportunities are provided to enhance specialized knowledge and skill in selected content areas of physical therapy practice. Depending upon the student's educational goals and prior accomplishments, the program should require one to two calendar years for completion.

Special Requirements: Selection for admission to the Master of Science degree program (physical therapy pathway) is based on an assessment of intellectual capacity, basic professional competence, promise for future contributions to the field, and availability of the program (due to funding limitations, the program is not offered every year). Students must have completed a baccalaureate degree and an accredited physical therapy program with a minimum cumulative grade-point average of 3.00, based on a 4-point scale, on all college work. Detailed information on program and admission requirements is available from the department.

Graduation Requirements (Master of Science degree): Minimum of 36 credits, including specified core course work and approved individual curriculum program. Completion of an approved thesis and Graduate School requirements for a master's degree.

Master of Physical Therapy Degree

The purpose of the Master of Physical Therapy program is to provide opportunities to pursue in-depth study in an area of interest related to a clinical specialty and to strengthen general evaluation and management skills for practice as a health-care practitioner. Preparation in statistics and research design and completion of a major project are requirements of this plan. Focus of this curriculum is on work related to future clinical practice in positions of responsibility and on participation in clinical teaching, research, and administration.

Special Requirements: Selection for admission to the Master of Physical Therapy degree program is based on assessment of intellectual capacity, basic professional achievement in undergraduate physical therapy course work, promise for future contributions to the field, and availability of the program (due to funding limitations, the program is not offered every year). Students must have completed a baccalaureate degree

and an accredited physical therapy program with a minimum cumulative grade-point average of 3.00, based on a 4-point scale, on all college work. Detailed information on program and admission requirements is available from the department.

Graduation Requirements (Master of Physical Therapy degree): A minimum of 36 credits, including specified core course work and approved individual curriculum program. Completion of an approved project and Graduate School requirements for a master's degree.

Faculty

Chairperson

Walter C. Stolor

Professors

Anderson, Marjorie E.,* 1971, (Physiology and Biophysics),† Ph.D., 1969, Washington; physiology.

deLateur, Barbara J.,* 1967, M.D., 1963, M.S., 1968, Washington; psychiatry.

Fordyce, Wilbert E.,* 1955, (Emeritus), M.S., 1951, Ph.D., 1953, Washington; psychology.

Guy, Arthur W.,* 1965, (Electrical Engineering), (Bioengineering),† M.S.E.E., 1957, Ph.D., 1966, Washington; electrical engineering.

Halar, Eugen M.,* 1968, M.D., 1959, Zagreb (Yugoslavia); psychiatry.

Kraft, George H.,* 1969, M.D., 1963, M.S., 1967, Ohio State; psychiatry.

Lehmann, Justus F.,* 1957, M.D., 1945, Frankfurt (West Germany); psychiatry.

Stolor, Walter C.,* 1960, M.A., 1951, M.D., 1956, Minnesota; psychiatry.

Associate Professors

Berni, Rosemarian,* 1967, (Emeritus), M.N., 1973, Washington; rehabilitation nursing.

Cardenas, Diana D.,* 1981, M.D., 1973, Texas (Dallas); M.S., 1976, Washington; psychiatry.

Dikmen, Sureyya S.,* 1974, (Neurological Surgery, Psychiatry and Behavioral Sciences), M.A., 1967, Michigan; Ph.D., 1973, Washington; neuropsychology.

Fraser, Robert T., 1977, (Neurological Surgery),† M.S., 1972, Southern California; Ph.D., 1976, Wisconsin (Madison); M.P.A., 1984, Seattle; psychology.

Habek, Rochelle V., 1987, M.S., 1975, Virginia Commonwealth; Ph.D., 1982, Wisconsin; rehabilitation psychology.

McMillan, JoAnn,* 1958, M.S.Ed., 1968, Southern California; physical therapy.

Turner, Judith A., 1980, (Psychiatry and Behavioral Sciences),† M.A., 1975, Ph.D., 1979, California (Los Angeles); psychology.

Warren, C. Gerald,* 1968, (Clinical), M.P.H., 1971, Washington; technology applied in rehabilitation, biomechanics, biophysics, environmental modification, computer applications and software development.

Yorkston, Kathryn M.,* 1978, M.S., 1972, Ph.D., 1975, Oregon; speech and hearing.

Assistant Professors

Britell, Catherine W., 1985, (Acting), M.D., 1973, Southern California; psychiatry.

Brockway, Jo Ann,* 1975, M.A., 1972, Ph.D., 1975, Iowa; psychology.

Brooke, Marvin M., 1984, M.D., 1975, Emory; M.S., 1978, Washington; psychiatry.

Catanzaro, Marci,* 1977, ‡(Nursing), M.N., 1971, Washington; Ph.D., 1980, Union Graduate School-West (San Francisco); symptom management and chronic illness.

Czerniecki, Joseph M., 1986, (Acting), M.D., 1981, British Columbia; M.S., 1985, Washington; psychiatry.

Deitz, Jean C.,* 1979, M.Ed., 1970, Ph.D., 1976, Florida; occupational therapy.

Egan, Kelly, 1980, (Psychiatry and Behavioral Sciences),† M.A., 1988, Texas Tech; Ph.D., 1980, Washington; clinical psychology.

Hammond, Margaret C., 1982, M.R.M., 1984, Washington; M.D., 1979, Medical College of Wisconsin; psychiatry.

Hays, Ross M.,* 1983, (Pediatrics), M.D., 1978, Washington; psychiatry, pediatrics.

Jaffe, Kenneth M.,* 1982, (Pediatrics), M.D., 1975, Harvard; M.R.M., 1982, Washington; pediatric psychiatry.

Little, James W., 1984, Ph.D., 1976, M.D., 1977, Chicago; psychiatry.

Patterson, David R., 1984, Ph.D., 1982, Florida State; clinical psychology.

Questad, Kent A., 1982, (Acting), M.S.W., 1979, Washington; Ph.D., 1983, Wisconsin; rehabilitation counseling, psychology.

Slimp, Jefferson C.,* 1980, (Research), M.A., 1974, Ph.D., 1976, Wisconsin; psychology.

Trotter, Martha J., 1965, B.S., 1957, East Tennessee; physical therapy.

Uomoto, Jay M., 1987, M.A., 1983, Ph.D., 1985, Fuller Theological Seminary; psychology.

Instructors

Collins, Kathryn M., 1986, M.D., 1975, Dartmouth; psychiatry.

Guthrie, Mark R., 1983, (Acting), M.P.T., 1980, Washington; physical therapy.

Honsinger, Melissa J., 1986, (Acting), M.A., 1981, Washington State; speech communication disorders.

Price, Robert, 1985, (Research), M.S.M.E., 1985, Washington; mechanical engineering.

Lecturers

Crowe, Terry K., 1979, M.S., 1979, Boston; occupational therapy.

Dralle, Alan J., 1972, B.S.P.T., 1968, Washington; prosthetics and orthotics.

Hertling, Darlene M., 1965, B.S., 1956, California (Berkeley); physical therapy.

Kanny, Elizabeth M., 1978, M.A., 1977, Seattle; occupational therapy.

Yamane, Ann, 1982, B.S., 1976, Washington; prosthetics and orthotics.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

REHAB 320, 321 Medical Science (4,4) W,Sp Lectures in fields related to: general surgery, obstetrics and gynecology, internal medicine, neurology, rehabilitation medicine, orthopaedics, psychiatry and behavioral sciences, rheumatology, and pediatrics. Required for occupational therapy, prosthetics and orthotics, and physical therapy students. Offered on credit/no credit basis only.

REHAB 322 Medical Science Laboratory (1, max. 2) WSp Dralle, Greenberg, McMillan To introduce students to the role of allied health professionals in the treatment of disabilities presented in 320, 321 lectures. Offered on credit/no credit basis only. Prerequisite: 320, 321.

REHAB 332 Pathologic Physiology for Physical Therapists and Occupational Therapists (5) A Anderson Emphasis on normal and pathologic physiology of the circulatory, respiratory, central nervous, and musculoskeletal systems as basis for treatment in occupational therapy, physical therapy, and prosthetics-orthotics. Required for students in these fields. Others by permission. Prerequisites: B STR 301, ZOOL 118, and permission of instructor.

REHAB 340 Spinal Orthotics (3) Dralle Instruction in, and experience with, the use of orthotic components and materials, including layout, measurement, and fitting of orthoses for management of spinal pathology. Each student plans, fabricates, and fits orthoses for lumbar, dorsolumbar, thoracic, and cervical regions. Required for prosthetics and orthotics majors; others by permission of instructor.

REHAB 341 Upper-Limb Prosthetics I (4) W Instruction in, and experience with, the use of prosthetic components and materials, including preprosthetic care, prosthetic components, principles of fabrication and harnessing, and techniques of checkout and prosthetic training for all amputation types. Required for prosthetics and orthotics majors; others by permission of instructor.

REHAB 342 Upper-Limb Prosthetics II (4) Sp Instruction and experience in use of prosthetic components and materials, including preprosthetic care, principles of fabrication and harnessing, and techniques of checkout and prosthetic training, review of anatomy, biomechanics, locomotion, and motor disability as they pertain to upper-limb prosthetics, as well as medical management and prescription considerations. Immediate postsurgical fitting techniques.

REHAB 343 Upper-Limb Orthotics (8) Instruction in, and experience with, the use of orthotic components and materials. Students evaluate and fabricate therapeutic and functional orthoses, including externally powered devices. Required for prosthetics and orthotics majors; others by permission of instructor.

REHAB 380 Occupational Therapy in the Health-Care System (2) Acquisition of an understanding of the role of occupational therapy within the American health-care delivery system. Covers factors including national health, use of health-care services, regulation and reimbursement of services and health-care trends affecting occupational therapy services. Prerequisite: occupational therapy major standing.

REHAB 404, 405 PT Management of Musculoskeletal Disorders: I, II (5,5) A,W Hertling Functional anatomy, biomechanics, clinical assessment and management as they relate to patients with common musculoskeletal disorders who have been referred to physical therapy services. Development of appropriate therapeutic strategies for management of extremity joints (404) and spine (405). Prerequisite: physical therapy major standing.

REHAB 413 Special Studies in Physical Therapy (1-15, max. 24) AWSpS Series of courses on theory and practice in specialized areas of physical therapy. Includes organization and administration of specialized programs, advanced evaluation and treatment techniques, role of the consultant. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

REHAB 414 Psychological Aspects of Disability (2) AW Fordyce Psychological processes underlying adjustment to disability; application of behavioral/analysis systems in patient therapy management; effects of intellectual and perceptual deficit on patient performance and treatment strategies. Prerequisite: occupational therapy or prosthetics and orthotics major standing.

REHAB 415 Undergraduate Seminar for Physical Therapy Students (1-3, max. 5) AWSp McMillan Basic principles of medical ethics; history, scope of physical therapy; relationships of physical therapy, oc-

cupational therapy, nursing, rehabilitation counseling, social service, and other allied services. Required for physical therapy students. Offered on credit/no credit basis only.

REHAB 416 Principles of Physical Therapy Administration (3) McMillan The nature of administration, economic trends, operational policy, aspects of supervision, ethical and legal influences applicable to a physical therapy department. Required for physical therapy students.

REHAB 417 Introduction to Research in Occupational Therapy (3) Statistics, group research design, tests and measurements, and single-subject research methodology. Lectures, readings, and assignments related to occupational therapy and rehabilitation medicine research. Prerequisite: occupational therapy major or permission of instructor.

REHAB 420 Lower-Limb Prosthetics I (8) Dralle Instruction in fabrication, fitting, and alignment of the patellar-tendon-bearing prosthesis. Emphasis is placed on the biomechanics of below-knee fit and alignment, dynamic alignment, and the use of the below-knee adjustable leg and duplication devices, as well as methods of suspension. Required for prosthetics and orthotics majors; others by permission of instructor.

REHAB 421 Lower-Limb Prosthetics II (11) Dralle Instruction in stump casting, cast modification, socket fabrication, static and dynamic alignment, alignment duplication, and suspension system. Required for prosthetics and orthotics majors; others by permission of instructor.

REHAB 423 Lower-Limb Orthotics (8) Dralle Instruction in, and experience with, the use of orthotic components and material, including measurement and fitting of lower-limb orthoses and shoe modifications to patients. Each student evaluates patients and plans, fabricates, fits, and checks out several orthoses. Required for prosthetics and orthotics majors; others by permission of instructor.

REHAB 427, 428 Applied Prosthetics and Orthotics I, II (1-1-1; 5) Dralle Further clinical experience in patient evaluation, planning, fabricating, and fitting of prosthetic and orthotic devices, and attendance at prosthetics and orthotics clinics at University Hospital and University-affiliated Seattle hospitals. Experience in immediate postoperative prosthetics. Required for prosthetics and orthotics majors; others by permission of instructor.

REHAB 429 Immediate Post-Operative and Early Fitting (3) Dralle Lecture and laboratory designed to introduce the student to the principles of immediate postsurgical prosthetic fitting, including patient management for both upper and lower extremities.

REHAB 430 Advanced Limb Prosthetics and Engineering Concepts (4) S Dralle Use of prosthetic components and materials, including casting techniques and alignment procedures for hip disarticulation and Symes prostheses. Anatomy, biomechanics, locomotion, and motor disability pertaining to hip disarticulation and Symes prostheses. Principles underlying modern prosthetic/orthotic devices and practices. Hydraulic control, material behavior, force analysis, and basic electronics.

REHAB 432 Woodworking for Occupational Therapists (1) Hager Hand-tool processes, elementary machine operations, safety practices, problem solving and planning, methods of assembling and fastening, simple wood finishing as prerequisite skills to the learning of occupational therapy treatment activity applications and analyses. Prerequisite: occupational therapy major standing.

REHAB 435 Professional and Therapeutic Communication in Occupational Therapy (3) A Kanny Provides knowledge and understanding of communication skills, enabling student to apply practically these

skills in areas of oral and written professional communications, dyadic therapeutic communications, and public relations directed to health professionals and health consumers. Prerequisite: occupational therapy major standing.

REHAB 442 Advanced Clinical Kinesiology and Biomechanics (6) Sp Lehmann Study of joint motion and muscle function in relation to both the normal and abnormal state. Specific techniques employed in the field of rehabilitation medicine are analyzed. Required for occupational therapy and physical therapy students; others by permission.

REHAB 443 Introduction to Clinical Evaluation (2) Lecture and laboratory format. Developing clinical competency in goniometric measurement of joints, manual muscle testing, postural analysis, and gait analysis of normal and pathological patterns. Prerequisite: physical therapy major standing.

REHAB 444-445 Function of the Locomotor System (4-4) A,W Functions of musculoskeletal system as applied to patterns of motion. Anatomy of peripheral-vascular and peripheral-nervous system. Required for occupational therapy students and physical therapy students; others by permission of instructor. Prerequisites: B STR 301, ZOOL 118.

REHAB 446, 447 Anatomy Laboratory for Occupational Therapists (1,1) A,W Hager Guided self-study of musculoskeletal, peripheral-vascular, and peripheral-nervous systems from projected material. Required for occupational therapy students.

REHAB 448 Applied Kinesiology for Occupational Therapists (1) S Wittmeyer Instruction and laboratory focus on practical experience and clinical problem solving related to muscle and joint motion testing procedures, gait, prosthetic and orthotic devices, environmental controls, and assistive devices utilized in occupational therapy treatment strategies. Required for occupational therapy students.

REHAB 451, 452 Functional Anatomy Laboratory (1,1) A,W Study of musculoskeletal, peripheral-vascular, and peripheral-nervous systems from projected material. Required for physical therapy students.

REHAB 460 Hydrotherapy Applications (1) Therapeutic uses of local and general procedures. Laboratory practice, including assessment of physiologic responses. Microbiological hazards, methods of protection of patient and operator from infection. Prerequisite: physical therapy major.

REHAB 463 Application of Physical Therapy Modalities (2) Trotter Techniques of application of physical agents commonly used by physical therapists (e.g., electricity, EMG biofeedback, shortwave diathermy, ultrasound). Practice with a wide variety of machines. Required for physical therapy students.

REHAB 466-467 Advanced Biophysical and Physiological Effects of Modalities (2-2) A,W Lehmann Biophysical principles of equipment employed in physical therapy, physiological effects produced. Required for physical therapy students; others by permission of instructor.

REHAB 468 Therapeutic Modalities: Activities and Analysis (1-4) AWSp Paulson Lectures and laboratory practice to develop skills in the analysis, adaptation, and teaching-learning processes of therapeutic activities. Specifically designed crafts, self-care activities, prevocational assessment and training, and specific pediatric techniques. Prerequisite: occupational therapy major standing.

REHAB 469 Therapeutic Modality: Facilitating Movements (1-3) Greenberg Lectures and laboratory practice of special skills in occupational therapy directed toward facilitation of movements as applied to the treatment of the physically disabled. Emphasis on

evaluation skills and treatment techniques in mobility, activities of daily living, muscle, reeducation, and upper-extremity prosthetics and orthotics. Prerequisite: occupational therapy major standing.

REHAB 470 Vocational Assessment and Training (3) Provides knowledge and skill competencies relevant to vocational/work evaluation and training for individuals with physical, psychosocial, and developmental disabilities. A clinical component provides experience in work assessment/training. Prerequisite: occupational therapy major standing.

REHAB 471 Therapeutic Exercise Procedures I (5) Theory and principles of basic exercise procedures used for treatment purposes in physical therapy: motor learning and control, variables of motor performance, risks and benefits of exercise, exercise prescription, selected patient assessment and exercise procedures. Lectures and laboratories. Simulated patient problems. Prerequisite: physical therapy major standing.

REHAB 472 Therapeutic Exercise Procedures II (5) Theory and principles of advanced therapeutic exercise procedures: normal motor development, facilitation and inhibition elements, adaptation of procedure to appropriate age level and handicap. Lectures and laboratories. Simulated patient problems. Prerequisite: physical therapy major standing.

REHAB 473 Administration of Occupational Therapy Services (3) *Kanny* Organizational structure, administrative techniques, and communicative processes; principles of cost accounting, personnel management, marketing services, and funding and accountability mechanisms. Practice in developing applicable skills. Prerequisite: occupational therapy major standing.

REHAB 475 Physical Restoration (4) *S Hertling* Lectures and laboratory practice to develop special skills in physical therapy directed toward facilitation of movement as applied to treatment of neurological and musculoskeletal dysfunction. Treatment techniques in mobility, activities of daily living, self-care, transfers, and ambulation activities. Required for physical therapy students.

REHAB 477 Group Techniques (3) *A Kanny* Principles and concepts of small-group interaction and dynamics. Development of group participatory and leadership skills through class learning experiences and leadership of patient groups. Prerequisite: occupational therapy major standing.

REHAB 481 Introduction to Theory and Practice of Occupational Therapy (4) *A Hager* History, theory, and practice of occupational therapy. Application of treatment principles and observations in clinical settings. Prerequisite: occupational therapy major standing.

REHAB 482 Occupational Therapy Theory and Practice in Pediatrics (4) *Sp Greenberg* Theoretical bases for occupational therapy intervention and treatment of children (birth to 16 years) with acute and chronic physical or developmental dysfunction. Laboratory includes assessments of normal children as well as observation and limited participation in clinical settings. Prerequisite: occupational therapy major standing.

REHAB 483 Occupational Therapy Theory and Practice in Physical Disabilities (4) *A* Theoretical bases for occupational therapy intervention and treatment of the physically disabled client. Supervised clinical experiences. Prerequisite: occupational therapy major standing.

REHAB 484 Occupational Therapy Theory and Practice in Psychosocial Dysfunction (5) *W Kanny, Thorn* Psychosocial intervention and its relation to occupational therapy practice. Theory and practical application with examination of issues and tech-

niques of evaluation and therapeutic interventions. Fieldwork training provides integration of didactic course work with actual practice experiences. Prerequisite: occupational therapy major standing.

REHAB 485 Occupational Therapy Theory and Practice in Geriatrics (4) *Sp Hager* Occupational therapy evaluation, program planning, and treatment of the elderly. Aging as a developmental process, distinguishing between normal aging and the pathology of biological, cognitive, and emotional changes. Practical application of theory and treatment in clinical setting. Prerequisite: occupational therapy major standing.

REHAB 490 Clinical Clerkships in Physical Therapy (2, max. 4) *AWSpS Trotter* Observation, instruction, and supervised practice in treatment of patients in diverse clinical settings. Emphasis is given to the application of previously learned material and skills to specific clinical problems. Required for physical therapy students. Offered on credit/no credit basis only.

REHAB 492 Pathways in Occupational Therapy (*, max. 3) *WSp Deltz, Greenberg* Provides the opportunity for continued study in specific areas of interest under preceptorship of selected faculty members with guided readings and clinical experiences. Oral presentation of completed projects to students and faculty. Offered on credit/no credit basis only. Prerequisite: occupational therapy major standing.

REHAB 494 Clinical Fieldwork in Occupational Therapy (4-12) *Kanny* A minimum of six months of directed and supervised occupational therapy fieldwork experience at University-affiliated hospitals and other approved centers. Required for occupational therapy major. Offered on credit/no credit basis only.

REHAB 495 Clinical Affiliation in Physical Therapy (2-12, max. 24) *AWSpS Trotter* Six to twelve weeks with two hundred minimum working hours. Clinical application of physical therapy techniques under supervision in affiliated hospitals. Offered on credit/no credit basis only. Prerequisite: physical therapy major standing.

REHAB 496 Special Topics in Rehabilitation (1-9, max. 14) *AWSpS* Guided opportunity for in-depth study in specific areas of rehabilitation. Topics vary. Prerequisite: permission of instructor.

REHAB 498 Undergraduate Thesis (*) Prerequisite: permission of instructor.

REHAB 499 Undergraduate Research (*) *AWSpS* Opportunity to design, perform, and analyze research investigation in problem areas in rehabilitation medicine. These include clinical and basic research problems in, for example, head and spinal injury, chronic disease, pain neurophysiology, electrodiagnosis, communication, and bioengineering. Prerequisite: permission of instructor.

REHAB 500 Specialized Clinical Experience in Physical Therapy (1-5, max. 15) *AWSpS Trotter* Student is assigned to an affiliated clinical facility. Activities focus on a variety of processes. These might include acquisition of an advanced and/or specialized treatment skill to be used in patient care; the development and presentation of an in-service training program; the analysis and assessment of existing supervisory problems. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

REHAB 501 Physical Therapy Management of Selected Motor Problems (2-5, max. 7) *AWSp Guthrie* Study of mechanisms involved in the control of posture and movement. Critical examination of selected literature and techniques dealing with the evaluation or modification of motor behavior. Prerequisite: physical therapy graduate student standing.

REHAB 502 Management of the Child With a Developmental Disability (3) Practical management of child with a physical handicap or other developmental

disability. Developmental motor assessment, developing therapy goals and objectives, and an introduction to NDT handling and feeding techniques. Completion of a practicum project with a handicapped child is required. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

REHAB 504 Physical Therapy Approach to Common Orthopaedic Problems (4) *Sp Hertling* Discussion of common disorders affecting the musculoskeletal system, with emphasis on evaluation and physical therapy management of patients with such disorders. Prerequisite: permission of instructor.

REHAB 510 Somatopsychology: Psychological Aspects of Disability (3) Processes and management methods for assimilation of disability, enhancing patient participation in rehabilitation process, and for helping in maintenance of performance; behavioral management and case conference strategies; rehearsal of contingency management techniques. Required for residents; others by permission of instructor.

REHAB 513 Special Studies in Physical Therapy (1-5, max. 15) *AWSpS* Series of courses on theory and practice in specialized areas of physical therapy. Includes organization and administration of specialized programs, advanced evaluation and treatment techniques, role of the consultant. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

REHAB 516 Medical Information for Rehabilitation Counselors (4) Lectures in medical science field regarding the etiology, prognosis, and physical restoration of common disabling conditions. Case studies are used extensively, and major emphasis is placed on vocational implications of physical disability. Prerequisite: permission of instructor.

REHAB 518 Research Seminar on Handicapped Infants (3) *Sp Harris, Swanson* Recent research relating to early identification and intervention of handicapped children. Critical evaluation of published articles in the areas of early identification and intervention. Prerequisite: clinical experience or course work related to handicapped infants.

REHAB 520 Seminar (1-5) *AWSp Deltz, Greenberg, Hager, Kanny* Conferences, seminars, discussions of advanced physical medicine and rehabilitation topics for residents and postdoctoral fellows in rehabilitation medicine. Lectures, discussion, and laboratory work in selected aspects of occupational therapy appropriate to elected area of study for applicants for Master of Science in Occupational Therapy degree. May be repeated for credit.

REHAB 522 Neurophysiological Basis for Neuromuscular Reeducation (3) Review of traditional neurophysiological concepts and an exposition of recent advances in neurophysiological research related to the practice of rehabilitation medicine. Mechanisms underlying facilitation techniques and other techniques used in neuromuscular reeducation; various techniques compared and evaluated. Prerequisite: permission of instructor.

REHAB 530 Medical Aspects of Vocational Counseling (3) Introduction to vocational implications of physical and emotional disabilities. Methods, counseling techniques, therapeutic modalities, community resources used in producing vocational assistance for the handicapped. Prerequisite: resident standing in rehabilitation medicine.

REHAB 532 Clinical Affiliation for Rehabilitation Counselors (5-6) *A* Under preceptorship of rehabilitation counseling staff, students counsel and evaluate patients with severe physical, emotional, or social problems; administer vocational testing; obtain placement on job stations; work with community resources for vocational/educational placement; and develop activity-oriented schedules. Prerequisite: permission of instructor.

REHAB 535 Administration (3) W Kanny Introduction to administration, management, and supervision of services in health care. Management theory, specific administrative techniques, formal organizational structure, and the practical application of this knowledge to occupational therapy. Strategies for activating constructive change in the health-care system identified and investigated.

REHAB 539 Communication Disorders in Rehabilitation Medicine (2) S Yorkston Overview of communication disorders secondary to central and peripheral nervous system impairment. Emphasis on facilitating identification of speech/language disorders with discussion of implications for rehabilitation. Prerequisite: graduate student status (postdoctoral fellow).

REHAB 540 Application of Measurement Systems (3) Sp Deitz Introduction to reliability, validity, norms, the test development process, statistics relevant to tests and measurements, and ethical implications of testing. Prerequisite: permission of instructor.

REHAB 542 Advanced Pediatric Occupational Therapy (3) W Provides opportunity to integrate information pertinent to pediatric occupational therapy research, theory, and practice as it relates to developmental disabilities, cerebral palsy, and learning disabilities; and to develop a personal theoretical framework of occupational therapy practice. Prerequisite: permission of instructor.

REHAB 546 Teaching Practicum in Occupational and Physical Therapy (1-3) Integration of knowledge and skills in teaching through actual teaching in the classroom or presentation of a minicourse, workshop, or in-service training series (optional). Prerequisites: MEED 520 and permission of instructor.

REHAB 550 Neuropsychology in Rehabilitation (2) Examination and management of patients with brain lesions, as well as an understanding of the consequences of such conditions. Prerequisite: graduate standing in rehabilitation medicine.

REHAB 555P Neuromuscular Electrodagnosis (2½) AWS Kraft Demonstration of fundamentals of electromyography and peripheral nerve stimulation followed by participation in clinical electrodagnosis examinations. Develops awareness of the usefulness of knowing when such procedures are indicated for patients and interpret results rather than develop proficiency in performing these examinations. Prerequisites: HUBIO 560P and permission of instructor.

REHAB 566 Special Topics in Rehabilitation (3) Philosophy and concepts in the interdisciplinary rehabilitation of persons with major disabilities, including advanced content in the rehabilitation theory and process of selected categories: post-CVA, post-spinal cord injury, and chronic back pain.

REHAB 568 Biophysics as Applied to Physical Medicine (2) A Lehmann Propagation and absorption characteristics of physical forms of energy used for treatment in physical medicine. Physiologic effects basic to prescription of the physical therapy modalities. Prerequisite: resident standing in rehabilitation medicine; others by permission of instructor.

REHAB 596 Electromyography and Clinical Neurophysiology (4) S Kraft Didactic course covering electromyography and clinical neurophysiology. First part covers basic neurophysiology and second covers electromyography, nerve conduction studies, somatosensory-evoked potentials, residual and auditory-evoked potentials, single fiber EMG, late response, quantitative analysis, and macro EMG. Prerequisite: residency in rehabilitation medicine; others by permission of instructor.

REHAB 597-598-599 Electromyography and Electrodagnosis Laboratory (1-1-1) A,W,Sp Kraft Elective work in clinical electromyography and other electrodiagnostic methods. Prerequisite: residency in rehabilitation medicine; others by permission of instructor.

REHAB 600 Independent Study or Research (*) AWSps Offered on credit/no credit basis only.

REHAB 654P Second-Year Clinical Elective in Physical Medicine and Rehabilitation (8) S Hays, Stolov Alternative to 685 to meet chronic-care requirement. Explores the same goals recognizing the limited skills of the first-year student. Structured contacts permit understanding of disability problems in patients with chronic disease. Treatment methods and psychosocial consequences explored. Prerequisite: completion of one year of medical school.

REHAB 685P Chronic Disease and Disability (4) AWSps Hays, Stolov Meets chronic-care requirement for medical students. Structured clinical experience on rehabilitation medicine services. Differences between acute and chronic medicine, identification of disability problems, and therapeutic techniques for removing disability. Hospitals are within University system, local area, WAMI area, and Hawaii. Prerequisite: third-year medical student standing.

REHAB 686P Rehabilitation Medicine Clerkship—Pediatrics (8 or 12) AWSps Jaffe, Stolov Meets chronic-care requirement for medical students. Incorporates material of 685 and expands into disabling pediatric disease. School planning, family counseling, community support services included. Six-week package permits inpatient, outpatient, and consultation experience. Recommended for students contemplating pediatrics. Prerequisite: third-year medical student standing.

REHAB 687P Rehabilitation Medicine Clerkship—Medical (8 or 12) AWSps Hays, Stolov Meets chronic-care requirement for medical students. Incorporates material of 685 and expands into disability problems associated with "nonsurgical" disease. Six-week package permits inpatient, outpatient, and consultation experience. Recommended for careers in family medicine, internal medicine, rheumatology, cardiology, neurology, and geriatrics. Prerequisite: third-year medical student standing.

REHAB 688P Rehabilitation Medicine Clerkship—Surgical (8 or 12) AWSps Hays, Stolov Meets chronic-care requirement for medical students. Incorporates material of 685 and expands into disability problems associated with surgically related disease. Six-week package permits inpatient, outpatient, and consultation experience. Recommended for careers in orthopedic surgery, neurosurgery, cardiovascular surgery, and urology. Prerequisite: third-year medical student standing.

REHAB 689P Spinal Cord Injury (8 or 12) Hammond Introduction to diagnosis, management, rehabilitation of patients with spinal-cord injuries. Interaction with rehabilitation team, psychiatrists, and subspecialists in urology, neurosurgery, and plastic surgery. Performance at subintern level expected. Veterans Administration Medical Center only. Prerequisites: MED 665P, SURG 685P.

REHAB 695P Rural Rehabilitation Medicine Clerkship (8) Stolov Structured clinical experience in identification and treatment of disability problems in rural (nonmajor urban) communities. Satisfies chronic care/rehabilitation medical graduation requirements. Prerequisites: completion of at least six months of clinical clerkships, permission of instructor.

REHAB 697P Rehabilitation Medicine Special Elective (*, max. 24) Equivalent to 686P, 687P, or 688P. Satisfies requirements in rehabilitation medicine/chronic care. Student arranges with another university, using the "Special Assignment Form." Students can qualify after review, similar experience at another university. Prerequisite: permission of instructor.

REHAB 700 Master's Thesis (*) AWSps Offered on credit/no credit basis only.

Surgery

BB487 University Hospital

In the Department of Surgery, instruction is carried on during all four years of the student's training and is integrated with that of the other departments in the School of Medicine.

Faculty

Chairperson

C. James Carrico

Professors

Carrico, C. James, 1974, M.D., 1961, Texas; trauma and general surgery.

Copass, Michael K., 1973, ‡(Medicine), M.A., 1964, M.D., 1964, Northwestern; neurology/surgery.

Dillard, David H., 1953, M.D., 1950, Johns Hopkins; thoracic surgery.

Heimbach, David M., 1974, M.D., 1964, Cornell; burn and general surgery.

Herman, Clifford M., 1977, M.D., 1959, Vermont; general surgery.

Ivey, Tom D., 1975, M.D., 1970, Wisconsin; cardiothoracic surgery.

Johansen, Kaj H., 1978, M.D., 1970, Washington; Ph.D., 1977, California (San Diego); general and vascular surgery.

Jones, Robert F., 1974, M.D., 1952, Texas Southwest; oncology and general surgery.

Marchloro, Thomas L., 1967, M.D., 1955, St. Louis; transplant surgery.

Merendino, K. Alvin, 1949, (Emeritus), M.D., 1940, Yale; Ph.D., 1946, Minnesota; cardiothoracic surgery.

Rice, Charles L., 1984, M.D., 1968, Medical College of Georgia; critical care and general surgery.

Schilling, John A., 1974, (Emeritus), M.D., 1941, Harvard; general surgery.

Stevenson, John K., 1954, (Emeritus), M.D., 1949, Rochester; general and pediatric surgery.

Strandness, D. Eugene, Jr., 1962, M.D., 1954, Washington; vascular surgery.

Tapper, David., 1983, (Pediatrics), M.D., 1970, Maryland; pediatric surgery.

Trier, William C., 1985, M.D., 1947, New York Medical College; plastic and reconstructive surgery.

Winterscheid, Loren C., 1957, Ph.D., 1953, M.D., 1954, Pennsylvania; general and thoracic surgery.

Associate Professors

Beach, Kirk W.,* 1976, (Research), (Bioengineering), M.S.Ch.E., 1968, Ph.D., 1971, California (Berkeley); M.D., 1976, Washington; vascular-Doppler ultrasonic techniques.

Clowes, Alexander W., 1980, M.D., 1972, Harvard; general and vascular surgery.

Dellinger, E. Patchen,* 1977, M.D., 1970, Harvard; general surgery.

Engrav, Loren H., 1977, M.D., 1969, California (Los Angeles); plastic and reconstructive surgery.

Maier, Ronald V., 1981, M.D., 1973, Duke; general surgery.

Marvin, Janet A.,* 1974, (Physiological Nursing), † M.N., 1969, Washington; burn nursing.

Moe, Roger E., 1966, M.D., 1959, Washington; oncology and general surgery.

Phillips, David J., 1981, (Research), (Bioengineering), Ph.D., 1975, Duke; ultrasound diagnostic instrumentation.

Radke, Hubert M., 1963, M.D., 1954, Texas; general and thoracic surgery.

Assistant Professors

- Allen, Margaret D., 1985, M.D., 1974, California (San Diego); cardiothoracic surgery.
- Gajdusek, Corinne M.,* 1981, (Research), (Pathology),† Ph.D., 1972, Colorado; endothelial cells.
- Gottlieb, Jordan R., 1985, M.D., 1976, Case Western Reserve; plastic and reconstructive surgery.
- Gregg, Mary G., 1987, (Acting), M.D., 1980, Washington (St. Louis).
- Grube, Baiba J., 1986, M.D., 1980, Utah; burn and general surgery.
- Kazmers, Andris, 1985, M.D., 1976, Wayne State; general and vascular surgery.
- Kohler, Ted R., 1983, M.D., 1976, Harvard; general and vascular surgery.
- Langdale, Lorrie A., 1985, M.D., 1979, Washington; general surgery.
- Misbach, Gregory, 1982, M.D., 1973, California (Los Angeles); cardiothoracic surgery.
- Nicholls, Stephen C., 1986, (Acting), M.B.Ch.B., 1975, Auckland (New Zealand).
- Pohlman, Timothy H., 1986, M.D., 1978, Rush Medical College.
- Rusch, Valerie W., 1983, M.D., 1975, Columbia; thoracic surgery.
- Sikkema, Wesley W., 1967, M.D., 1957, Michigan; general surgery.
- Walkinshaw, Marcus D., 1981, M.D., 1974, California (Irvine); plastic and reconstructive surgery.
- Winn, Robert K., 1984, (Research), (Electrical Engineering), Ph.D., 1974, Washington; pulmonary physiology.
- Zierler, R. Eugene, 1984, M.D., 1976, John Hopkins; general and vascular surgery.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

SURG 498 Undergraduate Thesis (*) AWSpS Trier Offered to those students who have engaged in undergraduate research in general surgery. (Full- or part-time.)

SURG 499 Undergraduate Research (*) AWSpS Trier Provides an opportunity to participate in ongoing research projects in general surgery being carried out by Department of Surgery faculty or to carry out an independent research project under supervision. Practical experience in experimental design and execution is provided under direct supervision of selected faculty members. (Full- or part-time.)

SURG 505P Preceptorship in Surgery (1) Opportunity for first- and second-year medical students to gain personal experience with clinical faculty members in the community. Students observe general aspects of private practice, including clinical problems seen; practice limitation; doctor-doctor, doctor-patient, and doctor-nurse relationships in the office and hospital. Prerequisite: permission of department.

CONJ 585 Surgical Anatomy (1-3, max. 12) See Conjoint Courses.

SURG 600 Independent Study or Research (*) AWSpS

SURG 665P Clinical Clerkship (*, max. 24) AWSpS Trier (Veterans Administration Hospital, Harborview Medical Center, Pacific Medical Center, Providence Medical Center, University Hospital) Diagnosis and management of problems amenable to surgical therapy. Physiological basis of surgical care, differential diagnosis and decision making, and the basic principles

of surgical management. Care of inpatients and outpatients, including participation in the operating rooms. Prerequisite: HUBIO 563P. (Six weeks. Limit: twenty-five students.)

SURG 681P Peripheral Vascular Disease (4 or 8) AWSpS Strandness (Veterans Administration Hospital, University Hospital) Peripheral arterial and venous problems, including methods of clinical evaluation; new diagnostic procedures; and the available methods of treatment. Patient workup, performance of diagnostic studies, and presentation of case material to the staff. Prerequisites: 665P, HUBIO 563P. (Two or four weeks. Limit: two students.)

SURG 682P Clinical Burn Care (*, max. 12) AWSpS Heimbach Offered on the burn unit of Harborview Medical Center. Exposure to the care of patients with thermal injury, including management of severe metabolic and septic problems and opportunity to participate in surgical procedures. Exposure to plastic and reconstructive surgery. Prerequisite: 665P.

SURG 683P Pediatric Surgery Externship (8 or 12) AWSpS Tapper (Children's Orthopedic Hospital and Medical Center) Surgical conditions peculiar to the particular age group with a preponderance of congenital and neoplastic conditions that are amenable to surgical treatment. A reasonable background of knowledge in human embryology and genetics is recommended. Prerequisite: 665P. (Four or six weeks, full-time. Limit: two students.)

SURG 684P Trauma and Emergency Care (*, max. 16) AWSpS Copass, Eisenberg Register for one or both segments of this course. Segment 1: emergency medicine and trauma at Harborview Medical Center with assignment to the emergency department. Emphasis on management of critical medical emergencies and trauma. Segment 2: acute medicine at University Hospital. Evaluate and treat ambulatory emergencies. Prerequisites: 665P, MED 665P. (Four weeks, fourth-year students. Limit: twelve students at Harborview Medical Center; three students at University Hospital.)

SURG 685P Cardiothoracic Surgery Externship (*, max. 12) AWSpS Ivey Serve as subintern, participate in patient care while learning cardiopulmonary hemodynamics of cardiac surgery. Wide variety of both cardiac and thoracic disease entities. Participate in the open-heart procedures in the operating room. Opportunity to gain additional understanding of physiology of cardiopulmonary bypass.

SURG 686P Plastic Surgery Clerkship and Preceptorship (*, max. 12) AWSpS Engrav Plastic surgery service at University-affiliated hospitals; includes patient workups and operating room experience with emphasis on learning the fundamentals of plastic surgery, wound management on animal specimens and in the emergency room. Includes wounds, burns, facial trauma, head and neck cancer, cosmetic surgery, skin tumors, hand surgery, and reconstructive surgery. Prerequisite: 665P. (Four or six weeks. Limit: one student.)

SURG 688P Subinternship in General Surgery (*, max. 12) AWSpS Trier Offered on the general surgery wards of the University-affiliated hospitals. Diagnosis, preoperative care, and postoperative care; management of surgical emergencies and outpatient follow-up of discharged patients. Students function at the intern level under close supervision of the staff and house staff. Prerequisite: 665P.

SURG 697P Surgery Special Electives (*, max. 24) AWSpS Trier Special clerkship, externship, or research opportunities can at times be made available at institutions other than the University of Washington. Students wishing to elect this course should obtain from the Dean's office a special assignment form at least one month before preregistration. Prerequisites: 665P and departmental permission. (Four, six, or twelve weeks.)

Urology

BB1115 Health Sciences

Urology is the surgical discipline concerned with diseases of the male genitourinary organs and the female urinary tract. Training for medical students starts in the second year and continues through the third and fourth years.

Training is also provided for interns, nurses, and physical medicine technologists and allied specialists.

An approved urology residency program is available.

Faculty**Acting Chairperson**

Warren H. Chapman

Professors

Ansell, Julian S., 1959, M.D., 1951, Tufts; Ph.D., 1959, Minnesota; congenital defects and pediatric urology.

Barnes, Glover W.,* 1969, (Microbiology),† M.A., 1955, Ph.D., 1962, State University of New York (Buffalo); tissue, organ immunology.

Chapman, Warren H., 1966, M.D., 1952, Chicago; oncology and microsurgery.

Mayo, Michael E., 1975, M.B.B.S., 1962, St. Thomas Hospital (London); urodynamics.

Associate Professors

Berger, Richard E., 1979, M.D., 1973, Chicago; infertility and infectious diseases.

Krieger, John N., 1982, M.D., 1974, Cornell; infectious diseases.

Assistant Professors

Burns, Mark W., 1986, M.D., 1979, Washington; pediatric urology.

Iretton, Robert C., 1984, Ph.D., 1974, M.D., 1979, Washington; general urology, spinal cord injury.

Course Descriptions

Courses numbered with a P suffix are not graduate courses and are restricted to medical student enrollment only.

UROL 488 Undergraduate Thesis (*) AWSpS Berger Provides an opportunity for medical students to write theses in the area of urology. Prerequisite: permission of sponsor and department.

UROL 499 Undergraduate Research (*) AWSpS Berger The student participates in current urologic research projects under supervision of full-time staff. Certain specific problems may be elected by the student. Elective for medical students. Prerequisite: permission of sponsor and department.

UROL 501P Urology Preceptorship (1) AWSpS Berger Individual experiences with one or more of the full-time department faculty members covering research, teaching, and patient care. Students observe activities in the clinic, hospital ward, operating room, and research laboratories. Prerequisites: first- or second-year medical student standing; permission of instructor.

UROL 675P Urology Preceptorship (*, max. 8) AWSpS Berger Student follows a private practice preceptor in all of his or her work. Becomes acquainted with the office management of urological problems. Prerequisites: 680P, HUBIO 562P. (Two or four weeks.)

UROL 680P Urology Clerkship (*, max. 8) AWSpS *Ansell, Berger, Chapman, Ireton, Krieger, Mayo* Full activities of clinical service. Basic principles of urology emphasized. Prerequisite: HUBIO 562P. (Two or four weeks.)

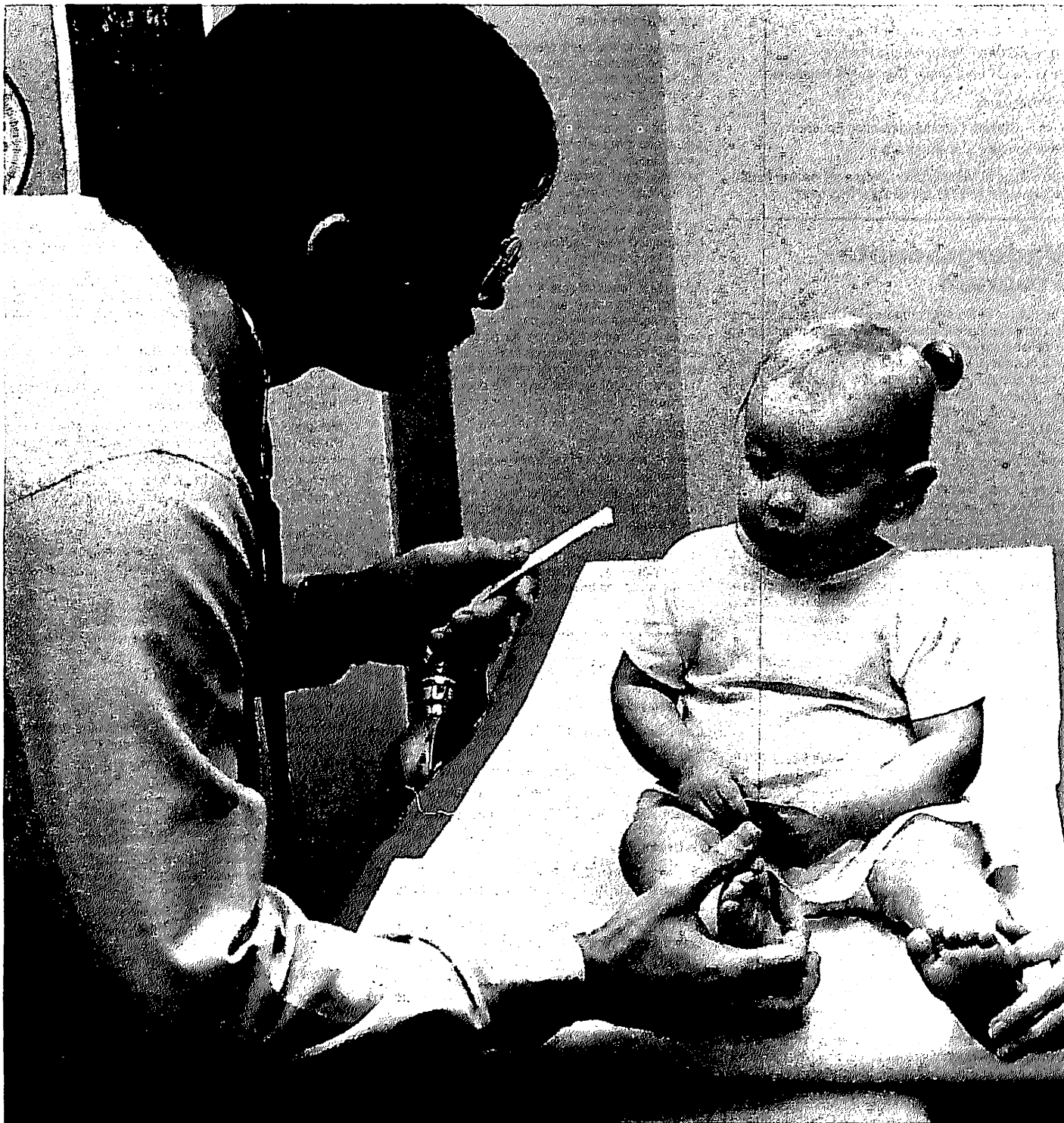
UROL 685P Urology Subinternship (*, max. 12) AWSpS *Ansell, Berger, Chapman, Ireton, Krieger, Mayo* Subintern is responsible for patient workups and for preoperative and postoperative care and participates in the operating room. Prerequisite: MED 665P

or pediatrics basic clerkship, or permission of instructor.

UROL 690P Urology Specialties (*, max. 8) AWSpS *Berger* For those who wish further exposure to a specific aspect of urology. Students can spend time with one attending at University Hospital, Harborview Medical Center, Children's Hospital and Medical Center, or Veterans Administration Hospital studying oncology, infections, infertility, stone disease,

impotence, or other aspects of urology. Prerequisites: 680P and permission of instructor.

UROL 697P Urology Special Electives (*, max. 24) AWSpS *Berger* Special clerkship, externship, or research opportunities can at times be made available at institutions other than the University of Washington. Students wishing to elect this course should obtain from the Dean's office a special assignment form at least one month before preregistration. Prerequisite: permission of instructor. (Six or twelve weeks.)



School of Nursing

Dean

Sue T. Hegyvary
3138 Health Sciences

Associate Deans

Kathryn E. Barnard, Academic Programs
Marie J. Cowan, Research and Practice
Susanna L. Cunningham, Community Relations

Assistant Deans

Ruth F. Craven, Continuing Nursing Education
Anne Loustau, Student Affairs

The School of Nursing offers programs leading to baccalaureate, master's, and doctoral degrees.

Undergraduate Program

The School of Nursing prepares its graduates to function as generalists in professional nursing practice and to collaborate with other health-care providers. The nine-quarter undergraduate curriculum emphasizes theory and clinical practice to ensure critical thinking and clinical expertise. Clinical experiences are provided in institutional and community settings. Completion of the curriculum leads to a Bachelor of Science in Nursing degree and eligibility to take the licensure examination to become a registered nurse.

Students may be admitted to the University of Washington as prenursing majors. Courses required for admission to the nursing major include: inorganic and organic chemistry, precalculus or college algebra, microbiology, behavioral science, English composition, and electives to achieve a minimum of 45 credits. A minimum grade of 2.0 must be obtained for each prerequisite course. The four required natural science courses must have been taken within five years of admission. There is no time limit for the other courses.

A four-quarter modification of the basic curriculum is available for the registered nurse who is able to validate selected nursing courses through written examination and who intends to complete a master's degree program.

Admission to the nursing major occurs once a year, in Autumn Quarter, with an application deadline in the previous February. Selection is competitive. For information on admission criteria, specific prerequisites, and deadlines, as well as application forms, contact the Office of Academic Programs, School of Nursing.

Graduate Program

The School of Nursing offers graduate study leading to the degrees of Master of Nursing, Master of Science, and Doctor of Philosophy. At the master's level, programs are designed to provide opportunity for advanced study and research in nursing and, in the Master of Nursing program, to assist in the development of increased competence in selected areas of clinical specialization: community health care systems, parent and child nursing, physiological nursing, and psychosocial nursing. Research is an integral part of all programs, and a thesis is required of all master's degree program students. Opportunities for functional preparation in teaching, administration, and clinical practice are available.

The aim of the program at the doctoral level is to prepare scholars and researchers to expand the body of knowledge upon which the practice of nursing rests. The program provides for rigorous research training related to four fields of nursing science: (1) individual adaptations to health and illness; (2) family adaptations to health and illness; (3) environments: supporting and nonsupporting; and (4) clinical therapeutics. The Ph.D. in Nursing Science program is appropriate preparation for nurses interested in careers in academia or for other types of leadership positions in health service agencies in which the ability to design, plan, and implement research in nursing is a critical requirement.

Special Requirements

In addition to the basic requirements for graduate status in the University, admission to premaster's status in the School of Nursing requires baccalaureate preparation with an upper-division major in nursing or equivalent, a basic course in statistics, a Graduate Record Examination within the past five years, a statement of goals, and three references. Admission is normally Autumn Quarter, except for the Nursing Administration pathway, which begins Summer Quarter. The deadline for application to the Nursing Administration pathway is December 1. Application deadlines for all other master's degree pathways vary. Additional information may be obtained from the School of Nursing Office of Academic Programs.

Admission requirements for the doctoral program, in addition to the above, include Graduate Record Examination scores within the past five years, five references, a statement of goals for doctoral study, a description of area of research interest, and evidence of scholarly work. A personal interview may be required. The deadline for application to the doctoral program is February 1.

Financial Aid

A limited number of nurse traineeships are available for premaster's study. Special pre- and post-master's traineeships are also available to a limited number of students for specific specialties. Additional information may be obtained from the School of Nursing.

Teaching assistantships and research assistantships are available to a limited number of students. Priority for these appointments is given to predoctoral students.

Faculty

Chairpersons

Community Health Care Systems: Beverly M. Horn (Acting)
Parent and Child Nursing: Nancy F. Woods
Physiological Nursing: Anne Loustau (Acting)
Psychosocial Nursing: Shirley A. Murphy (Acting)

Professors

Barnard, Kathryn E.,* 1972, (Psychology), M.S., 1962, Boston; Ph.D., 1972, Washington; ecological factors of child development.
Batey, Marjorie V.,* 1956, M.S., 1956, Ph.D., 1968, Colorado; sociological factors in health-care systems.
Benoliel, Jeanne Q.,* 1970, M.S., 1961, California (Los Angeles); D.N.Sc., 1969, California (San Francisco); psychosocial consequences of life-threatening illnesses, process of identity change.
Chrisman, Noel J.,* 1973, (Anthropology, Family Medicine), M.P.H., 1967, Ph.D., 1966, California (Berkeley); health beliefs and practices, social networks and social support.
deTornyay, Rheba,* 1975, M.A., 1954, San Francisco State; Ed.D., 1967, Stanford; health services, nursing education.

Disbrow, Mildred A.,* 1968, (Emeritus), M.Litt., 1954, Pittsburgh; Ph.D., 1954, Washington; maternal-infant interaction, child abuse.

Eyres, Sandra J.,* 1974, M.P.H., 1968, Ph.D., 1972, North Carolina; environmental resources promoting adaptation and health.

Gallucci, Betty B.,* 1976, M.L.Sc., 1972, Ph.D., 1973, North Carolina State; oncology, nutritional assessment, pathophysiology of stomatitis, and graft versus host disease.

Giblin, Elizabeth C.,* 1959, (Emeritus), M.N., 1954, Washington; Ed.D., 1959, Colorado; nursing assessment and nursing therapies, pathophysiological bases.

Goertzen, Irma E., 1968, M.N., 1968, Washington; nursing organization in hospitals, finance.

Hegyvary, Sue T.,* 1986, M.N., 1966, Emory; Ph.D., 1974, Vanderbilt; health services research, organization of health-care facilities, institutional quality assurance, nursing management.

Heinemann, Edith M.,* 1954, (Emeritus), M.A., 1954, Washington; alcohol- and substance-abuse nursing.

Horn, Barbara J.,* 1977, M.S., 1957, Indiana; Ph.D., 1971, Michigan; effective organization of nursing resources.

Kuramoto, Alice M.,* 1977, M.S., 1969, Minnesota; Ph.D., 1975, Michigan; nursing education and evaluation.

Lewis, Frances Marcus,* 1978, M.N., 1968, Washington; M.A., 1973, Ph.D., 1977, Stanford; complex organizational analysis, evaluation research, psychosocial factors in chronic illness.

Little, Dolores E.,* 1957, (Emeritus), M.N., 1957, Washington; leadership, emerging nursing roles.

Mansfield, Louise W., 1951, (Emeritus), M.A., 1951, Columbia; physiological nursing.

McCorkle, M. Ruth,* 1975, (Affiliate), M.A., 1972, Ph.D., 1975, Iowa; psychosocial responses to chronic illness, communication strategies.

Mitchell, Pamela H.,* 1965, M.S., 1965, California (San Francisco); neuroscience nursing, diagnostic strategies.

Nakagawa-Kogan, Helen,* 1968, M.A., 1956, Columbia; Ph.D., 1968, California (Los Angeles); stress response: cognitive/physiologic interface in chronic dysfunctions, self-management teaching.

Osborne, Oliver H.,* 1969, (Anthropology), M.A., 1960, New York; Ph.D., 1968, Michigan State; ideology, policy and health-care systems, transcultural health, mental health.

Patrick, Maxine L.,* 1955, M.N., 1953, Washington; D.P.H., 1970, California (Los Angeles); gerontology, geriatrics.

Prinz, Patricia N.,* 1976, ‡(Psychiatry and Behavioral Sciences), Ph.D., 1969, Stanford; sleep.

Rose, Marlon H.,* 1976, A.M., 1959, Ph.D., 1972, Chicago; coping, vulnerability and stress in children.

Thomas, Morgan D.,* 1959, ‡(Geography), Ph.D., 1954, Queens (Belfast); regional economics, regional planning and development, technical innovation.

Wolf-Wilets, Vivian C.,* 1969, M.A., 1964, Ph.D., 1969, Chicago; curriculum development, instruction, stress management.

Woods, Nancy F.,* 1978, (Social Work), M.N., 1969, Washington; Ph.D., 1978, North Carolina; women's health.

Associate Professors

Beaton, Randal D.,* 1977, (Research), (Community Dentistry), Ph.D., 1972, Washington; evaluation of clinical outcomes in health-care programs.

Blackburn, Susan T.,* 1974, M.N., 1973, Ph.D., 1979, Washington; high-risk infants and their families, infant care-giving actions and environments.

Blainey, Carol A.,* 1967, M.N., 1967, Washington; clinical teaching and problems of patients with diabetes mellitus.

- Booth, Cathryn L.,* 1979, (Research), M.A., 1971, Ph.D., 1974, Ohio State; mother-infant interaction, observational methodology, childbirth experiences and attachments.
- Booser, Mary K.,* 1960, (Emeritus), M.N., 1955, Washington; physiological nursing, care of patients.
- Brandt, Edna M., 1954, (Emeritus), M.N., 1953, Washington; physiological nursing.
- Brandt, Patricia A.,* 1982, M.S., 1968, Colorado; Ph.D., 1981, Washington; influence of family functioning on early child development.
- Burke, A. Evelyn, 1943, (Emeritus), M.A., 1941, Case Western Reserve; community health-care systems.
- Bush, James P., 1974, M.N., 1973, Washington; Ed.D., 1984, San Francisco; pain management, power and powerlessness as perceived by professional nurses.
- Carnevali, Doris L.,* 1982, (Emeritus), M.N., 1961, Washington; planning nursing care.
- Cobb, M. Marguerite, 1953, (Emeritus), M.N., 1957, Washington; community and school health problems.
- Cowan, Marie J.,* 1979, (Medicine), (Pathology),† M.S., 1972, Ph.D., 1979, Washington; estimation of infarct size by electrocardiography, sudden cardiac death.
- Craven, Ruth F.,* 1968, M.N., 1968, Washington; Ed.D., 1984, Seattle; gerontological nursing.
- Cunningham, Susanna L.,* 1978, (Physiology and Biophysics), M.A., 1969, Ph.D., 1977, Washington; cardiovascular and sympathetic nervous system control of renin release.
- Estes, Nada J.,* 1972, M.S.N., 1958, Colorado; counseling, people with substance-use disorder, depression.
- Fine, Ruth B.,* 1960, (Emeritus), M.N., 1957, Washington; organization and structure as it influences behavior.
- Gray, Carol A.,* 1971, ‡(Education), M.Ed., 1968, Western Washington; Ph.D., 1971, Washington; school psychology/human development and cognition.
- Gray, Florence I., 1945, (Emeritus), M.S., 1950, Washington; undergraduate nursing education.
- Hammond, Mary A.,* 1972, (Research), M.S., 1968, Ph.D., 1971, Wisconsin; child development, longitudinal research methods.
- Hay, Stella,* 1955, (Emeritus), M.A., 1951, Minnesota; physiological nursing.
- Heitkemper, Margaret,* 1981, M.N., 1975, Washington; Ph.D., 1981, Illinois; physiological nursing, gastroenterology, enteral nutrition, gerontology.
- Horn, Beverly M.,* 1976, (Anthropology), M.N., 1962, Ph.D., 1975, Washington; cross-cultural research in maternal-child nursing.
- Jackson, Nancy E.,* 1975, (Research), (Psychology), M.S., 1971, Ph.D., 1975, Washington; intellectual development and individual differences in intellectual functioning.
- Killien, Marcia Gruis,* 1982, M.N., 1974, Ph.D., 1982, Washington; women's health, reproductive decision making, evaluation research, perinatal nursing.
- Kotchek, Lydia D.,* 1975, (Women Studies), M.A., 1964, Ph.D., 1975, Washington; individual and family development, cultural influences on family, aging, death.
- Loustau, Anna,* 1976, M.S., 1967, California (San Francisco); Ph.D., 1975, Washington; clinical decision making, patient teaching, patient compliance with therapeutic regimens.
- Marvin, Janet A.,* 1974, (Surgery),† M.N., 1969, Washington; burns, trauma, nutrition, infection control.
- Molbo, Doris M.,* 1970, (Emeritus), M.A., 1968, Washington; oncology: prevention and screening, care and rehabilitation.
- Muecke, Marjorie A.,* 1979, (Anthropology), M.A., 1968, New York; M.A., 1972, Ph.D., 1976, Washington; medical anthropology, women's health, refugee health, Southeast Asia.
- Murphy, Shirley A.,* 1985, M.Ed., 1965, Gonzaga; Ph.D., 1981, Portland; addictive processes in women, coping with undesirable life events.
- Olcott, Virginia, 1931, (Emeritus), M.A., 1931, Washington; public health nursing.
- Pesznecker, Betty L.,* 1970, M.N., 1957, Washington; life change, life strain, impact on health, low-income women.
- Pittman, Rosemary J.,* 1954, (Emeritus), M.S., 1947, Chicago; family nurse practitioner.
- Price Spratten, Lois,* 1976, M.N., 1972, California (Los Angeles); Ph.D., 1976, Washington; urban and ethnic factors in health and illness.
- Shaver, Joan,* 1980, M.N., 1970, Ph.D., 1976, Washington; women's health and female reproductive physiology.
- Smith, Harriet H., 1949, (Emeritus), M.N., 1957, Washington; nursing.
- Webster-Stratton, Carolyn H.,* 1976, M.S.N., 1972, M.P.H., 1972, Yale; Ph.D., 1978, Washington; parent intervention programs for behaviorally disturbed children.
- Woods, Susan L.,* 1975, M.A., 1974, Washington; cardiovascular clinical specialist, pulmonary artery catheter measurement.

Assistant Professors

- Benedict, M. Beth, 1986, M.S., 1974, Arizona; Dr.P.H., 1985, Texas (Houston); community health nursing, nursing administration, retention of hospital nursing personnel.
- Betrus, Patricia A.,* 1982, M.N., 1979, Ph.D., 1985, Washington; stress, cognitive behavioral therapy, depression, research design.
- Bond, Eleanor F.,* 1985, M.A., 1976, Ph.D., 1985, Washington; critical care nursing.
- Brown, Marie A.,* 1983, M.N., 1973, Ph.D., 1983, Washington; perimenstrual distress (premenstrual syndrome and dysmenorrhea), psychosocial aspects of pregnancy.
- Catanzaro, Marci L.,* 1977, (Rehabilitation Medicine), M.S., 1971, Washington; Ph.D., 1980, Union Graduate School—West (San Francisco); symptom management and chronic illness.
- Cowan, Diana M., 1983, (Research), M.N., 1969, Ph.D., 1982, Washington; children's parental relationships, stress management techniques for adolescents.
- Draye, Mary Ann, 1973, M.P.H., 1968, Michigan; FNP practice, infertility, computer-aided instruction, risk appraisal.
- Eggert, Leona L.,* 1978, M.A., 1970, Ph.D., 1984, Washington; personal relationships, nurses' communication competency, adolescents' drug use and abuse.
- Foerder, Beverly A.,* 1984, M.A., 1969, Wisconsin; Ph.D., 1978, Washington; developmental anatomy, physiologic responses in acute and chronic illness.
- Fought, Sharon G.,* 1986, M.S.N., 1976, Ph.D., 1983, Texas (Austin); emergency care—critical-care nursing, simulation gaming educational strategies.
- Hoffman, Agnes K.,* 1979, M.N.S., 1968, Wayne State; M.A., 1974, Ph.D., 1977, Kansas; substance-use disorders, mental-health care of the elderly.
- Jones, Mary C.,* 1964, (Emeritus), M.S., 1962, Boston; occupational health nursing, health promotion, self-care practice.
- Jordan, Pamela L.,* 1984, M.S., 1975, Rush; Ph.D., 1984, Michigan; family expansion, fathering, social support.
- Kieckhefer, Gail M., 1988, (Research), M.S., 1977, St. Louis; Ph.D., 1985, Washington; children with chronic illness.
- Larson, M. Linn,* 1967, (Emeritus), M.N., 1967, Washington; cross-cultural variables in mental illness, nursing interventions in disturbed behaviors.

- Lentz, Martha J., 1984, (Research), M.N., 1975, Ph.D., 1984, Washington; circadian phase relationship of sleep-wake cycle and body temperature rhythm in aging.
- Lind, Gregory A., 1987, (Acting), M.S., 1980, Missouri; primary health care, community health promotion.
- Magyary, Diane L.,* 1982, M.N., 1977, Ph.D., 1981, Washington; parent interactions with high-risk infants and children.
- O'Connor, Frederica W., 1986, M.S.N., 1974, Illinois; M.S., 1984, Ph.D., 1986, Northwestern; psychiatric nursing, social psychology, psychoeducational care.
- Olshansky, Ellen F.,* 1985, M.S., 1979, D.N.Sc., 1985, California (San Francisco); psychological implications of infertility related to the family, qualitative research.
- Ryan, William J., 1986, M.S.N., 1981, St. Louis; Ph.D., 1986, Wisconsin (Madison); clinical exercise physiology.
- Snyder, B. Charlene, 1971, (Research), M.N., 1971, Washington; nursing intervention with high-risk families, especially mothers with newborns.
- Spieker, Susan J.,* 1985, (Research), Ph.D., 1982, Cornell; developmental psychology, infant security.
- Spletz, Anita L., 1971, (Research), M.N., 1971, Washington; nursing interventions with high-risk families.
- Swanson-Kauffman, Kristen M.,* 1985, (Research), M.S.N., 1978, Pennsylvania; Ph.D., 1983, Colorado; psychosocial and parent-child nursing, reproductive loss, caring, qualitative research methodologies.
- Thomas, Karen A. J.,* 1986, M.A., 1977, Iowa; Ph.D., 1986, Washington; physiological adaptation of premature infants.
- Thomas, Mary Durand, 1985, (Research), M.S.N., 1962, Washington; Ph.D., 1978, Hawaii; psychiatric disabilities, nursing assessment and diagnosis, cultural aspects of care.
- Tyler, Martha L.,* 1976, M.N., 1977, Washington; oxygenation during chest physiotherapy, suctioning, dyspnea, breathing patterns in disease.
- Viriden, Susan,* 1979, M.S., 1976, D.N.Sc., 1981, California (San Francisco); nursing interventions that promote adaptations to parenting.
- Wagnild, Gail M.,* 1986, M.S.N., 1980, Montana State; Ph.D., 1984, Texas (Austin); geriatric care in the community.
- Ward, Deborah H., 1987, M.S., 1977, Yale; Ph.D., 1987, Boston; health policy, equity of health care, care of elderly by women.
- Wilkinson, William E.,* 1984, (Environmental Health), M.P.H., 1978, Tulane; D.P.H., 1982, Texas (Houston); occupational epidemiology and surveillance, occupational health service delivery.
- Worthy, Elizabeth J.,* 1966, (Emeritus), M.N., 1964, Washington; mother-infant interactions, handicapped child.

Lecturers

- Hancock, Lois A., 1982, M.S.N., 1978, Yale; parent and child nursing.
- Himle, Constance J., 1983, M.N., 1973, Washington; diabetes, clinical teaching.
- Pipes, Peggy L., 1968, M.A., 1952, Columbia; M.P.H., 1966, Michigan; nutrition.
- Russell, Millie L., 1974, (Biology), M.S., 1979, Washington; kinesiology.
- Underhill, Sandra L.,* 1976, M.N., 1976, Washington; cardiovascular nursing, angina.
- Zerwekh, Joyce V., 1986, M.A., 1969, New York.

Course Descriptions

Community Health Care Systems

CHCS 301 The Discipline and Profession of Nursing (3) A Conceptual organization of the discipline of nursing and the scope of its professional practice. Nursing's historical development and current trends influencing the contributions of nursing in health-care delivery. Prerequisite: admission to School of Nursing.

CHCS 361 Cultural Variation and Nursing Practice (2) W Importance in nursing practice of ethnomedical beliefs, values, practices pertaining to wellness-illness, care seeking, and healing. Comparative approach emphasizes cross-cultural similarities and differences. Value orientations influencing the effectiveness of nurses working with culturally diverse populations. Prerequisite: upper-division standing.

CHCS 402 Strategies in Community Health Nursing (8) WSp Community health nursing process at levels of family and other small groups, community and aggregate populations. Formulation of community health diagnoses as basis for interventions to promote disease prevention, wellness, and self-care within community. Prerequisite: senior standing in nursing or permission of instructor.

CHCS 406 Introduction to Research in Nursing (3) Organization of the structure of nursing knowledge through research. Concepts and processes of research utilized in the investigation of nursing science. Prerequisite: one introductory statistics course.

CHCS 408 Legal and Ethical Issues in Clinical Practice (2) Identification of ethical and legal issues and the ensuing dilemmas relevant to the profession of nursing and nurses as health professionals and citizens. Selected problems and dilemmas affecting nurses, nursing, and the delivery of health care analyzed using specific moral-ethical perspectives. Prerequisite: upper-division standing or permission of instructor.

CHCS 410 Gerontological Nursing (2) WSp Major physiological, psychological, and sociocultural changes associated with aging and their impact on individuals within the context of their families and environments. Nursing assessments and interventions utilizing strengths and capabilities of the elderly and aimed at maintaining optimum health status. Prerequisites: senior standing, nursing major standing.

CHCS 420 Nursing Leadership and Health-Care Systems Analysis (3) WSp Analysis of selected leadership theories and their relationship to leadership role required of professional nurse. Comparative analysis of past, current, and emerging health-care systems in United States and other countries. Factors influencing health-delivery systems (e.g., political, technological, socioeconomic, cultural). Prerequisite: senior standing or permission of instructor.

CHCS 423 Senior Practicum in Community Health Nursing (7) Sp Theoretical depth and practice as offered in areas of leadership, health promotion, health education, community organization, and application of research influencing the quality of health-care delivery as applied in primary community health-care settings. Prerequisite: 402 or permission of instructor.

CHCS 450 Advanced Fieldwork Community Health Nursing (2) Guided experience in delineating nursing roles in community settings. Development of a philosophy of community health nursing. Application of core concepts pertaining to health, ethics, care, and community. A minimum of four hours of guided experience weekly. Prerequisites: graduate standing, permission of instructor.

CHCS 458 Practice Teaching Community Health Nursing (3) Sp Guided experience in selected teaching-learning situations in community health nursing. Identification, analysis, and solution of teaching-learning problems. A minimum of seven hours of guided experience weekly. Prerequisite: 450.

CHCS 492 Anthropology of Refugees (3) W The refugee phenomenon, its emergence in postcolonial world, and structure of life history of refugees. Ethnic change, involuntary deculturation, and acculturation as they occur in refugee life histories. Joint with ANTH 492. Prerequisite: ANTH 202 or permission of instructor.

CHCS 495 Child Rearing, Culture, and Health (3) Sp Cross-cultural study of the child-rearing practices, cultural norms, and health behavior of children and adolescents in different societies. Comparative approaches, diverse theoretical postures, and empirical research findings are used. Joint with ANTH 440. Prerequisite: permission of departmental adviser.

CHCS 499 Undergraduate Research (1-5, max. 5) AWSpS Supervised individual research on a specific nursing problem. Prerequisites: junior year standing in the School of Nursing, cumulative grade-point average of 3.00 or better, and permission of undergraduate advising office.

CHCS 501 Health Assessment of Adults and Children (4 or 5) A Provides framework for systematic data collection, organization, precise recording, and accurate communication of health status data on individuals of all ages. Demonstrations of, and experiences with, the processes of symptom analysis and health screening with basically healthy individuals. Prerequisites: graduate standing, permission of instructor.

CHCS 506 Seminar in Nursing Administration (3) Sp Critical analyses of problems affecting the administration of nursing. Intensive directed study of the conditions that influence human behavior in nursing work environments. Prerequisites: graduate standing, ADMIN 510, and permission of departmental adviser.

CHCS 514 Seminar in Home Care for Chronic Illness (3) S Home-care services as component of community health nursing. Understanding effects of direct nursing functions on care of chronically ill persons and their families. Selected field study experiences in community health settings. Prerequisites: 550, graduate standing, and permission of instructor.

CHCS 515 Seminar in Nursing Leadership and Management (3) Current leadership and management theories of nurses working in a variety of settings. Concepts essential in developing the nurse's leadership activities and skills at different management levels. Prerequisites: graduate standing, permission of instructor.

CHCS 516 Communications in Complex Health-Care Systems (3) W Forum for critically examining and conceptualizing various communication processes in complex health-care systems and their implications for practice. Analytic and theoretical perspectives for the study of communication within health care. Prerequisites: 571, permission of instructor.

CHCS 520 Methods of Research in Nursing (3) A Research process as it applies to nursing. Use of the literature in building theoretical rationale. Selection of appropriate methods. Presentation of findings. Minimum of two laboratory hours weekly. Prerequisite: a course in statistics.

CHCS 521 Methods of Research in Nursing (2) W Continuation of 520, with emphasis on methods of research applied to the solution of problems in all fields of nursing.

CHCS 522 Family-Focused Health Care (2-3) W Foundation for integrating principles of family-focused health care into primary care. Theories of family de-

velopment and functioning examined in context of primary care. Study and evaluation of research and clinical decision making related to family assessment, health status determinations of individuals in family context, and selection of strategies of care.

CHCS 524 Seminar in Leadership—Nurse Executive (3) Examines process in nurses' executive leadership roles in variety of settings. Concepts of organization theory introduced as overview of theory and practice for the nurse executive and applied to specific leadership contexts: complex organizations, community, social movements, and political. Prerequisites: ADMIN 510 or equivalent; permission of instructor.

CHCS 550 Advanced Community Health Nursing (3) Systematic inquiry into the nature and foundations of community health nursing. Analytic and theoretical perspectives on health risk assessment and nursing interventions in the community. Implications for community health nursing services. Prerequisites: permission of instructor and graduate standing.

CHCS 551 Theoretical Foundations of Primary Care I (3) W Presentation and interpretation of theoretical bases of family-focused primary care, mutual responsibility and participation, clinical decision making, professional leadership, and research. Provides students with conceptual foundation upon which to base their development as family nurse practitioners. Prerequisite: permission of instructor.

CHCS 552 Theoretical Foundations of Primary Care II: Health Promotion and Maintenance (3) W Clinical analysis of health promotion and maintenance methodologies in primary care. Focus on wellness of individuals through the life span, and families and communities seeking to maintain or improve health. Emphasis on prospective health care and strategies for changing behavior. Prerequisites: 551, 501, or permission of instructor; Primary Health Care students must register for 553 concurrently.

CHCS 553 Seminar in Primary Care I: Clinical Decision Making in Health and Wellness (3) W Weekly seminars with supervised field study within selected primary-care and wellness settings. Emphasis on health assessment and strategies related to improving health in people of all ages. Analysis of, and counseling on, life-styles, nutrition, physical fitness, stress management, self-care, and prevention. Offered on credit/no credit basis only. Prerequisites: graduate standing, permission of instructor.

CHCS 554, 555 Theoretical Foundations of Primary Care III and IV: Acute and Chronic Illness (4,4) Sp,S Differential diagnosis and selection of health-care strategies within the scope of practice of family nurse practitioners. Includes clinical decision making in common acute or stable chronic health problems. Stresses concepts of health promotion, maintenance, and restoration and the development of advanced assessment and management. Prerequisite: permission of instructor.

CHCS 556, 557 Seminar in Primary Care II and III: Decision Making in Acute and Chronic Illness (3,3) Sp,A Focus on research questions, patient presentations, and group discussions drawn from field study. Supervised clinical field study within selected primary health-care settings and weekly seminar discussions related to theory presented in 554, 555. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

CHCS 558 Advanced Occupational Health Nursing (2 or 5) A Occupational health nursing theory; concepts from community health nursing, industrial hygiene, occupational epidemiology, and toxicology. Students synthesize concepts and explore in-depth selected problems in work settings. Evaluation and application of theories and research findings. Field experiences in occupational health nursing mandatory for 5 credits. Prerequisites: ENVH 453, permission of instructor.

CHCS 560- Seminar in Primary Care IV: Decision Making in Complex Clinical Problems (1-5), max. 5) WSp Seminar with associated field study. Synthesis of advanced knowledge base and clinical family nurse practitioner skills with effective management of complex clinical problems. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

CHCS 561 Systems Analysis in Nursing Administration (3) W Examines concepts and techniques in industrial engineering, system analysis, and operations research applicable to decision making, control and monitoring functions in nursing administration. Student demonstrates application and critical appraisal of concepts and techniques. Prerequisites: ADMIN 510, or equivalent, and permission of instructor.

CHCS 562 Clinically Applied Anthropology (3) Sp Anthropology as it relates to interdisciplinary delivery of culturally relevant health care. Cultural variation in illness beliefs and behavior, types of healing practices, illness prevention, social support networks. Joint with ANTH 562. Prerequisites: graduate standing, permission of instructor.

CHCS 564 Nursing Administration (3) W Elements of the administrative process as applied to organized nursing service. Exploration of concepts related to organizational structure, administrative behavior, personnel management, and the technology of administration. Prerequisites: ADMIN 510, graduate standing, and permission of instructor.

CHCS 566 Program Development in Clinical Areas (3) A Application of administrative theory in the development of a program in a selected clinical area of practice. The program will be developed on consumer need, community and agency resources and constraints; two-hour seminar; three hours field study each week. Prerequisites: graduate standing, 561, 564, ADMIN 510, or permission of instructor.

CHCS 567 Evaluation and Quality Assurance in Nursing (3) A Examines the framework for the evaluation and quality assurance of nursing practice in health-care and educational settings. The multiprofessional responsibility for review of health care is incorporated into the legal and professional mechanisms of peer review practices. Prerequisites: graduate standing, 520, 521.

CHCS 568 Field Study in Nursing Administration (8) S Field study provides opportunities to study and analyze the relationships between espoused theories and theories in action under real-time conditions and to make a comparative analysis of structure and behavior of management systems. Minimum of sixteen hours of field study and a two-hour seminar weekly. Prerequisites: equivalency of 506, 520, 521, 564, and ADMIN 510.

CHCS 571 Seminar in Nursing and the Social Order (3, max. 9) AWS Changing patterns of nursing service and education in contemporary society. Implications of personal value systems. Prerequisite: permission of instructor.

CHCS 574 Selected Topics in Comparative Nursing Care Systems (2 or 3, max. 10) ASp In-depth examination of the literature pertinent to major theoretical issues in cross-cultural nursing and health-care systems. Seminar with analysis and discussion of selected topics and readings. Implications for research and health care stressed.

CHCS 575 Death Influence in Clinical Practice (4) WS Analysis and study of social, cultural, and psychological conditions that influence human death in modern society. Research findings, selected readings, and direct experience provide direction for examination of philosophic, theoretical, and pragmatic issues underlying choices and decisions in clinical practice. Open to graduate students with permission of instructor. (Limit: sixteen students.)

CHCS 578 Health, Care, and Community (3) A Analysis of health care in community from nursing and behavioral science perspectives. Sociocultural influences on health beliefs and practices, natural-care units, and community life patterns analyzed. Community as both context and target of change explored in relation to nursing approaches in health promotion and maintenance. Prerequisite: graduate standing.

CHCS 580 Populations at Risk in the Community (3) Health needs and risks of selected populations in the community and theoretical and analytical perspectives on assessment and intervention strategies in community health nursing practice with groups and populations whose health is at risk. Prerequisites: graduate standing and permission of instructor.

CHCS 581 Seminar in Advanced Community Health Nursing (4) Construction and analysis of research questions, presentation of individual and community problems and intervention/evaluation strategies in community health nursing. Individual and community assessment and nursing strategies related to health promotion and prevention of illness. Field study in community health settings. Prerequisites: graduate standing and permission of instructor.

CHCS 583 Transcultural Nursing Practices (3) WS Study of nursing practices in different cultures. Seminar focus is on theoretical formulations and comparative analysis of values, patterns, techniques, and practices of nursing care in many societies. Rituals, myths, taboos, and beliefs are studied in relation to the subculture(s) of caring and nursing practices.

CHCS 600 Independent Study or Research (*) Offered on credit/no credit basis only.

CHCS 700 Master's Thesis (*) Offered on credit/no credit basis only.

Parent and Child Nursing

PCN 300 Human Growth and Development Through the Life Span (5) A Processes of, and theories about, human growth and development; examination of relevant research; relationship of research and theory to working with clients of various ages. Prerequisite: admission to School of Nursing or permission of instructor.

PCN 328 Family Centered Nursing of Children (7) AWSp Holistic assessment and optimizing wellness of pediatric clients and their families. Clinical experiences include care of children and families at various positions along the wellness continuum. Prerequisite: junior standing with nursing major standing.

PCN 400 Nursing Care of the Childbearing Family (5) AWSp Nursing care of families through pregnancy, childbirth, and early parenting. Reproductive health-care issues, including human sexuality, family planning, and sexually transmitted diseases. Clinical experiences in community and hospital settings. Prerequisites: PN 323, 324, PSN 305.

PCN 425 Senior Practicum in Parent-Child Nursing (7) WSp Further development, critical examination, and synthesis of nursing care in a specialized parent-child setting. Increasing depth of clinical practice, including care to groups of clients, applying leadership skills, assessing problems affecting quality health-care delivery, and applying research findings. Prerequisite: senior standing in nursing.

PCN 499 Undergraduate Research (1-5, max. 5) AWSpS Supervised individual research on a specific nursing problem. Prerequisites: junior-year standing in the School of Nursing, cumulative grade-point average of 3.00 or better, and permission of undergraduate advising office.

PCN 501 Pediatric Health Assessment and Promotion (4 or 5) A Gives experience in obtaining a health history and performing a physical assessment of

infants, children, and adolescents. Interviewing techniques, problem-oriented charting, and a systems approach to the physical examination. Emphasis on screening principles, health promotion, and wellness care for children/families. Prerequisite: permission of instructor.

PCN 502, 503 Primary Care: Common Pediatric Problems, Part I, II (2 or 5; 2 or 4) W,Sp Process of assessment, integration of current research findings into clinical decision making, and management of common pediatric problems. Concepts of health promotion, maintenance, and anticipatory guidance are emphasized. Clinical experiences are provided with selected patient problems and illnesses. Prerequisite: 501.

PCN 504 Common Child Behavioral Problems, Part III (2 or 4) Sp Process of assessment and management of common pediatric behavioral and psychological problems. Concepts of prevention, self-care, anticipatory guidance, and family involvement are included in formulating management strategies. Relationship between medical and psychological aspects of pediatric illness in families emphasized. Prerequisite: permission of instructor.

PCN 505 Seminar: Counseling and Educational Approaches in Child Health Care (1 or 3) A Focuses on theory, practice, and issues involved in conducting health-related groups. Special emphasis on counseling process. Alternative approaches to educating communities about health-care issues. Clinical experiences designed to assist students in developing and conducting health-related groups in various settings in the community. Prerequisite: permission of instructor.

PCN 506 Primary Care: Common Adolescent Problems, Part IV (1 or 3) A Process of assessment, clinical decision making, and management of common adolescent problems. Covers both biomedical and psychosocial aspects of adolescent health care. Clinical experiences designed for students to work with adolescents in a variety of settings. Prerequisite: permission of instructor.

PCN 507 Seminar: Advanced Pediatric Primary Care (6) W Intensive, supervised field study within pediatric primary-care settings. Focus on assessment, diagnosis, and selection of strategies of care for children with acute or chronic problems. Emphasis on synthesizing advanced knowledge of clinical judgment and current research findings into clinical practice. Prerequisites: 501, 502, 503, 504, 506.

PCN 509 Perinatal Nursing I: The Prenatal Period (2 or 4) A Theories and issues related to health care of childbearing families during the prenatal period. Examination of physiological and psychosocial processes and analysis of individual and family adaptations in normal and at-risk situations occurring during pregnancy with implications for health promotion, research, and advanced nursing practice. Prerequisite: permission of instructor.

PCN 510 Individual Adaptation to Childbearing (3) Analysis of theories, research, and issues related to physiological and psychosocial adaptation of individual family members during the perinatal period. Theoretical foundations of therapeutic strategies for care in normal and high-risk situations. Prerequisite: 529 or permission of instructor.

PCN 511 Seminar in Neonatal Nursing (3) Neonatal neurobehavioral and physiologic adaptation within context of physical and social environment. Neonatal responses to alterations in growth and illness. Assessment modalities and therapeutic strategies used during the neonatal period. Prerequisite: 529 or permission of instructor.

PCN 512 Advanced Practicum in Perinatal Nursing I (2-10) Clinical practicum/seminar to develop expertise in nursing care of childbearing family. Opportunities for developing proficiency in comprehensive

nursing assessment, prescription, implementation, and evaluation of nursing therapies in collaboration with other health-care providers. Prerequisite: graduate standing or permission of instructor.

PCN 513 Advanced Practicum in Perinatal Nursing II (4-12) Clinical seminar/practicum to develop advanced skills relevant to diagnosis and management of selected nursing-care problems of groups (e.g., case-load, population, community), evaluate outcomes of care, and develop identity of advanced practitioner of nursing. Prerequisite: graduate standing or permission of instructor.

PCN 514 Coping Strategies of Well and Sick Children (3) A Gaining knowledge and skill in helping well and sick children cope in supportive and nonsupportive environments. Fit between coping strategies and environment, adaptation to environment, adjustment of environment to child's needs. Prerequisite: course in growth and development or permission of instructor.

PCN 515 Wellness Care for Children and Their Families (2-5) Concepts and issues related to wellness, health maintenance, promotion and prevention of illness for well children and children with special needs. Models of wellness and intervention, appropriate nursing diagnoses, assessment, and intervention approaches for various areas of wellness (physical, social, emotional, and spiritual) and the nurse's role. Prerequisite: permission of instructor.

PCN 516 Nursing Management of Acutely Ill Children and Their Environments (2-5) Nursing management of children with acute illnesses. Scientific principles, theories, and research used in planning, implementing, and evaluating nursing care of children at different levels of acuity and their families. Prerequisites: permission of instructor.

PCN 517 Advanced Clinical Seminar in the Nursing of Children (2-6) Sp Synthesis and evaluation of scientific principles and research findings for care collaboration with other health professionals. Development of specialist role. Social and environmental issues. Prerequisites: core courses, 516 or permission of instructor.

PCN 518 Pediatric Pulmonary Anatomy and Physiology: Clinical Applications (2) Lung development, anatomy, and physiology; clinical application when caring for children with acute and chronic lung disease. Prerequisite: permission of instructor.

PCN 519 Pediatric Pulmonary Nursing (2-5) Applies knowledge of pediatric anatomy and physiology to assessment and treatment of pulmonary pathophysiology in children. Nursing issues in caring for children and families with acute and chronic lung disease. Prerequisite: permission of instructor.

PCN 520 Methods of Research in Nursing (3) W Research process as it applies to nursing. Use of the literature in building theoretical rationale. Selection of appropriate methods. Presentation of findings. Minimum of two laboratory hours weekly. Prerequisite: course in statistics.

PCN 521 Methods of Research in Nursing (2) Sp Continuation of 520, with emphasis on methods of research applied to the solution of problems in all fields of nursing.

PCN 528 Implications of Human Embryology and Genetics for Clinical Practice (3) Normal development of the human embryo and fetus and principles of human genetics. Alterations in development leading to common anomalies and implications for clinical practice. Prerequisite: graduate standing or permission of instructor.

PCN 529 Perinatal Physiologic Adaptations (3) Normal physiologic and anatomic changes in the pregnant woman and fetal-neonatal development physiology. Implications for perinatal nursing practice. The re-

search basis for selected nursing management strategies. Prerequisite: graduate standing or permission of instructor.

PCN 530 Conceptual Frameworks for Parent-Child Nursing (3) A Designed to assist graduate students in exploration, criticism, and analysis of selected concepts, frameworks, and models relevant to parent-child nursing practice. Group seminar work focuses on the discussion of issues influencing the roles and practice of clinical nurse specialists in parent-child nursing. Skills necessary for developing a conceptual framework for practice.

PCN 531 Nursing Process in Parent-Child Nursing (4) W Includes lecture, seminar, and laboratory instruction designed to assist the student with knowledge and skill acquisition related to nursing care of individuals and families with regard to childbearing and childrearing. Prerequisite: 530.

PCN 532 Advanced Parent and Child Nursing: Provision of Health Services (3) Sp Focus on the aggregate of parents and children and their health-care needs. Selected strategies suitable for providing services to groups of parents/children emphasized. Role of the clinical nurse specialist in planning, implementing, and evaluating services. Prerequisites: 530, 531.

PCN 534 Cultural Influences Upon Parenting (3) Sp Comparison of cross-cultural similarities and differences in: definitions of ideal parenting; socializations into a parent role; social support for, and controls upon, parenting. Analysis of additional effect of changes in ideology, technology, and demography upon parenting roles. Joint with ANTH 534. Prerequisite: permission of instructor.

PCN 535 Children with Chronic Health Conditions (2-5) Theory and research analyses of physical problems, biobehavioral responses and psychosocial hardships. Interventions that prevent handicaps and maintain, promote or restore health of infant and preschool-age children within a developmental, family, institutional, and community context. Optional laboratory clinical experiences. Prerequisite: permission of instructor.

PCN 536 Behavioral Change Strategies: Children and Their Families (3) Analysis of behavioral change paradigms that promote the child's and adolescent's health behaviors, self-control, and functional patterns within the context of the family, community, and physical environment. Treatment strategies based on the integration of behavioral, cognitive, operant, and social learning models. Prerequisite: permission of instructor.

PCN 537 Interpersonal Therapeutics and Partnerships: Children and Their Families (3 or 5) Analysis of conceptual models and research on interpersonal processes for developing communication and partnerships among health and human service providers, children/adolescents, and families. Individual, group and case management strategies that promote health behaviors, interpersonal functioning, sense of empowerment, and competence. Helping skills laboratory and optional clinical. Prerequisite: permission of instructor.

PCN 538 Family Adaptation During Childhood and Adolescence (3) Analysis of conceptual models and research in family support, stress, and functioning. Multidirectional influences and interactive patterns among the child, family, and community. Family assessment, diagnosis and therapeutic intervention that promote family adaptation and reduce the associated hardships that may be handicapping. Prerequisite: permission of instructor.

PCN 540 Physical Therapeutics: School Age Children and Adolescents (2-6) Theory and research analysis of physical problems, biobehavioral responses, and psychosocial hardships. Adaptive physical and technological interventions that prevent handicaps and maintain, promote, or restore health of school-age children and adolescents within a develop-

mental, family, institutional, and community context. Optional laboratory and clinical experiences. Prerequisite: permission of instructor.

PCN 573 Selected Topics in Parent and Child Nursing (1-6, max. 12) In-depth examination of the literature pertinent to major theoretical issues in parent and child nursing. Seminar with analysis and discussion of selected topics and readings. Implications for research, prevention, and health care stressed. Prerequisite: permission of instructor.

PCN 600 Independent Study or Research (*) Offered on credit/no credit basis only.

PCN 700 Master's Thesis (*) Offered on credit/no credit basis only.

Physiological Nursing

PN 302 Clinical Decision Making and Therapeutics (5) W Clinical decision making and management of individuals experiencing common health concerns. Commonly occurring alterations producing broad pathological changes considered as basis for comprehensive nursing interventions. Theory underlying basic communication and patient-teaching activities. Prerequisites: CHCS 301, CONJ 340-, NUTR 301, PCN 300, concurrently with 304, permission of instructor.

PN 304 Clinical Decision Making and Therapeutics, Laboratory (4) W Clinical therapeutic decision making in the nursing care of ill adults. Instruction and supervision of basic nursing procedures in a clinical setting. Infection control in the hospital. Prerequisites: CHCS 301, PCN 300, CONJ 340-, NUTR 301, concurrently with 302, permission of instructor.

PN 321 Care of Ill Adults I (5) Sp Alterations in function of specific systems through pathophysiological concepts. Application of knowledge underlying critical thinking, sound judgment, and evaluation in the nursing process. Prerequisites: 302, 304, concurrently with 322, CONJ 340-341-.

PN 322 Care of Ill Adults I, Laboratory (5) Sp Application of scientific principles to decision making in nursing of ill adults. Emphasizes increasing skill in systematic patient assessment, in developing competency with selected nursing therapies, in nursing care of adults with physiological alteration. Includes two weeks operating room. Prerequisites: 302, 304, CONJ 340-341-; concurrent registration in 321.

PN 323 Care of Ill Adults II (3) A Alterations in function of specific systems through pathophysiological concepts. Application of knowledge underlying critical thinking, sound judgment, and evaluation in the nursing process. Prerequisites: 322, concurrently with 324, CONJ 340-341-342.

PN 324 Care of Ill Adults II, Laboratory (5) A Alterations in function of specific systems based on pathophysiological concepts. Application of knowledge underlying critical thinking, evaluation in the nursing process. May include operating room experience. Prerequisites: concurrently with 323, CONJ 340-341-342.

PN 426 Senior Practicum in Medical-Surgical Nursing (7) WSp Further development, critical examination, and synthesis of nursing care of the hospitalized ill adult. Clinical practice, problem solving, organizing, setting priorities, and other elements of leadership. Selected theoretical concepts and research findings. Prerequisites: senior standing in nursing, permission of instructor.

PN 466 Continuing Education in Nursing (3) Asp Planning, developing, and evaluating continuing education programs in various institutions and agencies. Includes the application of adult learning principles to a variety of situations, such as workshops, in-service and staff development programs. Prerequisite: graduate standing.

PN 499 Undergraduate Research (1-5, max. 5) AWSp Supervised individual research on a specific nursing problem. Prerequisites: junior-year standing in the School of Nursing, cumulative grade-point average of 3.00 or better, and permission of undergraduate advising office.

PN 502 Human Responses in Health and Illness I (3) W Survey of selected human responses to environmental demands in health and illness as expressed at physiologic, pathophysiologic, experiential, and behavioral levels. Such concepts as host defenses, ventilation, circulation, elimination, and nutrition that reflect human responses involved in maintaining internal equilibrium in health and illness. Prerequisite: graduate standing.

PN 503 Human Responses in Health and Illness II (3) Sp Survey of selected human responses to environmental demands in health and illness at physiologic, pathophysiologic, experiential, and behavioral levels. Responses discussed in framework of concepts relevant to physiologic nursing. Such concepts as immune response, stress response, circadian rhythms, sleep, cognition. Prerequisite: graduate standing.

PN 504 Nursing Therapies in Critical Continuing Care (3) Sp Therapeutic modalities commonly employed by nurses to assist patients with a variety of human responses to health problems. Weekly seminars and out-of-class assignments to encourage students to critically analyze current therapies. Prerequisites: 502, 503, or permission of instructor.

PN 509 Practice Teaching in Physiological Nursing (3) A Guided experience in selected teaching-learning situations in nursing, in both classroom and clinical situations. Identification, analysis, and solution of teaching-learning problems in clinical nursing. Minimum of seven hours of guided experience weekly.

PN 510 Curriculum Development in Nursing Education (3 or 5) WS Theoretical rationale for curriculum development, study of curricular problems in nursing in relation to the elements of the curriculum as described in a curricular design. The 5-credit plan includes the development of a curricular plan in a simulated faculty group.

PN 511 Evaluation of Clinical Performance in Nursing (3) S For graduate students preparing for faculty or staff development positions in nursing. Theory and principles of evaluation. Instruments to appraise clinical nursing performance developed as part of course requirements. Prerequisite: graduate standing or permission of instructor.

PN 520 Methods of Research in Nursing (3) A Research process as it applies to nursing. Use of the literature in building theoretical rationale. Selection of appropriate methods. Presentation of findings. Minimum of two laboratory hours weekly. Prerequisite: course in statistics.

PN 521 Methods of Research in Nursing (2) A Continuation of 520, with emphasis on methods of research applied to the solution of problems in all fields of nursing.

PN 541 Clinical Physiological Nursing Seminar I (3) Sp Guided experience in nursing practice with selected individuals in a specialized field of nursing. Synthesis and application of relevant principles and theories from biological, behavioral, and pathological sciences; proficiency in comprehensive nursing assessments, interventions, and evaluations; effective collaborative functioning as a member of the health team.

PN 542 Seminar in Cardiovascular Nursing (3) W Systematic inquiry into the influence of physical and emotional factors on pathophysiology underlying selected cardiovascular conditions; group study of current therapies with emphasis on prevention and rehabilitation. Individual study of topic of interest.

PN 543 Seminar in Nursing in Gerontology (3) W Gerontological research findings applied to complex nursing problems in maintenance of health and maximum functioning in the aged.

PN 544 Clinical Physiological Nursing Seminar II (3) S Continuation of 541. Guided experience in selected situations in area of clinical interest. Minimum of seven hours of guided experience weekly. Prerequisite: 541.

PN 545 Special Topics in Physiological Nursing (3, max. 9) AWSpS Guided survey of the experimental literature of major topics in physiological nursing, including cardiopulmonary, biology of aging, neuromuscular, cancer, and endocrine. Course conducted as a seminar with analysis and discussion of selected topics and readings. Implications for future research and health care are emphasized.

PN 546 Rehabilitation Nursing Seminar I (3) S Analysis of selected theoretical components underlying rehabilitation and utilization of scientific rationale in clinical nursing studies, with emphasis on prevention and maintenance. Library research and field study (minimum of seven hours weekly) are required.

PN 548 Management of Adults With Respiratory Dysfunction (3) S In-depth examination of problems such as abnormal secretions and shortness of breath associated with respiratory dysfunction due to pulmonary diseases and other pathophysiological states.

PN 549 Seminar in Critical-Care Nursing (3, max. 9) W Systematic inquiry into pathophysiology, initial nursing management, and systems of care for the critically ill adult or child.

PN 550 Seminar in Neuroscience Nursing (3) A Guided survey of clinical and experimental literatures regarding selected concepts of human functioning mediated by the nervous system: consciousness, mentation, movement, sensation, integrated regulation, coping with disability. Clinical and research measurement, current research and implications for further research, clinical applications. Prerequisite: knowledge of basic anatomy and physiology.

PN 570 Seminar in Clinical Research in Nursing (3) Sp Philosophy, problems of design; use of criterion measures in terms of patient care. Prerequisite: permission of departmental adviser.

PN 600 Independent Study or Research (*) Offered on credit/no credit basis only.

PN 700 Master's Thesis (*) Offered on credit/no credit basis only.

Psychosocial Nursing

PSN 303 Psychosocial Dimensions of Health and Illness (3) Surveys the psychobiosocial responses of persons to their environments. Stress response, crisis, and selected factors that affect dyadic and multiperson relationships. Psychosocial assessment and intervention practiced in seminars, using a variety of mechanisms. Prerequisite: junior standing or permission of instructor.

PSN 305 The Family in Health and Illness (2) A Basic theories (general systems, role) useful in family nursing care. Assessment and intervention issues with emphasis on family life-span development, social support, and adaptation. Nursing role and the family-health-care systems interface. Prerequisite: junior standing or permission of instructor.

PSN 403 Psychosocial Nursing Theory (2) AWSp Selected theories relevant to the practice of psychosocial nursing. Severely psychosocially disabled persons, both adults and children. Theoretic basis of psychosocial nursing interventions in acute and long-term treatment settings. Prerequisites: 303; 407 or equivalent, which may be taken concurrently.

PSN 406 Introduction to Research in Nursing (3) Organization of the structure of nursing knowledge through research. Concepts and processes of research utilized in the investigation of nursing science. Prerequisite: one introductory statistics course.

PSN 407 Psychosocial Nursing Practice (6) AWSp Application of selected theory to practice of psychosocial nursing. Severely psychosocially disabled persons, both adults and children. Theoretically based psychosocial nursing interventions tested in acute and long-term treatment settings. Prerequisites: 303; 403 or equivalent, which may be taken concurrently.

PSN 424 Senior Practicum in Psychosocial Nursing (7) AWSp Synthesis and application of psychosocial nursing theories in the care of psychosocially disabled persons. Analysis of factors supporting or impeding quality care within the mental-health-delivery system. Use of research findings and application of theories of leadership and psychosocial nursing. Prerequisite: senior standing in nursing or permission of instructor.

PSN 488 Effects of Alcohol and Its Relation to Health and Disease (3) ASPS Intensive inquiry into the effects of alcohol on the total person, emphasizing physiological effects, utilizing case studies, research reports, and audiovisual materials. Focus on methods used in the assessment of patients, in patient management, and in evaluation of therapeutic intervention. Open to students in other disciplines. Prerequisite: permission of instructor.

PSN 489 Alcohol Problems in Family and Society (3) WS Analysis of family problems associated with alcoholism. Emphasis on psychological, cultural, and social implications; examination of various counseling practices employed and theories of prevention. Open to upper-division and graduate students. Prerequisite: permission of instructor.

UCONJ 490 Social Sensitivity in Health Care (3) AWSp For course description, see Interschool or Intercollege Programs.

PSN 499 Undergraduate Research (1-5, max. 5) AWSpS Supervised individual research on a specific nursing problem. Prerequisites: junior-year standing in the School of Nursing, cumulative grade-point average of 3.00 or better, and permission of undergraduate advising office.

PSN 500 Theories in Interpersonal Systems in Psychosocial Nursing (3) W Empirical and theoretical literature on etiology and treatment of chronic mental illness in a sociocultural framework. Social networks and personality development, adaptation to stress, and chronic mental illness. Implications for research and implementation of nursing intervention strategies and mental health programs.

PSN 503 Seminar in Psychosocial Family Theory (4) W Examination of theories relevant to psychosocial family intervention into problems of children, adults, and the aged. Analysis of appropriateness of theories for nursing theory development, practice, and research.

PSN 504 Theories of Intervention and Process in Family and Child Treatment (3) Sp Critical review of the family assessment and intervention process. Analysis of existing treatment methods regarding adaptation to psychosocial nursing practice. Prerequisite: 503.

PSN 505 Selected Topics in Psychosocial Nursing (2-10, max. 10) AWSpS In-depth exploration of the major theoretical issues in psychosocial nursing. Seminar with analysis and discussion of selected topics and readings and implications for research and health care.

PSN 506 Theoretical Models of Family Analysis and Intervention (3) Sp Selected theoretical models of family analysis and intervention evaluated in relation

to: models of intervention; nursing theories, psychosocial nursing practice. Assessment of family unit and family as context of individual dysfunction. Interventions in various crises and chronic dysfunction. Prerequisite: 550 or equivalent or permission of faculty.

PSN 507 Behavior and Adaptation: Elder Adults (3) A Theory and research of behavior and adaptation in elder adults. Functional impairments within person-environment contexts. Intervention strategies based on psychodynamic, development, cognitive-behavioral, role theory, somatic, and self-help models. Prerequisite: permission of instructor.

PSN 508 Psychosocial Strategies for Elder Adults (4) W Psychosocial strategies that promote well-being/mental health of elder adults within a person-environment context. Selected treatment approaches based on psychodynamic, developmental, cognitive-behavioral, somatic, and person-environment transaction models. Prerequisite: 507 or permission of instructor.

PSN 513 Seminar in Group Treatment (2) Sp Seminar on the theoretical basis for working with various treatment groups. Analysis of selected approaches to group treatment. Analysis of leader responsibilities and functions in the development of therapeutic group experiences.

PSN 520 Methods of Research in Nursing (3) A Research process as it applies to nursing. Use of the literature in building theoretical rationale. Selection of appropriate methods. Presentation of findings. Minimum of two laboratory hours weekly. Prerequisite: course in statistics.

PSN 521 Methods of Research in Nursing (2) W Continuation of 520, with emphasis on methods of research applied to the solution of problems in all fields of nursing.

PSN 526 Program Planning and Program Evaluation in Health Service Delivery (3) S Analysis of selected theories and methods of program planning and program evaluation in the design, organization, and development of health services for defined populations in the community. Prerequisite: graduate standing or permission of instructor.

PSN 527 Practicum in Family Treatment (2-6) AWSp Supervised experience as a cotherapist within a family. Long-term therapy for primary and secondary intervention in family crises. Treatment of all family members, including extended family as appropriate. Offered on credit/no credit basis only. Prerequisites: 503, 504, which may be taken concurrently, or equivalent, and permission of departmental adviser.

PSN 528 Field Study in Evaluative Analysis for Health Care Programs (3, max. 6) WSp Field study in evaluation. Experiences include preevaluation studies; consultation with community members and agency personnel to operationalize health-care program objectives in terms of goals; construction of evaluation protocols; and assessment of program functioning. Offered on credit/no credit basis only. Prerequisite: 526.

PSN 529 Practicum in Group Treatment (2-6) SpS Supervised experience working as primary therapist or cotherapist in a group. Opportunity is provided to practice selected therapeutic techniques in therapy groups. Supervision is provided by nursing faculty member. Offered on credit/no credit basis only. Prerequisites: 513 or equivalent, which may be taken concurrently, and permission of departmental adviser.

PSN 550 Interpersonal Aspects of Behavior (3) A Selected theories in relation to psychosocial development and adaptation across life span for individuals, families, and small groups and as explanatory models of major psychosocial disabilities. General and psychosocial nursing models evaluated for heuristic value for research and practice. Prerequisite: graduate standing in nursing or permission of instructor.

PSN 551 Biologic Aspects of Psychosocial Disabilities (3) A Analysis of biological processes influencing psychosocial behavior in response to internal and external stimuli. Research and theory of neuroendocrine mechanisms in psychosocial disabilities. Analysis of nursing management and evaluation of biopsychosocial modalities used in modification of behavior. Prerequisite: graduate standing in nursing or permission of instructor.

PSN 552 Socioecological Dimensions of Community Mental Health (3) W Socioecological and sociocultural theories of mental health disabilities analyzed. Conceptual trends and intervention strategies evaluated with community and client-centered emphasis on mental health service delivery to high-risk and underserved populations, including the moderately and severely mentally disabled. Prerequisite: graduate standing in nursing or permission of instructor.

PSN 553 Assessment in Psychosocial Nursing (3) W Concepts, methods, and clinical approaches to psychosocial nursing assessment. Basic principles of measurement as they apply to psychosocial nursing assessment diagnosis and intervention. Knowledge synthesized from psychosocial nursing and allied disciplines tested. Clinical assessment laboratory included. Prerequisite: graduate standing in nursing or permission of instructor.

PSN 554 Clinical Therapeutics Theory (3) Sp Introduces conceptual foundation for clinical practice in psychosocial nursing with moderate to severe mentally disabled. Opportunities to synthesize selected theories and research contributions to generic psychosocial nursing interventions. Offered on credit/no credit basis only. Prerequisites: 550, 551, 553, or permission of instructor, concurrently with 555.

PSN 555 Advanced Clinical Therapeutics Seminar (4) Sp Opportunities to test and evaluate selected theories presented in 554. Faculty and preceptor supervision in clinical agencies guide students' therapeutic skills in working with individuals, groups, and families. Collaborative interactions with interdisciplinary team members. Prerequisite: concurrent registration in 554.

PSN 556 Theories of Substance Use Disorders: Psychosocial and Biological Aspects (3) W Psychosocial and pathophysiological aspects of substance use examined for their effects on individuals and families throughout life span. Theories and empirical findings serve as basis for evaluating preventive and therapeutic nursing approaches to substance use disorders, including those related to target populations. Prerequisite: basic course in biological sciences.

PSN 557 Clinical Seminar in Substance Use Disorders I (4) Treatment of individuals and families with substance use-related disorders. Students function as primary or cotherapists in application and evaluation of selected therapeutic interventions. Weekly seminars analyze student/client interactions. Offered on credit/no credit basis only. Prerequisite: prior or concurrent registration in 556.

PSN 558 Advanced Clinical Seminar in Substance Use Disorders II (4) A Practicum with opportunities for advancement of skills in therapeutic interventions and involvement in community-linked substance-use-disorder issues. Students engage in therapeutic interventions, coordinate community health-care resources, and design a prevention program for target populations within context of regional laws and policies. Prerequisite: 557.

PSN 559 Theories of Psychiatric Disabilities (3) W Theories from psychosocial nursing, psychiatry, and behavioral sciences explanatory of psychiatric disabilities provide basis for identifying psychosocial problems and developing nursing diagnosis and interventions. Structure and functions of mental health organizations and social networks analyzed for more effective system management by nurses. Prerequisites: 500 and 551 or permission of instructor.

PSN 560 Clinical Seminar in Psychiatric Disabilities I: Community (4) S Supervised psychosocial nursing experience with clients in psychiatric treatment programs. Treatment settings, such as community mental health centers, partial hospitalization, and congregate care facilities viewed as social systems. Weekly seminars provide analysis of client/student interaction. Prerequisite: prior or concurrent registration in 559, or permission of instructor.

PSN 561 Advanced Clinical Seminar in Psychiatric Disabilities II: Institutions (4) A Mental hospital and psychiatric unit viewed as social systems. Clinical practice in institutional setting focuses on planning and evaluating psychosocial nursing care programs. Effects of organizational dynamics on client populations analyzed and intervention theories tested. Analyzes client/student interaction. Prerequisite: prior or concurrent registration in 559, or permission of instructor.

PSN 562 Theoretical Basis of Management of Stress Response (3) W Theories of physiologic responses linked to theories of cognitive/affective and behavioral responses to stressors. Conceptual basis of self-management techniques. Research findings relevant to these theories and techniques examined and analyzed. Prerequisites: course in human physiology or physiologic psychology, permission of instructor.

PSN 563 Clinical Seminar in Management of Stress Response I (4) S Theory and application of self-management training for dysfunctional stress responses. Demonstration/training in relaxation, biofeedback instrumentation, and supervision of self-management program conducted by students. Prerequisites: 562, human physiology course.

PSN 564 Advanced Clinical Seminar in Management of Stress Response II (4) A Supervised field experience in self-management techniques for clients with dysfunctional stress responses such as headache and hypertension. Supervised clinical application of biofeedback and stress counseling for selected psychophysiological disorders. Prerequisite: 563 or permission of instructor.

PSN 565 Self-Management Strategies and Techniques in Patient Care (3) ASp Theories underlying cognitive/behavioral self-management strategies and techniques in patient care. Evaluation of the clinical appropriateness and utility for nursing. Application to such clinical problems as abstinence in the recovering alcoholic, depression, and eating disorders. Prerequisite: graduate standing or permission of faculty.

PSN 569 Consultation in Human Service Systems (3) S Exploration of theoretical perspectives and concepts relevant to consultation in human service systems. Models for intervention evaluated. Students design consultation projects, implementation determined through negotiation with faculty and agency representatives. Prerequisites: fourth-quarter placement or faculty permission; access to consultee system.

PSN 600 Independent Study or Research (*) Offered on credit/no credit basis only.

PSN 700 Master's Thesis (*) Offered on credit/no credit basis only.

Nursing Science

NURS 580 Theory Building in Nursing I (3) Sp Exploration and analysis of nursing theory, types, techniques of construction, problems in evaluation and testing, and implications for nursing science. Prerequisite: permission of instructor.

NURS 581 Theory Building in Nursing II (3) S Continuation of 580 with emphasis on evaluation of existing nursing theories, student construction and presentation of a theory for nursing, and critiques of the students' theories. Prerequisite: 580.

NURS 582 Environments, Supporting and Non-supporting (3) A Analysis and study of environments as complex multidimensional systems that support or do not support human health. Emphasis on the influence of different conceptualizations of human-environmental interactions. Prerequisites: graduate standing, a minimum of 5 credits of basic nursing research methodology at graduate level and permission of instructor.

NURS 584 Clinical Therapeutics: Physical (3) S Analysis and study of current theories and knowledge regarding physical therapeutic measures and nursing interventions that promote, maintain, or restore health status for humans throughout the life span. Prerequisites: graduate standing and a minimum of 5 credits of basic nursing research methodology at graduate level and permission of instructor.

NURS 585 Individual Adaptations to Wellness and Illness (3) W Survey and analysis of current theory and research in health and illness awareness, in health-seeking and -maintaining behaviors, and in coping responses to illness and disability. Prerequisites: graduate standing and a minimum of 5 credits of basic nursing research methodology at graduate level and permission of instructor.

NURS 586 Family Adaptations to Wellness and Illness (3) W Current theory and research in family functioning in health and illness. Family developmental tasks, separation, divorce, major and minor disabilities, social cultural processes, and other events that strengthen or weaken the family. Prerequisites: graduate standing and a minimum of 5 credits of basic nursing research methodology at graduate level and permission of instructor.

NURS 587 Clinical Therapeutics: Interpersonal (3) Sp Analysis of care/cure orientations in patient care and their impacts on nursing intervention programs. Dynamics of change, interpersonal aspects of planned change, and measurement of clinical outcomes. Prerequisites: minimum of 5 credits of basic nursing research methodology at graduate level and permission of instructor.

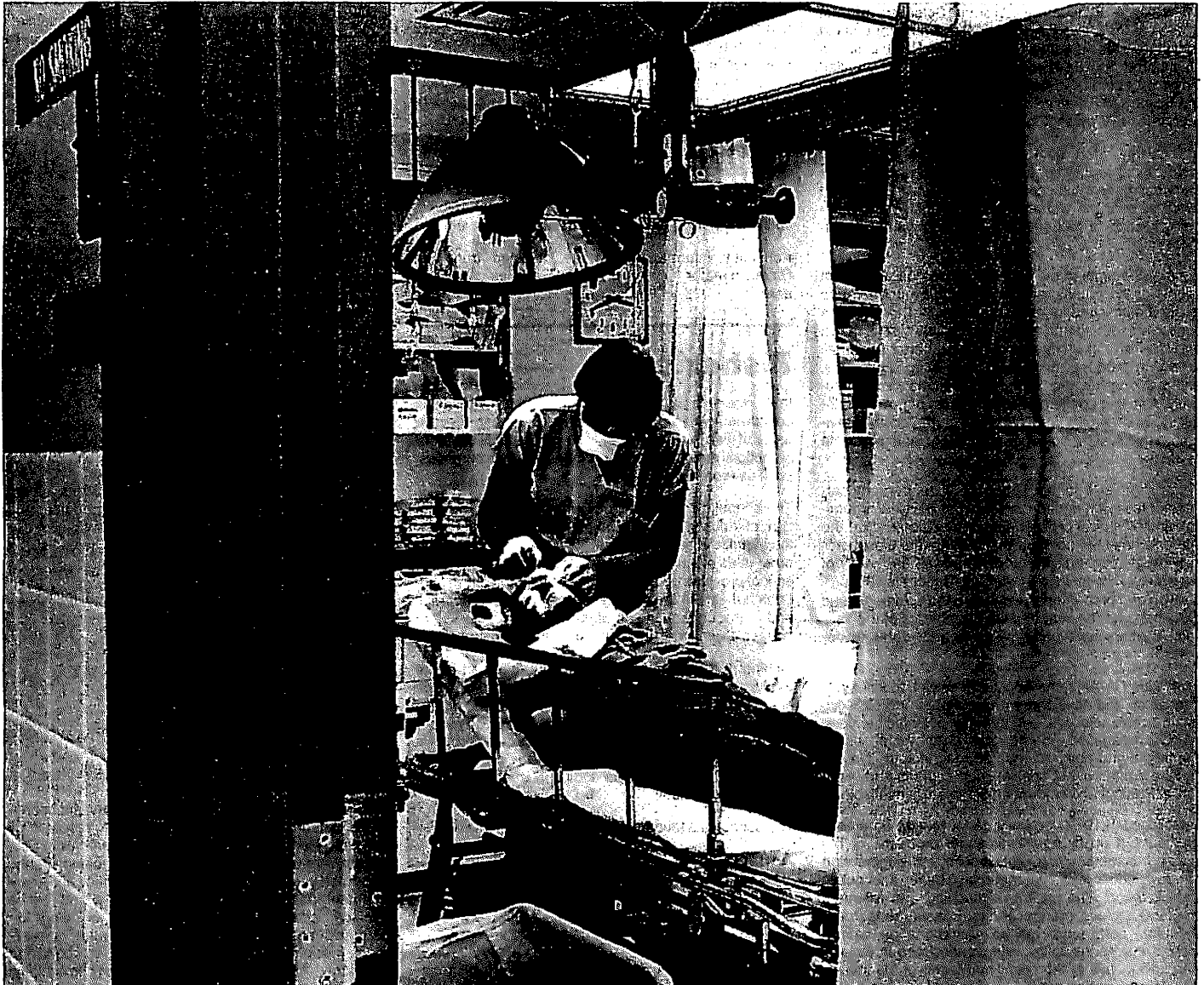
NURS 588-589 Advanced Problems in Nursing Research (3-3) W,Sp Examination of alternative methodological decisions for their direct and indirect consequences at different points in nursing research process. Prerequisites: inferential statistics; minimum of 5 credits of basic nursing research methodology at graduate level and permission of instructor.

NURS 590 Special Topics in Nursing Research (2-3, max. 9) AWSpS Examination of a specific research method, with evaluation of appropriateness, efficiency, rigor of measurement, and potential for inference for nursing research. Prerequisites: minimum of 5 credits of basic nursing research methodology at graduate level and permission of instructor.

NURS 591 Advanced Seminar in Nursing Science (3, max. 15) AWSpS In-depth analysis and evaluation of literature in focused areas of research. Synthesis of literature related to selected fields of nursing science. Oral analysis of assigned papers and topics. Prerequisite: graduate standing or permission of instructor.

NURS 599 Selected Readings in Nursing Sciences (1-3, max. 18) Analysis of synthesis of selected readings with faculty mentor. Prerequisite: permission of instructor.

NURS 800 Doctoral Dissertation (*) AWSpS Offered on credit/no credit basis only. Prerequisite: permission of Supervisory Committee chairperson or graduate program adviser.



College of Ocean and Fishery Sciences

Dean

G. Ross Heath
557 Henderson

Associate Dean

Marsha L. Landolt

The marine environment has been a dominant factor in the history of the Pacific Northwest from the time of the first Indian settlements to the modern day of container ships and waterfront condominiums. It is not surprising, therefore, that the University has a long tradition of commitment to teaching, research, and public service in the marine and freshwater area.

The College of Ocean and Fishery Sciences, newest college at the University, comprises five major units in the marine and freshwater sciences. Established in September 1981, the college consists of the Applied Physics Laboratory, Institute for Marine Studies, and the Schools of Fisheries and Oceanography. It also administers the Washington Sea Grant Program.

The college offers both undergraduate and graduate instructional programs; its faculty, staff, and students carry out research in oceans and freshwater lakes and rivers all over the world. Facilities range from ocean-going vessels to well-equipped laboratories and classrooms.

Each of the units in the college focuses on a different aspect of the aquatic environment, but much overlap exists. Established in 1919, the School of Fisheries is concerned with searching for ways to use stocks of fish and shellfish more effectively, making better use of all waters to produce more food from living organisms, and culturing aquatic plants and animals more effectively. It is also concerned with impacts of pollution, industry, and human population pressures on the environment. It offers both undergraduate and graduate degrees.

Established in 1930, the School of Oceanography carries out research and teaching on the physical, chemical, and biological processes in the ocean and on the interactions of the ocean with the earth, the biosphere, and the atmosphere. It is concerned with the study of seawater in motion, life in the sea, the chemical composition and properties of seawater, the sediments and rocks beneath the sea, and the geophysics of the seafloor. It offers both undergraduate and graduate degrees.

Established in 1943, the Applied Physics Laboratory, is a research and development unit with strong capabilities in ocean sciences, engineering, acoustic sensors, sound propagation, marine and geophysical instrumentation, and polar science and technology. No degrees are offered, but special short courses and seminars are taught and student employment is available.

Established in 1972, the Institute for Marine Studies is interested in policy and institutional problems of the ocean. It combines natural sciences and engineering with law, economics, international affairs, and public administration. The institute's teaching and research programs include marine affairs, coastal zone management, ports and marine transportation, atmospheric and marine policy, living marine resources, and international law of the sea. The Master of Marine Affairs degree is offered.

Also part of the college is the Washington Sea Grant Program, established in 1969. Congress created the Sea Grant program to enhance the wise use and protection of the nation's marine resources through coordinated efforts in education, training, research, development, and advisory services. Although the Sea Grant program does not offer degrees, it presents workshops, short courses, lectures, and publications, and supports research and advisory services.

One of the major achievements in this area was the designation of the University in 1971 by the U.S. Secretary of Commerce as a Sea Grant College. Along with the University of Rhode Island, Texas A&M University, and Oregon State University, the University of Washington was one of the first four universities so designated in recognition of outstanding sustained programs in research, education, and advisory services in the marine area.

In 1987, the college had a total of 156 undergraduate and 317 graduate students enrolled, a faculty of 153 members, and a budget of \$32 million, making it one of the largest institutions of its kind in the nation.

Office of Student Services

Through the Office of Student Services, the College of Ocean and Fishery Sciences assists students in obtaining internships, cooperative education work experience, and permanent employment. Students are encouraged to participate in field placements that provide not only needed income but also the valuable practical experience to bridge the transition from the classroom and the laboratory to employment after graduation.

Local and national job listings and a career information library are continually updated. The director of student services is available to work with students and alumni in career development, including job search strategies, such as writing of résumés and design of cover letters.

Additional information may be obtained from Pat Caver, director, Office of Student Services, 561 Henderson.

Fisheries

In its research and training, the School of Fisheries is concerned with the investigation of the most effective uses of fish and shellfish, both in products for consumption, especially as food, and for other purposes, such as recreation.

The school also is concerned with the impact of pollution, of industry, and of human population pressure on the aquatic environment as they affect fisheries and other uses of our waters. In general, the program of the school provides opportunity for training, not only in fisheries but also in the management of natural resources and in the understanding of the biological activities of aquatic organisms and use of the aquatic environment.

Fishing and fish products are an important part of the total food industry. The school's Institute for Food Science and Technology offers undergraduate and graduate curricula to train food scientists for industry, government, and academia. The undergraduate program provides a broad coverage of all phases of food technology while offering some additional specialization in fisheries technology.

The school has four major teaching divisions:

Aquaculture

Chairperson

Kenneth K. Chew
211 Fisheries

This unit provides training in finfish and shellfish culture, disease and pathology, toxicology, nutrition, and

biochemistry and physiology of fish and shellfish, as well as training in basic biology and resource management of commercially important invertebrate species.

Quantitative Science in Fisheries

Chairperson

E. David Ford
301 Center for Quantitative Science

The Center for Quantitative Science in Forestry, Fisheries, and Wildlife is an intercollege academic unit sponsored by the College of Forest Resources and the School of Fisheries in the College of Ocean and Fishery Sciences. The center offers a comprehensive program of study in mathematics and statistical methods applied to problems in ecology and natural resources management. The faculty of the center includes members of the College of Forest Resources or the School of Fisheries faculties, and most are also members of the Department of Biostatistics in the School of Public Health and Community Medicine. Students may enroll for study at the center through one of these programs.

The center has strong interests in fisheries population dynamics, assessment of water quality and pollution, management of fisheries populations, water resources, and techniques for estimating animal populations. Well equipped with computers for research and graduate instruction, the center offers a consulting service to graduate students in biology and ecology.

Food Science and Technology

Chairperson

John Liston
209 Marine Studies
3707 Brooklyn Avenue Northeast

The program provides general courses and those courses necessary for the food science major and the fish industry option, including courses in food technology, food microbiology, food chemistry, food engineering, fish technology, and nutrition.

Fisheries Science and Management Division

Director

Bruce S. Miller
486 Fisheries

The Division of Fisheries Science and Management coordinates the teaching of all undergraduate and graduate courses in fisheries. The division is administered through the Fisheries Research Institute of the school.

Research Programs

Fisheries Research Institute

Director

Robert C. Francis
260 Fisheries

The Fisheries Research Institute conducts and coordinates fisheries science and management research by the faculty and staff and graduate students within the school. Areas of research emphasis include marine and freshwater fisheries stock assessment and management, pollution; freshwater, estuarine, and marine ecology; riparian zone management, including forestry-fisheries interactions; direct resource assessment, including hydroacoustic methods; fish behavior; taxonomy; fish physiology; biochemistry; toxicology; nutrition; and disease.

Washington Cooperative Fish and Wildlife Research Unit

Leader

Gilbert B. Pauley
220 Fisheries

The Washington Cooperative Fish and Wildlife Research Unit, supported by the U.S. Department of Interior through the Fish and Wildlife Service and by the Washington State Departments of Fisheries and Wildlife, conducts research and teaching and participates in advanced degree programs primarily related to inland fisheries management.

Institute for Food Science and Technology

Director

John Liston
203 Marine Studies
3707 Brooklyn Avenue Northeast

The Institute conducts research on food composition, food safety, food processing, nutrition, and related food science topics. Cooperative programs with industry are emphasized.

Related Programs

School of Fisheries programs benefit from the presence in Seattle of a regional office and laboratories of the National Marine Fisheries Service, the Washington State Department of Fisheries, the Washington State Department of Wildlife, and laboratories of the U.S. Fish and Wildlife Service. The headquarters and research staff of the International Pacific Halibut Commission are located on the campus as well. Relationships also have been established between the school and the Seattle Aquarium, and between the school and various other public and private agencies and institutions. Members of various public and private organizations in the Puget Sound area, and in some cases, from other parts of the United States and Canada, serve as affiliate faculty members in the school.

School Facilities and Services

The Fisheries Center on the Lake Washington Ship Canal contains classrooms, laboratories, and support facilities. The Fisheries-Oceanography Library, a branch library offering research materials in fisheries, food science, oceanography, and wildlife science, is located in the Oceanography Teaching Building nearby. The collections of fishes and invertebrates now total some 225,000 specimens, representing more than 3,200 species in 237 families.

An annual run of several thousand salmon has been developed and is maintained at the school by the release of thousands of fingerlings each spring. Returning adults utilize a fish ladder to enter the school's experimental fish hatchery. The run is the basis for both instruction and research on the life cycle of Pacific salmon. A secondary hatchery at Seward Park allows for additional projects, such as a newly developing sportfish propagation program. The school also maintains a saltwater aquarium.

Other laboratories provide for the study of the physiology, biochemistry, and behavior of fish and of the effects of pollutants on fish. Physiological facilities include equipment for surgical procedures and biochemical analysis of body fluids and tissues from both freshwater and marine fish.

The School of Fisheries and the Fisheries Research Institute maintain an extensive library of computer programs for processing biological data. The Fisheries Analysis Center of the school provides service in programming, data entry, and assistance with the use of the computer; the school maintains video display terminals to provide ready access to the larger computers of University Computing Services and has an array of microcomputers for instructional and research use.

The school uses various small vessels for instructional and research work, including tow netting, purse seining, bottom grabs, and trawling to depths of a hundred fathoms. These vessels are used in regular courses or training cruises to introduce students to shipboard operations. The one-hundred foot R/V *Alaska* is operated by the school.

Fisheries field stations at Big Beef Creek on Hood Canal provide additional opportunities for class field studies and research in stream and estuarine ecology. Other field activities are carried on at stations in both Washington and Alaska.

Food science facilities, located in the Marine Studies Building, include separate well-equipped laboratories for food microbiology, food biochemistry, and food analysis. The food-processing and -engineering laboratory pilot plant complex comprises several separate facilities containing equipment for teaching and experimental work in applied areas of unit operations and processing.

Fisheries Club

Students formed the Fisheries Club in 1922. Since its beginning, the club has been a center of extracurricular social and educational activities.

Food Science Club

Organized and run by food science majors in the school, this club promotes interest in food science and technology. It works closely with the Puget Sound section of the Institute of Food Technologists.

Financial Aid

The school offers very limited financial assistance to undergraduates and graduates through industrial and private scholarships. The *Handbook of Scholarships*, available from the Office of Financial Aid, 105 Schmitz, lists other available scholarships.

Employment

The College of Ocean and Fisheries Sciences' Office of Student Services maintains a file of permanent and summer job opportunities for its students. Both summer and part-time employment during the scholastic year are frequently available with the research organizations that are associated with the School of Fisheries on or near the campus and elsewhere in the Pacific Northwest. The Fisheries Research Institute normally hires students for summer work in the field and usually has several part-time positions available during the school year. Similar work is available in the Washington State Department of Wildlife, Washington State Department of Fisheries, National Marine Fisheries Service, U.S. Fish and Wildlife Service, International Pacific Halibut Commission, International Pacific Salmon Fisheries Commission, and Alaska Department of Fisheries. Most of these agencies have offices in Seattle and are readily accessible to students. These jobs may be located within the state of Washington but also may take students to Alaska or elsewhere in the United States. Fisheries students are encouraged to seek such positions or other work in the field to gain valuable experience in both fishery biology and fisheries or food technology.

Undergraduate Program

Note: the undergraduate program is currently under review, and there may be substantial changes in the 1988-89 academic year. The School of Fisheries, 204 Fisheries, 543-4270, may be contacted for a current bulletin.

The school offers three degree programs: Bachelor of Science in fisheries, Bachelor of Science with a major in fisheries, and Bachelor of Science with a major in food science.

High School Preparation

Although the school does not have specific high school requirements other than those of the University, students are urged to take four years of college preparatory mathematics (usually including precalculus or mathematical analysis), because these are prerequisites for the mathematics courses included in all School of Fisheries curricula. Taking high school courses in chemistry, physics, and biology and training in computer use will prove to be valuable to the fisheries student.

Admission as a Fisheries Major

Students who wish to major in fisheries need only be students in good standing in the University and declare a major following University-wide guidelines.

Advising

After notification of admission and before registration, new students should visit or write to the School of Fisheries for help in planning their course programs. Academic and other counseling of fisheries students is given by faculty advisers in the School of Fisheries.

Graduation Requirements

Transfer students who do not include two units of foreign language in their college preparatory programs are required to achieve equivalent competence in a foreign language as a graduation requirement. This requirement may be fulfilled by successful completion in the University of 10 credits of a foreign language or by passing an appropriate placement examination.

At least 60 of the 180 academic credits required for graduation in fisheries or food science must be in upper-division courses (numbered 300 and above). Advanced ROTC courses do not count toward upper-division credit, and no more than 18 credits in advanced ROTC courses may be counted toward graduation. Additional graduation requirements associated with specific degrees are the following:

A total of 25 credits may be taken satisfactory/not satisfactory, and none are credited for any course required as part of a major. Any credit/no credit courses presented at the time of transfer into the School of Fisheries will reduce the number of satisfactory/not satisfactory credits that may be taken.

To graduate, students in fisheries must have at least a 2.00 cumulative grade-point average in fisheries courses, including core courses where applicable; students in food science must have at least a 2.00 cumulative grade-point average in food science courses. The University requires at least a 2.00 cumulative grade-point average in all courses taken at the University.

Fishery Science

Advisers

George W. Brown, Jr.
Fred Johnson
Charlene Martinsen
John Skalski

204 Fisheries Center

Core Curriculum

A baccalaureate degree requires completion of a common core curriculum.

The University-wide graduation requirements can be met conveniently in the following manner. The general education requirements (30 credits) are fulfilled by at least 15 credits in natural science (12-15 in a linked sequence in either biology, chemistry, or physics), a linked sequence in social science (6 credits minimum, although the recommended courses total 10 credits), and humanities (6 credits minimum, although the recommended courses total 10 credits). Students should note that a combined total of 15 credits must be taken in social sciences and humanities.

Mathematics Proficiency: This is met in the mathematics and statistics requirement.

Writing Proficiency: (8 credits minimum) ENGL 271 (5) and two W courses or an additional writing course such as ENGR 130, 331, STC 408 or 409. Note that ENGL 271 is included in the humanities.

Natural Science: (42 credits minimum, including linked sequences in biology, chemistry, and physics) Biology, general—BIOL 210, 211, 212 (BIOL 101-102, and BOT 113 or 220 may also be accepted, Chemistry, general—CHEM 140, 150, 151. Chemistry, organic—CHEM 102, or 231, 232; PHYS 114, 115, 116. Botany and physics are not required for fish industry curriculum.

Mathematics and Statistics: (13 credits minimum beyond MATH 105) Mathematics—Q SCI 291, 292; or MATH 124, 125; Q SCI 381.

Environmental Sciences: (10 credits minimum for the normal program) BIOL 472 (Ecology) and 473 (Limnology); BIOL 474, 475 (laboratories for ecology, limnology) or OCEAN 101 or OCEAN 200. The fish industry curriculum requires only BIOL 472 and OCEAN 101 or OCEAN 200.

Fishery Sciences: (35 credits) FISH 101, 311, 314, 340, 395, 401; Q SCI 482, 483; Q SCI 482 and 483 are not required for fish industry curriculum. ECON 200 can be linked with ECON 210.

Social Sciences: (6 credits minimum) The following courses are recommended: ECON 200 (5) and 435 (5) (linked), or a linked sequence in the UW social sciences list.

Humanities: (6 credits minimum) ENGL 271 (5) and SPCH 220 (5), or 6 credits from the UW humanities list if the 5-credit writing course requirement is satisfied in another manner (see above).

The School of Fisheries has three degree programs:

Bachelor of Science in Fisheries

This has a common core of courses and advanced course material in the options of either aquaculture, environment, or management. In addition to the core curriculum, student must select 30 credits from one of the following three sets:

1. **Aquaculture:** FISH 352, 444, 452, 454 (3, 3, 3, 3). Select additional courses for a minimum of 30 credits. Courses are listed by interest area; students may select from them. Invertebrate: FISH 405, 406, 407, 408, 459, and 499B (5, 5, 3, 3, 5, 6 max.). Salmonids: FISH 415, 416, 450, 451, 453, 455, 460, 462, 499B (3, 2, 3, 3, 4, 2, 4, 5, 1-3). Warm water: FISH 455, 459, 461, 462, 499 (2, 5, 3, 5, 1-3).

2. **Management:** FISH 379, 425, 463, Q SCI 456, FISH/Q SCI 457, and FISH/Q SCI 458 or Q SCI/STAT 480 (3, 5, 5, 4, 4, 4 or 3) and select additional courses for a minimum of 30 credits from FISH 405, 406, 450, 451, 475, 476, Q SCI/STAT 486 (5, 5, 3, 3, 3, 2, 3). Either FISH/Q SCI 458 or Q SCI/STAT 480 (4, 3) may be taken if not taken as part of the management core.

3. **Environment:** Two of the following three courses including at least one laboratory: FISH/CEWA 430/431 (3/2), 434 (3 or 5) and 435 (3); FISH 459 (5) and FISH 352 (3), or BIOC 405 and 406 (3, 3). Select additional courses for a minimum of 30 credits from FISH 456, 460, 467, 472, 475, 476, 477, 478 (5, 4, 5, 3, 3, 2, 3, 2), ENV S (maximum 6 upper-division credits), CHEM 241, 242 (3, 3), CEWA 456, 457 (3, 3).

Additional courses should be taken for a minimum of 180 credits.

Bachelor of Science Degree With a Major in Fisheries

This is termed the fish industry program. It has a modified core program and special advanced courses in the fields of food science, business, marketing, and accounting.

The University-wide graduation requirements can be met conveniently in the following manner: The general education requirements (30 credits) are met by at least 15 credits in natural science (10 credits in a linked sequence in either biology or chemistry), a linked sequence in social science (the required courses total 10 credits), and humanities (6 credits minimum, although the recommended courses total 10 credits). Students should note that a combined total of 15 credits must be taken in social sciences and humanities.

Mathematics Proficiency: This is met in the mathematics and statistics requirement.

Writing Proficiency: (8 credits minimum) ENGL 271 (5) and 2 W courses or an additional writing course such as ENGR 130, 331, STC 408 or 409. Note that ENGL 271 is included in the humanities.

Natural Sciences: (25 minimum) BIOL (10 credits) 210, and 211 or 212; or BIOL 101-102 (5-5). CHEM 140, 150, 151 (4, 4, 2).

Mathematics and Statistics: (13 credits minimum beyond MATH 105) same as for B.S. in Fisheries.

Environmental Sciences: (8 credits minimum) BIOL 472 (4), and OCEAN 101 or 200 (5 or 3).

Fishery Science: (25 credits minimum) FISH 101, 311, 314, 340, 395, 401 (5, 4, 3, 5, 3, 5).

Social Sciences: (10 credits minimum) ECON 200, 435 (5, 5 linked) are recommended or a linked sequence from the College of Arts and Sciences social science list.

Humanities: (6 credits minimum) ENGL 271 (5) and SPCH 220 (5), or 6 credits from the UW humanities list, if the 5-credit writing course requirement is satisfied in another manner (see above).

Also Required: FISH 379, 467, 499 (3, 5, 3); FD SC 378, 380, 385, 481, 491, 498 (3, 3, 3, 4, 1, 3); ACCTG 210, 220, 230 (3, 3, 3); ECON 201 (5); MKTG 300 (4), O E 200 (5); FISH 450 and 451 (3, 3), or 405, or 406, or 425 (5 each).

Additional courses should be selected for a minimum of 180 credits. Students may find that this program is inadequate for admission to graduate school in the sciences unless additional courses are taken. Among those recommended for graduate schools are CHEM 231 and 232 (4, 3) instead of CHEM 102; CHEM 241 (3); BIOL 210, 211, and 212 (5, 5, 5) rather than BIOL 101-102, Q SCI 482 and 483 (5, 5), and PHYS 114, 115, 116 (4, 4, 4) as well as associated laboratories and BIOL 473 (3).

Food Science

Adviser

John Liston
209 Marine Studies
3707 Brooklyn Avenue Northeast

Bachelor of Science Degree With a Major in Food Science

The food science program provides a curriculum leading to a Bachelor of Science degree with a major in food science. It is recommended that the entering student will have completed mathematics, including advanced algebra and trigonometry, and laboratory science, including chemistry and physics.

Students are advised to meet the University graduation requirements as follows:

General Education Requirement: (30 credits): Select a total of 15 credits from social sciences and humanities with a minimum of 6 credits in each. Include a linked sequence of two or more sequential courses in social sciences. Use the College of Arts and Sciences listing as a guide in selecting these courses.* Identify 15 credits in natural sciences, including at least one linked sequence, such as PHYS 114, 115, 116; CHEM 140, 150, 151; BIOL 210, 211, 212. This requirement will normally be covered by the typical food science major program.

Mathematics Proficiency: This is met by the requirements for the degree.

Writing Proficiency: (8 credits minimum): Take ENGL 271* and ENGR 130 or 331 or STC 408 or 409.

* ENGL 271 may be used as part of the humanities requirement.

A student majoring in food science must complete the quarter credits in the basic subjects shown below:

General biology (zoology, botany, etc.) (10 credits); nutritional science (5); CHEM 140 (4), 150 (4), 151 (2), 160 (4), 231 (4), 232 (3), (or 235, 236), 241 (3), 242 (3), 321 (5); MATH 124 (5), 125 (5) (or Q SCI 291, 292); PHYS 114 (4), 115 (4), 116 (4); Q SCI 381 (5); ENGR 130 (5) and ENGR 331 (3) or STC 408 (3) or STC 409 (3); ENGL 271 (5); FISH 395 (3); BIOC 405 (3), 406 (3), 426 (3); MICRO 301 (3), 302 (2); ENVH 440 (4) or 441 (3); FD SC 350 (3), 380 (3); 385 (3), 481 (4), 482 (3), 483 (3), 484 (4), 485 (3), 486 (3), 498 (2-5), 395 (1), 491 (1), 492 (2), 493 (2), 494 (3), 495 (2), 496 (2).

Students who intend to proceed to graduate study should consult with an adviser about the substitution of more advanced level courses in certain areas for those listed in the outline. All courses listed on an approved alternative or equivalent must be taken.

A suggested sequence of courses for the four-year curriculum in food science is as follows:

First year: First quarter: CHEM 140 (4); MATH 124 (Q SCI 291 and 292 may be substituted) (5); electives (6). Second quarter: CHEM 150, 151 (4, 2); MATH 125 (Q SCI 291 and 292 may be substituted) (5); electives (4). Third quarter: CHEM 160 (4); electives (11).

Second year: First quarter: CHEM 231, 241 (4, 3); PHYS 114 (4); electives (5). Second quarter: CHEM 232, 242 (3, 3); PHYS 115 (4); ENGR 130 and 331 (school requirement; strongly recommended; STC 408 and 409 may be substituted) (3 or 5); elective (1). Third quarter: CHEM 321 (5); Q SCI 381 (5); PHYS 116 (4); elective (1).

Third year: First quarter: MICRO 301, 302 (3, 2); ENVH 440 (ENVH 441 may be substituted) (4); FD SC 350 (3); electives (3). Second quarter: FD SC 380, 385, 395 (3, 3, 1); BIOC 405 (3), 426 (3); electives (2). Third quarter: BIOC 406 (3); FD SC 481, 491 (4, 1); electives (7).

Fourth year: First quarter: FD SC 482, 484, 492, 494, 498 (3, 4, 2, 3, 2); FISH 395 (school requirement) (3). Second quarter: FD SC 483, 493, 485, 495, 498 (3, 2, 3, 2, 2); electives (3). Third quarter: FD SC 486, 496, 498 (3, 2, 2); electives (8).

Electives should include 10 credits of biology and 5 credits of nutritional science. Students who intend to proceed to graduate study should consult with an adviser about the substitution of more advanced level courses in certain areas for those listed in the outline. All courses listed or an approved alternative or equivalent must be taken.

Graduate Program

Lynwood S. Smith
Graduate Program Coordinator

The school is currently reviewing the graduate program curriculum and degree requirements. There may be changes beginning in the 1988-89 academic year. The school may be contacted for a current bulletin.

The school offers programs leading to the Master of Science and Doctor of Philosophy degrees in fisheries and food science.

The time required is normally two years for an M.S. degree and two to three additional years for a Ph.D. degree. Students intending to pursue a Ph.D. degree normally complete a master's degree program and are reviewed by an academic standards committee before continuing.

Areas of study within fishery science include fish physiology, fish taxonomy, population dynamics, management of freshwater and marine fisheries, ecology and life history of fishes, invertebrate fisheries, diseases of fish and shellfish, aquaculture, fish genetics, hydroacoustics, biological impact studies, molecular biology, and water-quality studies. In food science, students may specialize in the chemistry, microbiology, or biochemistry of foods and in advanced study of food processing methods.

An active research program within the school provides support for many graduate students and enhances the opportunities for accomplishing significant thesis and dissertation research. The school has four major divisions: Aquaculture, Quantitative Science in Fisheries, Food Science and Technology, and Fisheries Science and Management, which are in addition to the Fisheries Research Institute.

Admission Requirements

Basic requirements for admission to the graduate program are a baccalaureate degree from an institution of recognized standing, a grade-point average of 3.00 in the junior and senior years of college work, and approval of the School of Fisheries and of the Graduate School. Applicants must also take the Graduate Record Examination (general only) and submit the score with the application to the Graduate School. Preference will be given those with a strong background in the basic sciences. A student admitted with a baccalaureate degree is accepted initially for a Master of Science degree program. Applications for admission are accepted only for Autumn Quarter, for which the deadline is February 1.

Financial Aid

General information on graduate student support is available from the Office of Financial Aid, 105 Schmitz. Scholarships, fellowships, and teaching and research assistantships are available from a wide variety of sources for qualified graduate students. Most student support comes from research grants and contracts under the direction of individual professors. Graduate applicants are, therefore, urged to discuss their financial needs with professors in their potential major fields and with the graduate program coordinator during the early stages of the graduate admission application process.

Correspondence and Information

A package of materials describing courses, listing more specific procedures for applying for graduate admission, and giving details of faculty research and activities is available from Graduate Program Assistant, 204 Fisheries, WH-10; (206) 543-4270.

Faculty

Director

Robert R. Stickney

Professors

Alverson, Dayton L.,* 1958, (Affiliate), (Marine Studies),† Ph.D., 1967, Washington; marine affairs.

Bell, Earl J.,* 1966, ‡(Urban Design and Planning), Ph.D., 1965, California (Berkeley); application of research methods to urban and regional planning, mathematical programming models.

Bell, Milo C.,* 1940, (Emeritus), B.S.M.E., 1930, Washington; hydrology and fish guidance.

Bevan, Donald E., 1959, (Emeritus), Ph.D., 1959, Washington; biometrics.

Brannon, Ernest L.,* 1973, Ph.D., 1972, Washington; aquaculture and fish behavior.

Brown, George W., Jr.,* 1967, M.A., 1951, Ph.D., 1955, California (Berkeley); fish biochemistry and biochemical ecology.

Burgner, Robert L.,* 1956, (Emeritus), Ph.D., 1958, Washington; salmon ecology and salmon biology.

Chapman, Douglas G.,* 1949, (Emeritus), M.A., 1940, Ph.D., 1949, California (Berkeley); population dynamics and enumeration.

Chew, Kenneth K.,* 1962, M.S., 1958, Ph.D., 1962, Washington; shellfish biology and aquaculture.

DeLacy, Allan C., 1950, (Emeritus), Ph.D., 1941, Washington; marine fish ecology, biology.

Dickhoff, Walton W.,* 1975, (Research), Ph.D., 1976, California (Berkeley); fisheries.

Donaldson, Lauren R., 1948, (Emeritus), Ph.D., 1939, Washington; freshwater fish biology.

Erickson, Albert W.,* 1974, (Research), M.S., 1955, Ph.D., 1964, Michigan State; wildlife biology and marine mammals.

Ford, E. David,* 1985, (Biostatistics, Statistics), (Forest Resources),† Ph.D., 1968, University College (London); analysis of ecological systems.

Francis, Robert C.,* 1980, (Marine Studies), M.S., 1966, Ph.D., 1970, Washington; ground fish and tuna ecology research and management, population dynamics of salmon.

Gallucci, Vincent F.,* 1972, (Biostatistics, Forest Resources), M.S., 1966, State University of New York (Buffalo); Ph.D., 1971, North Carolina State; biostatistics and population dynamics.

Halver, John E.,* 1958, M.S., 1948, Washington State; Ph.D., 1953, Washington; nutrition, biochemistry, toxicology.

Hilborn, Ray W.,* 1987, Ph.D., 1974, British Columbia; stock assessment, population dynamics, fisheries policy.

Landolt, Marsha L.,* 1975, (Pathology), M.S., 1970, Oklahoma; Ph.D., 1976, George Washington; fish and shellfish diseases.

Liston, John,* 1957, Ph.D., 1955, Aberdeen (Scotland); food science, marine microbiology.

Mar, Brian W.,* 1967, ‡(Civil Engineering, Environmental Studies, Fisheries), M.S., 1956, Ph.D., 1958, M.S.C.E., 1967, Washington; water resources management, environmental systems analysis, interdisciplinary research management.

Matches, Jack R.,* 1963, M.S., 1958, Oregon; Ph.D., 1963, Iowa State; microbiology, food science.

Mathews, Stephen B.,* 1969, M.A., 1962, California (Berkeley); Ph.D., 1967, Washington; quantitative fishery management.

Miller, Bruce S.,* 1971, M.S., 1965, Ph.D., 1969, Washington; life history and ecology of marine fishes.

Nakatani, Roy E.,* 1964, Ph.D., 1960, Washington; water pollution ecology.

Newell, William T.,* 1960, ‡(Fisheries, Management and Organization, Management Science), M.B.A., 1955, Denver; Ph.D., 1962, Texas; management sciences.

Pietsch, Theodore W.,* 1978, (Zoology), M.S., 1969, Ph.D., 1973, Southern California; ichthyology.

Pigott, George M.,* 1963, M.S., 1955, Ph.D., 1963, Washington; food engineering.

Rogers, Donald E.,* 1969, (Research), M.S., 1961, Ph.D., 1967, Washington; sockeye salmon research.

Royce, William F., 1958, (Emeritus), Ph.D., 1943, Cornell; applications of fisheries science.

Salo, Ernest O.,* 1965, (Emeritus), Ph.D., 1955, Washington; estuary problems.

Seymour, Allyn H., 1962, (Emeritus), Ph.D., 1956, Washington; radioecology.

Smith, Lynwood S.,* 1965, M.S., 1955, Ph.D., 1962, Washington; fish physiology.

Stickney, Robert R.,* 1985, M.A., 1968, Missouri; Ph.D., 1971, Florida State; aquaculture, biological oceanography.

Stober, Quentin J.,* 1969, (Research), M.S., 1962, Ph.D., 1968, Montana State; water pollution ecology and fisheries management.

Swartzman, Gordon L.,* 1973, (Research), M.S.E.E., 1965, Ph.D., 1969, Michigan; ecological modeling, quantitative natural resource management.

Taub, Frieda B.,* 1961, (Environmental Studies), M.S., 1957, Ph.D., 1959, Rutgers; ecology.

Thorne, Richard E.,* 1970, (Research), M.S., 1968, Ph.D., 1970, Washington; acoustic techniques of population estimation.

Whitney, Richard R.,* 1967, M.S., 1951, Utah; Ph.D., 1955, Iowa State; recreational fisheries.

Wissmar, Robert C.,* 1972, (Research), M.S., 1968, Ph.D., 1972, Idaho; ecology.

Wooster, Warren S.,* 1976, (Environmental Studies, Oceanography), (Marine Studies),† M.S., 1947, California Institute of Technology; Ph.D., 1953, California (San Diego); ocean circulation, effects on fish stock, ocean affairs.

Associate Professors

Anderson, James J.,* 1981, (Research), Ph.D., 1977, Washington; fisheries and oceanography.

Armstrong, David A.,* 1978, M.S., 1974, Oregon State; Ph.D., 1978, California (Davis); shellfish physiology.

Bledsoe, Lewis J.,* 1972, (Research), M.S., 1968, Ph.D., 1976, Colorado; systems ecology.

Conquest, Loveday L.,* 1978, (Biostatistics), M.S., 1972, Stanford; Ph.D., 1975, Washington; biological applications and statistics.

Gunderson, Donald R.,* 1978, (Marine Studies), M.S., 1966, Montana State; Ph.D., 1976, Washington; marine fisheries and stock assessment.

Hershberger, William K.,* 1970, M.S., 1965, Ph.D., 1968, Pennsylvania State; fish genetics.

Kocan, Richard M.,* 1978, (Research), (Pathology), M.S., 1965, Ph.D., 1967, Michigan State; aquatic toxicology.

Martinsen, Charlene S.,* 1969, M.S., 1966, Iowa State; Ph.D., 1974, Washington; sensory evaluation, food produce development, nutritional anthropology.

Nevissi, Ahmad Ed.,* 1973, (Research), (Environmental Health), M.S., 1966, Technische Hochschule (West Germany); Ph.D., 1973, Arkansas; radiochemistry.

Pauley, Gilbert B.,* 1974, M.S., 1965, Washington; Ph.D., 1971, California (Irvine); fish immunology, recreational fisheries.

Sibley, Thomas H.,* 1978, (Research), M.S., 1968, State University of New York (Buffalo); Ph.D., 1976, California (Davis); trace pollutants.

Skalski, John R.,* 1987, M.S., 1976, Oregon State; M.S., 1978, Ph.D., 1985, Cornell; population estimation, environmental sampling, effective assessment.

Assistant Professors

Dong, Faye,* 1984, (Research), M.S., 1973, Ph.D., 1976, California (Davis); nutrition.

Pikitch, Ellen K.,* 1987, M.S., 1982, Ph.D., 1983, Indiana; marine fisheries, population dynamics, fisheries management.

Quinn, Thomas P.,* 1986, M.S., 1978, Ph.D., 1981, Washington; fish behavior.

Rasco, Barbara A.,* 1984, Ph.D., 1983, Massachusetts; biochemistry.

Ribic, Christine A.,* 1985, (Research), M.S., 1980, M.S., 1983, Ph.D., 1984, Minnesota; statistical applications to ecology and marine mammal/bird population ecology.

Thomas, Gary L.,* 1979, (Research), M.S., 1973, San Diego State; Ph.D., 1978, Washington; marine acoustics.

Lecturer

Johnson, Frederick G., 1987, M.A., 1973, Stanford; Ph.D., 1979, Washington; marine biology, environmental impact.

Course Descriptions

Courses for Undergraduates

Fisheries

FISH 101 Introduction to Fisheries Science (5) ASpS *Johnson* Identification, distribution, and life histories of selected fish and shellfish; commercial and recreational fishing; utilization of fisheries products; problems faced in fisheries conservation and management.

FISH 311 Functional Anatomy of Fish and Shellfish (4) ASp *Pietsch* Functional capabilities and limitations of fish and shellfish as reflected in their anatomy, biology, and ecology. The laboratory portion of the course includes dissection of representative species of economically and ecologically important fish and shellfish. Laboratory fee may be required. Prerequisite: 10 credits in biological science.

FISH 314 Methods and Instruments for Fishery Investigations (3) A *Theory and practice of instrumentation and sampling in fisheries; shipboard experience with equipment, collecting and recording data from biological samples, and the physical environment. Laboratory fee may be required. Prerequisite: 5 credits in fisheries.*

FISH 340 Applications of Digital Computers to Biological Problems (5) WSp *Methods and procedures for processing biological and natural resource data by means of digital computers; interactive computing, file manipulation, problem analysis, elementary FORTRAN programming, use of data-base and statistical packages, interfacing of programs and software packages. Joint with Q SCI 340. May not be taken for credit if Q SCI 340 has been taken. Laboratory fee may be required. Prerequisite: Q SCI 381 or equivalent.*

FISH 352 Fundamentals in Fisheries Biochemistry (3) A *Brown* Occurrence and role of carbohydrates, lipids, proteins, amino acids, vitamins, nucleic acids, and other compounds in fishes and other aquatic organisms. Topics include respiration, digestion, absorption, growth, reproduction, excretion, body fluids, general metabolism, intermediary metabolism, energy metabolism, and detoxification. Emphasis on biochemistry as it relates to nutrition and fish. Credit not allowed if other biochemistry credits are used toward degree in fisheries. Prerequisites: organic chemistry and 10 credits in biological science.

FISH 387 Recreational Fisheries (4) Sp *Pauley, Thomas* History of recreational fishing; present trends in sport fishing and prediction of future trends; types and characteristics of recreational fisheries; value of recreational fisheries; habitat requirements; ecology and behavior that are important considerations in management; management philosophy and techniques. Recommended for majors and nonmajors. Field trips. Laboratory fee may be required. Prerequisite: 10 credits in biological science. (Offered irregularly.)

FISH 379 Fisheries of the World (3) A *Gunderson* Review of aquatic living resources; other resources of the sea; present and future of world's fisheries; estimation of potential harvest and problems of development; law of the sea and international arrangements for fisheries; status of the United States fishing industry; prospects of aquaculture.

FISH 395 Literature Search in Fisheries and Food Science (3) *Training in methods of searching fisheries and food science literature with emphasis on organizing and communicating the material. Prerequisite: 10 credits in fisheries or food science or permission of instructor.*

FISH 401 Ichthyology (5) ASp *Pietsch* Concepts of systematics and organic evolution as applied to current problems in the phylogeny of fishes; classification of fishes of the world by habitat; geographic distribution and ichthyogeography. Prerequisites: 10 credits in biological science and junior standing or above.

FISH 405 Economically Important Mollusca (5) Sp *Chew* Classifications, life histories, distribution, methods of cultivation, and economic importance of oysters, clams, scallops, abalones, cephalopods, and other mollusca. Prerequisite: 10 credits in biological science.

FISH 406 Economically Important Crustacea (5) W *Armstrong* Classifications, life histories, distribution, methods of capture, and economic importance of crabs, shrimps, lobsters, crayfish, and the smaller crustacea. Mandatory laboratory fee. Prerequisite: 10 credits in biological science.

FISH 407 Shellfish Hatchery Management Techniques (3) W *Chew* Through laboratory experience with resident aquaculture biologist, techniques for spawning bivalves and rearing their larvae are taught. Experience in maintaining support facilities for algal culture and in knowledge of seawater treatment and filtration. Basic reproductive physiology, history of oyster hatcheries, and state-of-the-art techniques. Guest lecturers discuss other shellfish hatchery culture methods. Prerequisites: 405 and permission of instructor.

FISH 408 Physiological Ecology of Shellfish (3) A *Armstrong* Relationship between the principal physical-chemical factors of aquatic habitats and physiological adaptations of invertebrates, primarily mollusca and crustacea. Ability to tolerate extremes in unstable environments and the synergistic impact of adverse conditions at the molecular and trophic levels are examined as contributory causes to poor recruitment, reduced productivity, shifts in energy allocations, use of marginal habitats, etc. Prerequisites: 352 and CHEM 102 or equivalents, or permission of instructor.

FISH 415 Principles of Fish Physiology (3) A *Smith* Survey of the functions of the organ systems of teleost fishes, emphasizing salmonids. Prerequisite: 10 credits in biological science.

FISH 416 Fish Physiology Laboratory (2) A *Smith* Exercises and projects in fish physiology. To be taken concurrently with or following 415.

FISH 425 Life History of Marine Fishes (5) W *Miller* Early life history (modes of reproduction, spawning, fecundity, egg and larva development, sampling eggs and larvae, ecology of eggs and larvae), aging, food habits, subpopulation identification, and migrations of marine fishes. Prerequisite: 401 or equivalent or permission of the instructor.

FISH 430 Biological Problems in Water Pollution (3) W *Taub* Ecological aspects of water pollution problems arising from processes such as electrical power production, oil utilization, pest control practices, and land management. Joint with CEWA 430. Prerequisite: senior standing in fisheries, civil engineering, or other science major, or permission of instructor.

FISH 431 Laboratory for Biological Problems in Water Pollution (2) W *Taub* Laboratory experiments and field visits relating to biological problems in water pollution. Laboratory fee may be required. Joint with CEWA 431.

FISH 434 Ecological Effects of Waste Water (3 or 5) ASp *Welch* Principles of aquatic ecology that relate to causes and effects of water quality problems in lakes and streams. Population growth kinetics, nutrient

cycling, eutrophication; acidification, oxygen/temperature requirements, and effects of various wastes on aquatic animals. Joint with CEWA 434. Prerequisite: senior or graduate standing in engineering or science.

FISH 435 Physiological Effects of Water Pollutants (3) Sp *Brown* Physiological effects of water pollutants on economically important or endangered fishes, especially with respect to wastewater. Types of industrial, urban, and agricultural entities that contribute wastes to natural waters. Joint with CEWA 435. Prerequisites: upper-division or graduate standing, organic chemistry, and some background in any of the following: general physiology, cell biology, biochemistry, chemical biology, sanitary engineering.

FISH 444 Fisheries Genetics (3) W *Hershberger* Survey of principles and practices in the field of genetics that can be applied to fisheries biology, with emphasis placed on the qualitative and quantitative aspects of variability in aquatic species, natural and artificial selection, and genetic analysis of fish populations. Prerequisite: GENET 360 or equivalent.

FISH 450 Salmonid Behavior and Life History (3) A *Brannon* Marine distribution, homing migration, and spawning behavior of adult salmon: incubation, emergence, migration, and residence of fry; fingerling distribution and residence with reference to species interaction and population evolution. Prerequisites: 401 and 15 credits in biology.

FISH 451 Reproduction of Salmonid Fishes (3) A *Brannon* Artificial spawning and incubation of salmon; embryology and development rates of different species; practical exposure to artificial spawning techniques, egg handling and care, alevin hatching and treatment. Prerequisites: 401 and 15 credits in biology.

FISH 452 Fish Nutrition (3) W *Halver* Basic nutritional requirements of fish in nature and artificial environment; nutritional diseases; quality evaluation. Prerequisites: 352 and 10 credits in biology.

FISH 453 Salmonid Culture and Enhancement (4) Sp *Brannon* Design of fish production facilities; methods of incubation, rearing, and handling of fish; problems encountered in hatchery water supplies. Management goals and strategy; assessment of production; stocking; impact on natural populations. Laboratory fee may be required. Prerequisites: 451, 452, or permission of instructor.

FISH 454 Communicable Diseases of Fishes (3) A *Landolt* Organisms causing diseases in fishes; prevention and known treatments of fish diseases. Prerequisites: 10 credits each in biology and chemistry.

FISH 455 Communicable Diseases of Fishes Laboratory (2) A *Landolt* Laboratories to study bacteria, viruses, and parasites that cause diseases of fishes and to study diagnostic techniques. Laboratory fee may be required. Prerequisite: permission of instructor.

FISH 456 Aquatic Entomology (5) Sp *Laboratory and field course dealing with the taxonomy, ecology, and life history of selected aquatic insects, with special reference to the impact of man on stream systems. Prerequisite: ZOOL 331 or permission of instructor. (Offered irregularly.)*

FISH 457 Management of Exploited Animal Populations I (4) W *Mathews* Equilibrium yield model; spawner-recruit models, management methods; use of catch-effort statistics in estimation and management, computer simulation in management decisions. Joint with Q SCI 457. Prerequisites: Q SCI 292, 381; BIOL 210 or FISH 425, or permission of instructor.

FISH 458 Management of Exploited Animal Populations II (4) Sp *Mathews* Extension of principles and practices of 457. Estimating catch and effort and analyzing catch-per-effort statistics. Standardizing effort, gear selectivity, recruitment, models of exploited fishery populations with management applications. In-

roduction to simulation of fish and wildlife populations, emphasis on applications using current data from fishery and game organizations. Joint with Q SCI 458.

FISH 459 Aquatic Food Chains (5) W Taub Survey of the sources and nutritional values of foods for fisheries resources. Efficiencies, rates of transfer through the food chain, pollution effects, and the potential for using pollution are considered. Prerequisite: major status or permission of instructor.

FISH 460 Water Management and Hydrology (4) A Brannon, Kent Nomenclature water cycles and soil retention, water-flow measurements in streams, flow in pipes and channels, determination of pressure in open and closed systems, screening of water diversions, upstream and downstream fish passage. Prerequisites: 401, MATH 105, and physics, or permission of instructor.

FISH 461 Culture of Temperate and Warm Water Fishes (3) Sp Stickney Culture, system design and management, care and feeding, spawning and rearing, harvest and processing of channel catfish, large-mouth bass, tilapia, and other economically important species.

FISH 462 Fish Feed Technology (5) W Halver Principles and practices of fish feed manufacturing, testing, formulation, storage, and distribution. Feed terminology and classification, nutritive characteristics; effect of processing on nutrient availability; linear formulation; diet-testing techniques.

FISH 463 Principles of Resource Assessment (5) Sp Gunderson Theory and methods of conducting resource assessment surveys, including survey planning, survey execution and data acquisition, analysis, interpretation, and presentation. Emphasis on the use of survey techniques to understand the status of fishery resources. Prerequisites: 314, Q SCI 381, or permission of instructor.

FISH 467 Fisheries Management (5) W Thomas Principles and practice of the management of commercial and recreational fisheries. Emphasis is on concepts and case histories. A field exercise provides practical experience. Guest lecturers from international, federal, and state agencies discuss the need to take into account factors other than biological in making management decisions. Students interested in a more quantitative emphasis should take Q SCI 456, 457. Prerequisite: Q SCI 381; recommended: 340.

FISH 472 Aquatic Radioecology I (3) A Nevissl Nature, detection, and measurement of ionizing radiation. The use of radionuclides for aquatic ecological studies. Prerequisites: 10 credits each in chemistry and biological science. (Offered irregularly.)

FISH 475 Marine Mammalogy (3) SpS Erickson Evolution, taxonomy, physiology, life history, and behavior of marine mammals; the techniques of studying and the management and conservation of them. (Offered irregularly.)

FISH 476 Laboratory of Marine Mammalogy (2) SpS Erickson Evolution, taxonomy, physiology, life history, and behavior of marine mammals; the techniques of studying and the management and conservation of them. Laboratory fee may be required. Prerequisite: 15 credits in biology; recommended: vertebrate anatomy and physiology. (Offered irregularly.)

FISH 477 Applied Chemical Techniques in the Aquatic Environment (3) Procedures for obtaining representative samples for chemical analysis of biological materials in the food chains; procedures for initial treatment and wet chemical or instrumental analysis in pollution-related problems; comparative methods for analysis of different sample types; sample collection in the field; analysis of biological material and water. Prerequisites: general inorganic (quantitative analysis), organic chemistry, CHEM 321 or 167, and CHEM 232 or 236 and permission of instructor. (Offered irregularly.)

FISH 478 Applied Chemical Techniques in the Aquatic Environment Laboratory (2) Methods in practical field sampling and analysis for pollution-related contaminants. Shipboard procedures and new chemical methods are used on special problems selected by the students. Sediment, biota, and water samples collected are measured by instrumental analysis methods, including neutron activation, atomic absorption, and gas chromatography. 477 may be taken concurrently with 478. Laboratory fee may be required. Prerequisites: CHEM 321 or 167, and CHEM 232 or 236. (Offered irregularly.)

FISH 499 Undergraduate Research (1-5, max. 9) AWSpS Individual research within the School of Fisheries or on-the-job training in governmental or industrial fisheries organizations. A. Guest lecture series. B. Special problems. C. Special courses in fisheries. D. Special courses in fisheries. Prerequisite: permission of instructor.

Food Science

FD SC 300 Nutrition for Today (3) Asp Dong Basic and applied nutrition and food science. Identification and physiological roles of nutrients, nutritional requirements, problems with over- and undernutrition, and nutritional and food-related diseases. Food additives, processing, safety, and their effects on overall nutrition. Current issues of public significance. Joint with NUTR 300.

FD SC 350 Food Components (3) A Matches Classification of foods and food ingredients. Chemical components and nutrients of foods: lipids, proteins, carbohydrates, pigments, and small molecules. Effects of handling and processing on major constituents, particularly nutrients.

FD SC 378 Principles of Fishing Gear and Vessel Development (3) A Pigott Principles of fishing technology as related to vessel design and construction. Fishing techniques, shipboard handling of catch, shipboard preprocessing, shipboard final product processing, and storing products and raw materials on shipboard. Special emphasis on the effect of these variables on quality of products, including nutritional aspects.

FD SC 380 Principles of Fisheries Technology (3) W Liston Composition of fish, safety and significance in human nutrition; biochemical and microbiological changes in fish postmortem; preservation and processing procedures and their effects on nutritional quality; analysis and control of processes; current technological developments. Prerequisite: CHEM 102 or CHEM 231 or permission of instructor.

FD SC 381 Environment, Food, and Technology (3) Sp Pigott Principles of seafood processing operations as related to control of pollution problems arising from food processing wastes through total utilization of raw materials.

FD SC 385 Food Engineering I (3) W Pigott Quantitative physics and chemistry of harvesting, processing, and storing foods. Solving problems of mass and energy transfer with regard to processes and to changes in important food components such as nutrients. Prerequisite: food science major or permission of instructor.

FD SC 395 Food Engineering I Laboratory (1) W Pigott Laboratory demonstrations and report writing involving basic food engineering principles studied in 385. Stoichiometry and nutritional effects of processing. Laboratory fee may be required. Prerequisite: concurrent registration in 385.

FD SC 481 Introduction to Food Technology (4) Sp Liston Chemical, biological, and nutritional properties of food raw materials. Principles of preservation and processing and significance of handling and storage procedures in relation to safety, wholesomeness, and nutritional value of foods. Prerequisite: permission of instructor.

FD SC 482 Food Chemistry (3) A Rasco Chemical composition, structure, and properties of foods and some of the chemical changes they undergo. Components of formulated foods, including vitamins, minerals and other nutrients, additives, and naturally occurring toxins. Prerequisite: organic chemistry or permission of instructor.

FD SC 483 Food Analysis (3) W Rasco Principles of separation and identification of food components by chromatographic, spectrophotometric, and other methods, including vitamins, minerals, and preservatives. Prerequisite: 482 or permission of instructor.

FD SC 484 Food Microbiology (4) A Liston, Matches Occurrence and activity of microorganisms in foods; their significance in spoilage, fermentation, food-borne disease, and nutritional effects; principles of control and destruction by environmental adjustment and processing, detection and evaluation of significance. Prerequisite: 481, MICRO 301, or permission of instructor.

FD SC 485 Food Engineering II (3) W Pigott Application of physical laws to the physical and chemical changes that occur in food during harvesting, transporting, processing, storing, packaging, and marketing. Nutritional components of foods and alteration, degradation, and stability during mass and energy transfer. Prerequisites: concurrent registration in 395 and food science major or permission of instructor.

FD SC 486 Deteriorative Processes in Foods (3) Sp Matches, Rasco Effects of deteriorative processes on quality and nutritional value of foods and chemical and microbiological analysis of this; quality assurance methods. Fish, meat, poultry, and other animal foods. Prerequisites: 483, 485, and concurrent registration in 496, or permission of instructor.

FD SC 491 Introduction to Food Technology Laboratory (1) Sp Liston Laboratories and field trips to local food-processing plants to see and study important food-processing operations, such as freezing, milling, canning, brewing, milk processing, and spice processing. Food science majors must take 491 concurrently with 481.

FD SC 492 Food Chemistry Laboratory (2) A Rasco Experiments in qualitative and quantitative analysis of foods, using physical and chemical techniques including HPLC. Food science majors must take 492 concurrently with 482. Laboratory fee may be required.

FD SC 493 Food Analysis Laboratory (2) W Rasco Experiments in proximate analysis, chromatography, and other methods of separation and identification of food components. Food science majors must take 493 concurrently with 483. Laboratory fee may be required.

FD SC 494 Food Microbiology Laboratory (3) A Liston, Matches Selected experiments on the enumeration and identification of microorganisms in food, fermentation processes, and the changes in microbial populations as a result of handling, storing, and processing. Food science majors must take 494 concurrently with 484. Laboratory fee may be required.

FD SC 495 Food Engineering II Laboratory (2) W Pigott Laboratory investigations and demonstrations concerned with the application of modern engineering principles to efficient commercial processing of food. Retaining maximum nutrient properties of foods, both natural and formulated. Prerequisite: concurrent registration in 485.

FD SC 496 Deteriorative Processes in Foods Laboratory (2) Sp Matches, Rasco Selected experimental problems in food deterioration. Measurement of changes in food components and such nutrients as proteins and vitamins during deteriorative processes. Laboratory fee may be required. Prerequisites: concurrent registration in 486 and food science major.

FD SC 498 Undergraduate Thesis (2-5, max. 5) AWSpS Prerequisite: permission of instructor.

Courses for Graduates Only

Fisheries

FISH 501 On-the-Job Training (1-5, max. 5 for M.S., 9 for Ph.D.) AWSpS Guided on-the-job training in governmental or industrial fisheries organizations. Prerequisite: permission of instructor.

FISH 503 Advanced Ichthyology (3) Sp Pietsch Biosystematic theory and practical application in ichthyology; analysis of recent advances and current problems in phylogeny and zoogeography. Prerequisite: 401 or equivalent. (Offered irregularly.)

FISH 504 Invertebrate Pathology (5) W Landolt, Pauley Pathological effects and communicable diseases in invertebrates. The discussion is phylogenetic and comparative. Juniors and seniors may take the course, but must have course prerequisites. Prerequisites: 454 and invertebrate zoology or equivalent, or permission. (Offered even-numbered years.)

FISH 505 Research Techniques in Shellfish Biology (5) Sp Chew Study of research methods in field surveys of invertebrates and of research techniques involved with the studies of reproduction, growth, and mortality of oysters and clams. Prerequisite: permission of instructor. (Offered irregularly.)

FISH 507 Special Problems in Fisheries (1-5, max. 15) AWSp Classroom, laboratory, or field studies on problems of current interest. A maximum of 6 credits of 507 is permitted to apply to a master's degree program. A. Guest lecture series. Offered on credit/no credit basis only. B. Special problems. C. Special course in fisheries. D. Special courses in fisheries. Prerequisite: permission of instructor.

FISH 515 Topics in Fish Physiology (3) W Smith Analysis of recent advances in salmonid physiology with detailed coverage of selected organ systems having greatest importance to class members. Prerequisite: 415 or permission of instructor.

FISH 516 Fish Physiology Laboratory (2) W Smith Selected experimental techniques in fish physiology. Prerequisite: 515 or concurrent registration.

FISH 520 Graduate Seminar (1) A Introduction to research in fisheries. Required of all first-year graduate students. Offered on credit/no credit basis only.

FISH 521 Scientific Method in Resource Management (2) Ford Process of scientific discovery and strategies used for different problems in ecology and natural resources management. The relationship between growth of objective knowledge and use made of that knowledge in natural resources management explored through case studies. Joint with Q SCI 521.

FISH 522 Graduate Seminar in Fisheries (1, max. 2) WSp Lectures and discussions of current problems and current research in fisheries. Offered on credit/no credit basis only.

FISH 525 Ecology and Behavior of Fishes (3) Sp Miller, Quinn Basic principles of ecology and behavior (e.g., habitat associations, competition and predation, migrations and movements, reproductive patterns) as applied to fishes. Critical evaluation of current literature and fieldwork required. Prerequisites: 401 or equivalent, and permission of instructor.

FISH 527 Experimental Aquatic Ecology (3) Sp Taub Microcosms, mesocosms, enclosures, experimental approaches to investigating ecosystem properties. Current research critically reviewed to contrast observational and experimental approaches. Responses of communities to chemical stresses, predation, and harvesting. May include closed ecological systems, gnotobiotic microcosms, or multispecies continuous-cultures. Recommended: ecology, and limnology or biological oceanography. (Offered odd-numbered years.)

FISH 535 Metabolic Effects of Chemical Pollutants (4) Sp Brown Physiological and biochemical effects of industrial, urban, and agricultural chemicals on aquatic biota; specific metabolic effects of various poisonous and inhibitory substances; models of inhibition of enzyme systems of aquatic organisms. Offered concurrently with 435. Prerequisites: upper-division or graduate standing, organic chemistry, general physiology, biochemistry, or cell physiology, or equivalent.

FISH 540 Application of Digital Computers to Biological Problems (5) WSp Methods and procedures for processing biological and natural resource data by means of digital computers; interactive computing, file manipulation, problem analysis, elementary FORTRAN programming, use of data-base and statistical packages, interfacing of programs and software packages. Not open for credit if 340 or Q SCI 340 has been taken. Prerequisite: Q SCI 381 or equivalent.

FISH 544 Genetics in Fish Management and Production (3) Sp Hershberger Possible changes in genetic characteristics and response of populations with the current types and levels of fisheries resource manipulation. Includes genetic considerations in population models, quantitative genetics and breeding, and use of genetic markers for population analysis. Prerequisites: 444, 451, Q SCI 482, 483, and upper-division or graduate standing. (Offered odd-numbered years.)

FISH 545 Selection and Breeding in Aquaculture (3) Sp Hershberger Genetic bases, analytical techniques and experimental approaches for study and utilization of quantitative genetic variation in aquatic species. Statistical determination of genetic and phenotypic parameters; design and assessment of selection and breeding programs; use of quantitative genetic data. Prerequisites: 444, GENET 360, Q SCI 486, or permission of instructor. (Offered even-numbered years.)

FISH 556 Introduction to Quantitative Population Dynamics (3) A Gallucci Simple analytic approaches to population management; applications of parent-progeny models and logistic models; biological and economic yields of natural populations; analysis of population data on high-speed digital computers. Prerequisites: Q SCI 291, 292, 483, 457, or permission of instructor.

FISH 557 Theoretical Models of Exploited Animal Populations (3) W Mathematical representation of basic population processes such as growth, mortality, natality, and mobility; application of optimization technique to yield models. Laboratory work on digital computer. Prerequisite: 556 or permission of instructor.

FISH 558 Estimation of Population Parameters (3) Sp Skalski Statistical analysis of population data; design and analysis of mark-recapture experiments on natural populations; laboratory work on digital computer. Prerequisite: 557 or permission of instructor.

FISH 560 Methods of Acoustic Stock Assessment (3) Sp Thorne Theory and implementation of processing of acoustic fish target signals. Application for estimation of fish stocks and the statistical properties of the estimation procedure. (Offered irregularly.)

FISH 565 Marine Fish Biology (9) S Taxonomy, ecology, and life history of the fishes of the San Juan Islands and northeast Pacific Ocean. Prerequisite: permission of instructor. (Offered at Friday Harbor Laboratories Summer Quarter only; offered alternate years.)

FISH 570 Management of Marine Fishes (3) W Gunderson Survey of biology, stock assessment, and management of major marine fisheries resources, including Atlantic cod, Pacific halibut, California sardine, northern anchovy, Atlantic menhaden, Peruvian anchoveta, and pandalid shrimp. Mixed species fisheries (i.e., groundfish resource in North Sea and California-Washington region). Prerequisites: 457, 458 (or 556, 557, 558), 463.

FISH 573 Advanced Aquatic Radioecology (5) Nevissl Origin and transport of natural and artificial radionuclides in the aquatic environment, their transport through the food chain, and their impact on man and other organisms. Prerequisites: 10 credits each in chemistry and biological sciences. (Offered irregularly.)

FISH 575 Principles of Ecology as Applied to Fishes (3) A Theoretical ecology as applied to fishes. Includes fish vision, color pattern determinants, adaptive radiation, competition and predation, fish behavior, reproductive patterns, community organization, and species diversity. Joint with ZOOL 575. Prerequisite: graduate standing or permission of instructor. (Offered irregularly.)

FISH 600 Independent Study or Research (*) AWSpS Offered on credit/no credit basis only.

FISH 700 Master's Thesis (*) AWSpS Offered on credit/no credit basis only.

FISH 800 Doctoral Dissertation (*) AWSpS Offered on credit/no credit basis only.

Food Science

FD SC 521 Graduate Seminar in Food Science (1, max. 3) AWSp Lectures and discussions of current problems and current research in food science. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

FD SC 522 Advanced Food Chemistry (3, max. 9) Sp Rasco Lecture and/or laboratory dealing with special or current topics in food chemistry and food analysis. Laboratory fee may be required. Prerequisite: graduate standing or permission of instructor. (Offered even-numbered years.)

FD SC 524 Microorganisms in Foods (3) W Liston, Matches Occurrence and activity of microorganisms important in foods as agents of spoilage, fermentation, and food-borne disease; relationship to food or food process; control and detection. Food science majors must take 534 concurrently with 524. Prerequisite: graduate standing in food science or permission of instructor.

FD SC 525 Advanced Unit Operations in Food Processing (3) Sp Pigott Application of modern engineering principles to operations such as evaporation, drying, distillation, pumping, and heat transfer in the handling, processing, and packaging of foods. To be taken concurrently with 526. Prerequisite: 485 or permission of instructor.

FD SC 526 Advanced Unit Operations in Food Processing Laboratory (3) Sp Pigott Laboratory investigations concerned with the engineering of food processes and processing facilities. To be taken concurrently with 525. Laboratory fee may be required.

FD SC 534 Microorganisms in Foods Laboratory (1) W Liston, Matches Special projects or selected experiments designed to study microorganisms in foods. Food science majors must take 534 concurrently with 524. Laboratory fee may be required.

FD SC 600 Independent Study or Research (*) AWSpS

FD SC 700 Master's Thesis (*) AWSpS

Marine Studies

3707 Brooklyn Avenue Northeast

Graduate Program

The Institute for Marine Studies offers an interdisciplinary program of study leading to the Master of Marine

Affairs degree. Marine affairs concerns management and policy questions on the uses of the coastal and offshore regions of the ocean and their resources. The core curriculum includes courses from the Institute for Marine Studies, business administration, economics, engineering, fisheries, law, oceanography, political science, and public affairs. The School of Law has a related Master of Laws degree program with specialization in marine affairs.

A major program objective is to prepare students for professional careers in policy making, management, teaching, and research. Breadth of study is emphasized, and all students are expected to gain familiarity with relevant aspects of the social, technological, and environmental sciences. In addition, each student is expected to develop a professional and scholarly proficiency in a particular aspect of marine studies.

Completion of the M.M.A. program normally requires two academic years for students who have recently received a baccalaureate degree. During the first year, students develop a comprehensive understanding of the marine affairs field and acquire analytic skills. During the second year, a special competence is developed in an area of concentration (e.g., coastal zone management, marine policy, port and marine transportation management, or marine resource management), and a research topic is prepared and presented in thesis format under the guidance of a faculty supervisory committee. Individual courses of study may be adjusted to accommodate prior experience and academic background, and especially qualified students, such as those in midcareer, may be able to meet the degree requirements in twelve months of study.

Admission Requirements

Admission to the Institute for Marine Studies is based on evaluation of required application materials in competition with other applicants. Required materials include Graduate Record Examination general test scores, completed departmental supplementary information form, three letters of recommendation, official academic transcripts, and a statement of career objectives. In addition, applicants must make separate application to, and be accepted by, the Graduate School of this university. Course sequences begin each Autumn Quarter, and new students are admitted at that time.

Financial Aid

The Institute for Marine Studies has a limited number of positions for graduate student appointments as research and teaching assistants. Applicants in need of support are urged to investigate outside sources of funding.

Correspondence and Information

Graduate Program Coordinator
Institute for Marine Studies, HF-05

Faculty

Director

Edward L. Miles

Associate Director

Marc J. Hershman

Professors

Alverson, Dayton L.,* 1958, (Affiliate), (Fisheries),† Ph.D., 1967, Washington; techniques for assessing fisheries resources, ecology and growth of marine fishes and shellfishes.

Burke, William T.,* 1968, (Law),† J.D., 1953, Indiana; J.S.D., 1959, Yale; international law of the sea.

Crutchfield, James A., 1949, (Emeritus), (Economics, Public Affairs),† M.A., 1942, California (Los Angeles); Ph.D., 1954, California (Berkeley); natural resources economics, policy and management, especially marine and environmental resources.

Fleagle, Robert G.,* 1948, ‡(Atmospheric Sciences), M.S., 1944, Ph.D., 1949, New York; theoretical and dynamic meteorology, weather modification and public policy, air-sea interaction processes.

Fleming, Douglas K.,* 1965, ‡(Geography), Ph.D., 1965, Washington; transportation geography (especially ocean and air), regional organization of Western Europe.

Fleming, Richard H., 1931, (Emeritus), (Oceanography),† M.A., 1931, British Columbia; Ph.D., 1935, California (La Jolla); regional oceanography, man's interactions with the ocean.

Francis, Robert C.,* 1980, ‡(Fisheries), M.S., 1966, Ph.D., 1970, Washington; ground fish and tuna ecology research and management, population dynamics of salmon.

Hershman, Marc J.,* 1976, (Law), J.D., 1967, Temple; LL.M., 1970, Miami; law of the coastal socioeconomic aspects of the uses of the coastal zone, port development.

Johnson, Ralph W.,* 1955, ‡(Law, Environmental Studies), LL.B., 1949, Oregon; coastal zone law and management, American Indian legal problems.

McManus, Dean A.,* 1959, ‡(Oceanography), M.S., 1956, Ph.D., 1959, Kansas; geological oceanography, exploration.

Miles, Edward L.,* 1974, (Public Affairs),† Ph.D., 1965, Denver; international law and organization, science and international relations, marine policy and ocean management.

Vesper, Karl H.,* 1969, (Management and Organization, Mechanical Engineering),† M.B.A., 1960, Harvard; M.S., 1968, Ph.D., 1969, Stanford; entrepreneurship, technological innovation, interdisciplinary management, marine systems design.

Wooster, Warren S.,* 1976, (Environmental Studies, Oceanography), (Fisheries),† M.S., 1947, California Institute of Technology; Ph.D., 1953, California (San Diego); ocean circulation, effects on fish stocks, ocean affairs.

Associate Professors

Adee, Bruce H.,* 1970, ‡(Mechanical Engineering), M.S., 1968, Ph.D., 1972, California (Berkeley); ocean, naval, aeronautical engineering, marine technology.

Delaney, John R., 1977, ‡(Oceanography), M.S., 1967, Virginia; Ph.D., 1977, Arizona; geochemistry and tectonics with special interests in the role of volatiles in submarine basalts.

Duxbury, Alyn C., 1964, (Research), (Oceanography),† M.S., 1956, Washington; Ph.D., 1963, Texas A&M; descriptive physical oceanography with emphasis on coastal and estuarine processes and education.

Gunderson, Donald R.,* 1978, ‡(Fisheries), M.S., 1966, Montana State; Ph.D., 1975, Washington; trawl and hydroacoustic assessment of fisheries resources, population dynamics and management of marine fisheries resources.

Kaczynski, Włodzimierz M.,* 1977, (Research), M.A., 1965, Ph.D., 1973, Gdansk (Poland); fishery economics, international joint ventures in marine fisheries, international fisheries policy and management.

Lee, Kai N.,* 1973, ‡(Environmental Studies, Political Science), Ph.D., 1971, Princeton; technology and public policy, nuclear energy, regional electric power development.

Leschine, Thomas M.,* 1983, (Research), M.A., 1970, Ph.D., 1975, Pittsburgh; marine pollution management, ocean policy studies.

Miller, Marc L.,* 1979, (Anthropology), M.A., 1972, California (San Diego); Ph.D., 1974, California (Irvine); maritime anthropology, cognitive anthropology and social/cultural change.

Stokes, Robert L.,* 1975, M.A., 1971, Ph.D., 1975, Washington; natural resource economics, marine policy economics.

Course Descriptions

IMS 455 Marine Resource Policy of the Soviet Bloc (3) A Kaczynski Criteria applied by communist states in developing ocean resource use and management strategy. Problems and choices influencing ocean policy; areas of conflicting ocean interests, including those of the West and developing countries. Joint with SISRE 455. Prerequisite: understanding of communist block economic and political systems or permission of instructor.

IMS 499 Undergraduate Research (1-3, max. 6) AWSpS Research on assigned topics under the supervision of faculty members. Prerequisite: permission of instructor.

IMS 500 Marine Affairs (5) A Miller Surveys a wide range of academic disciplines and substantive problems pertinent to interaction of human beings and the world's oceans and coasts. Management of living/nonliving resources, shipping, scientific research, pollution, recreation, and others. Lecture and discussion by invited specialists.

IMS 508 International Law of the Sea (4) W Burke Ways nations claim authority to regulate activities at sea. Fundamental policies and decisions regarding navigation for commercial and military purposes, fisheries, exploitation and conservation, continental shelf resources, scientific research, protection of environment, deep-sea mining, and other uses of the ocean. Joint with LAW B 561.

IMS 507 International Organizations and Ocean Management (3) W Miles Survey of the manner in which international organizations attempt to manage and regulate the uses of the ocean. Primary emphasis is on the analysis of processes that support or constrain these organizations and on the search for alternative policies and organizations. Joint with PB AF 507. Prerequisite: 500 or permission of instructor.

IMS 508 National Marine Policy Processes (3) Sp Miles, Miller, Stokes Institutional dimensions of marine policy processes. Marine policy context at the national level and the dynamics that drive policy formulation and policy implementation. Prerequisite: 507 or permission of instructor.

IMS 509 Principles of Coastal Zone Management (3) W Hershman Multiple uses of coastal waters and the adjacent land; conflicts arising from competition for space and resources; organizational problems associated with overlapping jurisdiction and spheres of interest; the development of alternatives for the resolution of conflicts. Prerequisite: 500 or permission of instructor.

IMS 511 Coastal Environment Management (3) Sp Duxbury Coastal zone planners and managers evaluate proposed and ongoing use activities that affect wetland, estuarine, and nearshore environments. Concepts and techniques for retrieving, analyzing, and using technical environmental information in planning and decision making. Washington State case examples and practical exercises. Prerequisite: OCEAN 580 or permission of instructor.

IMS 512 Ocean Environment and Living Resources (3) W Wooster Analysis of characteristics and processes in the ocean environment affecting abundance of marine organisms; implications for management of oceanic fisheries. Prerequisite: permission of instructor.

IMS 513 Introduction to Ocean Resource Technology (3) W Ocean technologies from the present state-of-the-art to possible future trends; the wide variety of technical problems associated with use of the marine environment. Entry card required.

IMS 515 United States Law and the Marine Environment (3) Federal/state boundary problems, living resources management, offshore oil and gas production, vessel and tanker safety. Joint with LAW B 565.

IMS 516 Seaport Management (3) Sp Dowd, Hershman, Yoshioka Role of port authorities in management of marine uses: cargo and trade, economic development, tourism and recreation, and fisheries. Management functions of planning, marketing, finance, engineering. Examples and guest speakers from the Port of Seattle and other Puget Sound ports. Prerequisite: 500 or permission of instructor.

IMS 517 Marine Uses: Transportation and Commerce (3) W D. K. Fleming Role of the oceans in the transportation of men and materials, character and trends in vessel design and terminal facilities, pattern and nature of industry organization, regulations, economics of the shipping industry, management of fleets and vessels, manpower at sea and ashore, national policies affecting the merchant marine and port facilities. Prerequisite: 500 or permission of instructor.

IMS 518 Port and Marine Transportation Systems (3) W Dowd Activities associated with the waterborne movement of cargo. Types of cargo handling methodologies used in ocean transport, ship types involved in these cargo-handling methods, and seaport terminal facilities that are utilized by each cargo handling method. Prerequisite: permission of instructor.

IMS 530 The Regional Implementation of an Extended Economic Zone (3) Sp Miles Team-research seminar to evaluate the implications of two-hundred-mile economic zones in the Central and North Pacific and Atlantic oceans, the Arctic and Indian oceans, and the Mediterranean Sea. Focus is on one region at a time. Prerequisite: 507 or permission of instructor.

IMS 537 Economic Aspects of Marine Policy I (3) W Stokes Development of pertinent economic concepts and their application to selected topics in marine policy decision making. Joint with ECON 537. Prerequisite: 500 or permission of instructor.

IMS 538 Economic Aspects of Marine Policy II (3) Sp Stokes Development of pertinent economic concepts and their application to selected topics in marine policy. Joint with ECON 538. Prerequisite: 508 or permission of instructor.

IMS 540 Economics of World Fisheries I (3) A Kaczynski World view of the contemporary problems in use and management of the marine living resources. How to approach and analyze international fisheries issues in students' own research. Prerequisite: 500 or permission of instructor.

IMS 550 Special Topics in Marine Studies (1-3, max. 18) AWSpS Examination of various aspects of marine studies. Content varies, depending upon the interests of the faculty and students. Intended for the joint participation by the faculty and advanced students in the investigation of selected topics. One or more groups are organized each quarter.

IMS 555 Soviet Ocean Policy (3) W Kaczynski Problems of Soviet ocean policy and challenge of Soviet ocean expansion. How Soviet navy, fishing fleet, merchant marine, ocean research capability, and network of overseas land support bases have put USSR in the front rank of military powers. Joint with SISRE 555. Prerequisite: permission of instructor.

IMS 560 Methods Seminar (2) Sp Preparation for thesis work. Draws on the philosophy of science from the natural, social, and policy sciences to examine such topics as research design, data collection, analysis, write-up, and abstract/applied research.

IMS 600 Independent Study or Research (*) AWSpS

IMS 700 Master's Thesis (*) AWSpS

Oceanography

108 Oceanography Teaching

The School of Oceanography, which had its beginnings in 1930, offers courses and conducts basic research in oceanography, the science that examines physical, geological, chemical, and biological processes in the ocean and interactions of the ocean with the earth, the biosphere, and the atmosphere. Education and research in the school include studies of seawater in motion; life in the sea; chemical composition and properties of seawater; interactions between the sea and the atmosphere, the sea and the land, sediments and rocks beneath the sea; and the geophysics of the ocean floor. Because the science of oceanography is interdisciplinary in nature, joint programs are maintained in the areas of geochemistry and biochemistry, geophysics, atmospheric sciences, marine biology and botany, and geophysical fluid dynamics, with the departments of Botany, Zoology, Atmospheric Sciences, Applied Mathematics, Geophysics, and Geological Sciences, and with the other units in the College of Ocean and Fishery Sciences.

Courses

A full spectrum of basic and advanced courses is offered in each of the areas of specialization in oceanography: biological oceanography, chemical oceanography, marine geology and geophysics, and physical oceanography. Among the wide variety of courses open to students are the following: zooplankton ecology, marine microbiology, advanced problems in chemical oceanography, ocean and climate variation, sedimentary dynamics and history of the ocean, marine science of coastal zone management, and man and the ocean.

Summer Quarter instruction is offered both on the main campus and at the Friday Harbor Laboratories on San Juan Island.

Advising

The student services office is staffed by an academic counselor, who assists students with curriculum, scheduling, and career counseling. All students also consult with a faculty adviser.

Research

Each year the school participates in a broad range of oceanographic investigations, ranging from individual research projects to multidisciplinary or multiuniversity projects. Major biological programs are carried out in Puget Sound, in the waters of the continental shelf off Washington and California, and in the North Pacific Ocean. These projects include investigations of the processes governing the communities or organisms in the water column, on the seabed, and in the surf zone. Chemical oceanography includes work on the distribution of organic material and trace metals in Puget Sound and the open sea, the geochemistry of the sediment-water interface, and study of chemical processes in waters trapped in the sediments. Geological investigations include theoretical studies and field experiments on sediment motion and sedimentary processes. This work has ranged from the deep waters of the Scotian Rise in the Atlantic Ocean to Prudhoe Bay to the East China Sea, where a cooperative program with Chinese scientists is under way.

The effect of organisms on sediment transport is a major new interdisciplinary program among geological, biological, and physical oceanographers. Geophysical research is concerned with the oceanic crust and upper mantle. Topics include seismic experiments on plate boundaries, crustal formation processes in the Juan de Fuca-Gorda Ridge System, and studies of the earth's magnetic field. Physical oceanographic programs range from large-scale circulation studies of the North Pacific, the North Atlantic, the tropical oceans, and the antarctic circumpolar current to coastal circula-

tion studies and small-scale mixing programs. The theoretical and experimental programs include studies of air-sea interaction, surface and internal waves, oceanic fronts, and sea ice.

The school is particularly strong in arctic research, which includes both physical oceanographic studies and multidisciplinary ecosystem studies of the processes and resources in the Bering Sea. Studies in local waters include sediment transport and mixing processes in fjords and inlets and the chemistry of Lake Washington.

Facilities and Vessels

Housed in four large and several smaller buildings on campus by Portage Bay, the school is equipped with extensive laboratories and teaching facilities, including controlled-environment rooms, a paleomagnetism laboratory, and a sea-ice laboratory. The school operates its own midscale interactive computer and highly specialized laboratory instruments, such as mass spectrometers, scanning electron microscopes, and seawater sediment transport flumes. Access to other more sophisticated facilities and instruments, as well as super computers, is available on campus. Docks provide mooring for the school's two research vessels. Deep-ocean research programs are accommodated on the 209-foot R/V *Thomas G. Thompson*. Graduate students are involved in all of the cruises, most often for their thesis research. The sixty-five-foot R/V *Clifford A. Barnes* undertakes short cruises into Lake Washington and Puget Sound for the instructional and research programs.

Friday Harbor Laboratories on San Juan Island offer unique opportunities for research and study. Specialized courses in new areas of oceanography are offered each summer. The facilities are utilized by faculty members and students throughout the year for oceanographic research.

Funding

The school is supported primarily by funds from the state of Washington and federal agencies. Major sources of federal funding include the National Science Foundation, National Oceanic and Atmospheric Administration, Office of Naval Research, and Department of Energy. Funds are also provided by various state and local government agencies and private organizations.

Undergraduate Program

Degrees

Students may earn a Bachelor of Science or a Bachelor of Arts degree, with specialization in biological, chemical, or physical oceanography, or marine geology and geophysics.

Careers in Oceanography

Oceanographers are employed predominantly in research, both pure and applied. They seek to produce a new understanding of an ocean system and to explore the potential consequences to the marine environment of human activities. They collect samples and data, analyze and interpret them, and prepare and disseminate the results. Oceanographers work at sea, on land, and in laboratories, often with computers.

In addition to the knowledge acquired through research, a degree in oceanography can serve as a background for a career in teaching, administration, marine affairs, environmental studies, production, inspection, computing, instrumentation development, and statistical analysis.

Most oceanographers are employed in educational and research institutions. Many others work for federal government agencies, such as the National Oceanic and Atmospheric Administration, U.S. Geological Sur-

vey, Office of Naval Research, U.S. Department of Interior, U.S. Coast Guard, Naval Oceanographic Research and Development Activity, and National Marine Fisheries Service. Other employers include state and local governments in coastal areas and independent consulting firms that conduct research for companies and government agencies. Additional private-sector positions are available in research and development and for companies extracting and harvesting products from the oceans.

An oceanographer's duties are diverse, dictated by the nature of the profession. Research projects are as varied as an oceanographer's responsibilities. The field is open to both women and men. Graduates from the oceanography program are prepared to enter the profession or to pursue graduate studies.

High School Preparation

A high school student considering oceanography as a career should be guided by an interest in natural sciences and a good record in high school science courses, and particularly mathematics. A student should plan to meet or exceed the general University entrance requirements. One year each of biology, chemistry, and physics is recommended.

Admission

The School of Oceanography has no admission requirement. Students may enter the program upon acceptance for admission to the University.

Bachelor of Science Degree

Students may specialize in biological, chemical, or physical oceanography, or marine geology and geophysics.

Major Requirements: (1) MATH 124, 125, 126; CHEM 140, 150, 151; PHYS 121, 122, 123; GEOL 205; and BIOL 101-102 or 210, 211; (2) OCEAN 200, W201, 202, 401, 402, 421, 433, 450, W460, W485; (3) 20 credits of upper-division science, mathematics, or engineering to be selected in the student's area of specialization in consultation with a faculty adviser; (4) 20 credits of humanities and 20 credits of social science selected from the College of Arts and Sciences distribution lists; and (5) 5 credits of English composition and a foreign language through the second quarter to satisfy proficiency requirements. University-approved W courses (writing) are included within the curriculum. Recommended foreign languages are German, French, Japanese, and Russian.

Bachelor of Arts Degree

Major Requirements: Same as for Bachelor of Science degree, except only 10 credits of upper-division science, mathematics, or engineering courses are required.

Student Oceanographic Society

The Student Oceanographic Society is an undergraduate organization for students majoring in oceanography. The society coordinates tours of the facilities and elects the undergraduate representatives to the school's student council. The club also provides the students with an informal environment for meeting with the faculty and other students who share an interest in the marine sciences.

Graduate Program

Arthur R. M. Nowell, Acting Director and Graduate Program Coordinator

The School of Oceanography provides excellent instruction and research opportunities at the graduate level in all areas of oceanography: biological oceanography, chemical oceanography, marine geology and geophysics, and physical oceanography. The program

of study emphasizes independent research in conjunction with basic and specialized courses. Interdisciplinary research is encouraged, and students enjoy the opportunity to work across the usual scientific boundaries. Course work during the first two years is required in each option; specialized course work is structured to fit the student's background and objectives. Foreign-language proficiency is required only when deemed crucial to scholarly research.

Admission

Students enter the school from varied undergraduate disciplines at many universities. All have in common a strong background in the sciences and mathematics; most have never taken courses in oceanography. Evaluation of candidates is based on Graduate Record Examination scores, the undergraduate transcript (scholarship and depth), three letters of recommendation, and the applicant's statement of objectives and interests. Admission can be accommodated at the beginning of any academic quarter, although autumn entry is most common.

Master of Science Degree

The program of study includes course work in the student's area of interest and the other oceanography options, a comprehensive examination, and the completion of an approved research project and oral presentation of the results. Thesis and nonthesis programs are offered; most students select the nonthesis option.

Doctor of Philosophy Degree

The degree program places a strong emphasis on research following completion of course requirements and General Examination. Upon successful completion of the General Examination, the student undertakes an original research investigation, which is described in the dissertation and defended during the Final Examination.

Financial Aid

Normally all students pursuing a graduate degree are supported by research or teaching assistantships, or by fellowships and scholarships from national or private sources. Most appointments continue through the summer when students are engaged in research.

Correspondence and Information

Graduate Student Services
School of Oceanography, WB-10

Faculty

Director

Arthur R. M. Nowell

Professors

Aagaard, Knut N.,* 1968, (Research), M.S., 1964, Ph.D., 1966, Washington; physical oceanography, ocean circulation, arctic oceanography.

Ahmed, Saïyed I.,* 1973, (Research), Ph.D., 1963, J.W. Goethe (Frankfurt); marine phytoplankton, ecology and nitrogen assimilation, biofouling, anoxic marine environments.

Anderson, George C.,* 1958, (Emeritus), M.A., 1949, British Columbia; Ph.D., 1954, Washington; plankton ecology, biological oceanography.

Banase, Karl,* 1960, Ph.D., 1955, Kiel (Germany); biological oceanography, plankton production and methodology, polychaete systematics.

Barnes, Clifford A., 1947, (Emeritus), Ph.D., 1936, Washington; physical oceanography, water properties, circulation.

Carpenter, Roy,* 1968, Ph.D., 1968, California (San Diego); marine geochemistry of metals and hydrocarbons in coastal zones.

Coachman, Lawrence K.,* 1962, M.F., 1951, Yale; Ph.D., 1962, Washington; physical oceanography, water properties circulation, arctic oceanography.

Creager, Joe S.,* 1958, (Geological Sciences),† M.S., 1953, Ph.D., 1958, Texas A&M; geological oceanography, sea-level changes, recent marine sediments, shallow-water sediment transportation.

Criminale, William O., Jr.,* 1968, (Applied Mathematics, Geophysics),† Ph.D., 1960, Johns Hopkins; applied mathematics, geophysical fluid mechanics, air-sea interactions.

Delaney, John R.,* 1977, (Marine Studies), M.S., 1967, Virginia; Ph.D., 1977, Arizona; geological oceanography, igneous petrology, properties and origin of the oceanic crust and upper mantle.

Devol, Allan H.,* 1974, (Research), Ph.D., 1975, Washington; marine and freshwater biogeochemistry, sediment diagenesis, oceanography of anoxic systems, carbon fluxes.

Emerson, Steven R.,* (Quaternary Research Center), 1976, M.Phil., 1973, Ph.D., 1974, Columbia; marine geochemistry/chemical oceanography, sediment diagenesis.

Eriksen, Charles C.,* 1986, Ph.D., 1977, Massachusetts Institute of Technology/Woods Hole Oceanographic Institution; physical oceanography: upper-ocean dynamics, internal gravity waves, mixing processes, equatorial dynamics.

Ewart, Terry E.,* 1970, (Research), Ph.D., 1965, Washington; physics, ocean microstructure, diffusion, acoustic transmission.

Fleming, Richard H., 1951, (Emeritus), (Marine Studies),† M.S., 1931, British Columbia; Ph.D., 1935, California (Berkeley); physical and general oceanography.

Frost, Bruce W.,* 1969, Ph.D., 1969, California (San Diego); biological oceanography, marine zoogeography, plankton ecology and systematics.

Gregg, Michael C.,* 1974, (Research), (Geophysics), Ph.D., 1971, California (San Diego); physical oceanography, ocean microstructure.

Heath, G. Ross, 1984, Ph.D., 1968, California (San Diego); geochemistry of sediments.

Hedges, John I.,* 1976, Ph.D., 1975, Texas (Austin); organic geochemistry, sources, transport, fate of organic material in coastal zones.

Henry, Dora P., 1960, (Research), M.A., 1926, Ph.D., 1931, California (Berkeley); systematics and ecology of barnacles.

Hickey, Barbara M.,* 1973, (Research), M.S., 1968, Ph.D., 1975, California (San Diego); physical oceanography, dynamics of equatorial and shelf circulation.

Holloway, Gregory,* 1978, (Affiliate), M.S., 1968, Ph.D., 1976, California (San Diego); physical oceanography, turbulence theory, geophysical fluid dynamics.

Johnson, H. Paul,* 1976, (Research), M.S., 1966, Southern Illinois; Ph.D., 1972, Washington; paleomagnetism and marine geophysics.

Jumars, Peter A.,* 1975, Ph.D., 1974, California (San Diego); biological oceanography, benthos, biological sedimentary dynamics and spatial statistics.

Lewin, Joyce C., 1965, (Emeritus), (Research), M.S., 1950, Ph.D., 1953, Yale; biological oceanography, dynamics of surf diatom blooms, physiology and systematics of diatoms, North Pacific nanoplankton.

Lewis, Brian T. R.,* 1970, (Geophysics),† Ph.D., 1970, Wisconsin; marine geophysics, marine seismology, gravity, magnetism, and computer modeling of those processes.

Lister, Clive R. B.,* 1965, (Geophysics), Ph.D., 1963, Sc.D., 1984, Cambridge (England); marine geophysics, cooling processes in the outer layers of the earth, geodynamics.

Lorenzen, Carl J.,* 1973, (Emeritus), M.S., 1962, Ph.D., 1964, Cornell; biological oceanography, marine food chain dynamics, carbon cycling in the ocean.

Martin, Seelye, * 1968, (Research), Ph.D., 1967, Johns Hopkins; geophysical fluid dynamics, properties of sea ice.

McManus, Dean A., * 1959, (Marine Studies), M.S., 1956, Ph.D., 1959, Kansas; geological oceanography, continental shelf sediments.

Merrill, Ronald T., * 1967, ‡(Geological Sciences, Geophysics), M.S., 1961, Michigan; Ph.D., 1967, California (Berkeley); geomagnetism and paleomagnetism.

Murray, James W., * 1973, (Environmental Studies), Ph.D., 1973, Massachusetts Institute of Technology/Woods Hole Oceanographic Institution; marine geochemistry, aquatic chemistry.

Nowell, Arthur R. M., * 1978, M.A., 1971, Ph.D., 1975, British Columbia; physical oceanography, turbulent boundary layer dynamics, sediment transport.

Rattray, Maurice, Jr., * 1950, (Emeritus), M.S., 1947, Ph.D., 1951, California Institute of Technology; physical oceanography, hydrodynamics, estuarine circulation, internal waves, ocean circulation modeling.

Rhines, Peter B., * 1984, (Atmospheric Sciences), † Sc.M., 1964, Massachusetts Institute of Technology; Ph.D., 1967, Cambridge (England); theoretical physical oceanography, fluid dynamics, global ocean circulation, climate dynamics, wave propagation.

Richey, Jeffrey E., * 1973, (Research), (Environmental Studies, Quaternary Research Center), M.S.P.H., 1970, North Carolina; Ph.D., 1973, California (Davis); aquatic chemistry, aquatic biogeochemistry and systems analysis, primary Amazon River, limnology.

Sanford, Thomas B., * 1979, (Research), Ph.D., 1967, Massachusetts Institute of Technology; physical oceanography, dynamics of ocean currents, motional induction, instrumentation.

Sarachik, Edward S., * 1984, (Research), (Atmospheric Sciences), † M.S., 1963, Ph.D., 1965, Brandeis; ocean-atmosphere interaction, equatorial oceanography.

Smith, J. Dungan, * 1967, (Geophysics, Geological Sciences), † M.S., 1963, Brown; Ph.D., 1968, Chicago; coastal and estuarine physical oceanography, turbulent boundary layers, sediment transport.

Sternberg, Richard W., * 1965, (Environmental Studies), M.Sc., 1961, Ph.D., 1965, Washington; geological oceanography, marine sedimentation processes.

Stuiver, Minze, * 1969, ‡(Geological Sciences, Quaternary Research Center), M.S., 1953, Ph.D., 1958, Groningen (Netherlands); chemical oceanography, limnology, isotope geology, geochronometry.

Taft, Bruce A., * 1973, (Affiliate), M.S., 1961, Ph.D., 1965, California (San Diego); physical oceanography, ocean circulation.

Welander, Pierre L. R., * 1973, (Atmospheric Sciences), M.S., 1950, Ph.D., 1954, Stockholm (Sweden); theory of general ocean circulation, large-scale atmosphere-ocean interaction.

Wooster, Warren S., * 1976, ‡(Environmental Studies, Fisheries, Marine Studies), M.S., 1947, California Institute of Technology; Ph.D., 1953, California (San Diego); ocean circulation, effects on fish stocks, ocean affairs.

Associate Professors

Baross, John A., * 1984, M.A., 1966, San Francisco State; Ph.D., 1973, Washington; microbial oceanography, bacterial ecology.

D'Asaro, Eric, * 1980, (Research), M.S., 1976, Harvard; Ph.D., 1980, Massachusetts Institute of Technology; upper-ocean dynamics, oceanic internal waves, bottom boundary-layer processes, oceanic turbulence and mixing processes.

Deming, Jody W., 1988, Ph.D., 1981, Maryland; marine microbiology.

Duxbury, Alyn C., 1964, (Research), (Marine Studies), † M.S., 1956, Washington; Ph.D., 1963, Texas A&M; descriptive physical oceanography, mechanics of estuarine and coastal circulation.

Harrison, D. Edmunds, * 1985, (Affiliate), (Atmospheric Sciences), † M.S., 1977, Ph.D., 1977, Harvard; equatorial models and ocean circulation.

Landry, Michael R., * 1978, (Research), Ph.D., 1976, Washington; biological oceanography, zooplankton-phytoplankton interactions, grazing, predation.

Larsen, Lawrence H., * 1966, (Research), Ph.D., 1965, Johns Hopkins; physical oceanography, hydrodynamics, waves, sediment transport.

McDuff, Russell E., * 1981, (Research), Ph.D., 1978, California (San Diego); marine geochemistry.

Perry, Mary Jane, * 1976, Ph.D., 1974, California (San Diego); biological oceanography, phytoplankton physiology, nutrient cycling.

Quay, Paul D., * 1981, (Research), M.Phil., 1975, Ph.D., 1977, Columbia; chemical oceanography, stable isotope geochemistry, ocean tracers and mixing rates.

Stewart, Richard J., * 1969, ‡(Geological Sciences), Ph.D., 1970, Stanford; geological oceanography, sedimentary petrology, sediment diagenesis.

Swift, James H., * 1985, (Research), M.S., 1975, Ph.D., 1980, Washington; physical oceanography, world ocean circulation, arctic oceanography.

Assistant Professors

Karlin, Robert, 1986, (Research), M.S., 1978, Ph.D., 1984, Oregon State; marine geology/geophysics; sediment and ocean history, sedimentology, sediment geochemistry, paleomagnetism.

Kawase, Mitsuhiro, 1988, Ph.D., 1986, Princeton; physical oceanography, geophysical fluid dynamics.

Keffer, Thomas, * 1985, (Research), Ph.D., 1981, Oregon State; general ocean circulation, dispersal of tracers in turbulent flows, models of bottom-water formation and ventilation, paleoceanography.

Kunze, Eric, 1987, (Research), Ph.D., 1985, Washington; physical oceanography: mesoscale and small-scale mixing processes.

Lilley, Marvin D., * 1986, (Research), M.S., 1970, Arkansas; Ph.D., 1983, Oregon State; chemical oceanography.

McPhaden, Michael J., * 1984, (Research), Ph.D., 1980, California (San Diego); tropical physical oceanography, equatorial dynamics, air-sea interaction, and ocean climate studies.

Riser, Stephen C., * 1981, S.M., 1974, Massachusetts Institute of Technology; Ph.D., 1981, Rhode Island; physical oceanography, large- and mesoscale mixing in the ocean, water masses and tracer fields in the ocean, physics of mesoscale eddies, numerical models of ocean circulation.

Rothstein, Lewis M., * 1985, (Research), M.S., 1976, Massachusetts; Ph.D., 1983, Hawaii; physical oceanography, analytical modeling of equatorial ocean dynamics.

Schultz, Adam, 1985, (Research), (Geophysics), Ph.D., 1985, Washington; electrical conductivity studies in marine environment, ocean bottom magnetic observatories and magnetotelluric stations, mini- and microcomputer systems.

Sempere, Jean-Christophe, 1987, Ph.D., 1986, California (Santa Barbara); marine geophysics.

Smith, Craig R., * 1986, (Research), Ph.D., 1983, California (San Diego); biological oceanography: processes structuring benthic communities, megafaunal bioturbation, deep-sea carbon budgets.

Lecturer

Emerick, Christina M., 1985, Ph.D., 1985, Oregon State; marine geochemistry and tectonics.

Principal Research Associate

Halpern, David, * 1970, (Atmospheric Sciences), † Ph.D., 1969, Massachusetts Institute of Technology; upper-ocean dynamics and equatorial ocean-atmosphere climate studies.

Course Descriptions

Courses for Undergraduates

OCEAN 101 Survey of Oceanography (5) AWSpS
Origin and extent of the oceans; nature of the sea bottom; causes and effects of currents and tides; animal and plant life in the sea. Intended for nonmajors.

OCEAN 102 Man and the Ocean (5) Sp Designed to study in detail the benefits and the scientific problems created by man's activities impinging on the oceanic environment. Prerequisite: 101 or permission of instructor.

OCEAN 110, 111, 112 Lectures in Oceanography (1,1,1) A,W,Sp Selected aspects of oceanography ranging from deep-sea drilling and hydrothermal springs to the ocean's role in climate. Students interested in oceanography can learn more about the field. May be entered any quarter.

OCEAN 200 Introduction to Oceanography (3) A
Description of the oceans. Emphasis on relations of biology, chemistry, geology, and physics in marine environments. Examination of relationships and interactions at macro-, meso-, and micro-scales in the ocean.

OCEAN 201 Introduction to Field Oceanography (3) Sp Methods of oceanographic field study. Instruments and sampling techniques. Writing assignment to teach report-writing skills. Prerequisite: oceanography major or permission of instructor.

OCEAN 202 Oceanic Geography (3) W Physical properties of ocean basins. Descriptive, regional outline of world's oceans. Water mass, T/S analysis, conservation, water salt and heat budgets, advection and diffusion.

OCEAN 351, 352 Quantitative Methods I, II (3,3) A,W Applications of mathematical techniques and basic principles of the natural sciences to problems in engineering and oceanography. 351: ordinary differential equations. 352: approximate methods; Fourier series; partial differential equations; boundary-value problems. Joint with AMATH 351, 352 and MATH 351, 352. Prerequisites: one year of physics and MATH 126 for 351; 351 or MATH 238 for 352.

OCEAN 401, 402 General Physical Oceanography I, II (3,3) A,W Physical properties and processes; theories and methods describing ocean currents, waves, and tides. Prerequisites: one year each of chemistry and physics, 202 for 401; 401 for 402.

OCEAN 421 Chemical Oceanography (4) Sp Physical and chemical properties of seawater and marine products; processes determining the chemical makeup of the oceans. Prerequisite: 401 or concurrent registration.

OCEAN 433 General Biological Oceanography (4) W Marine organisms, their quantitative distribution in time and space and their interactions with the ocean. Prerequisites: 401 and BIOL 101-102 or BIOL 210, 211.

OCEAN 440 Instrumentation in Oceanography (3-6) Introduction to the general principles of instrument design, including discussions of sensors, signal processing, telemetry, and recording from the point of view of the experimental scientist. Laboratory work, for variable credit, is offered in the form of projects, preferably practical ones resulting in the completion of a small hardware device.

OCEAN 450 Marine Geology and Geophysics (4) A Sedimentological and petrologic processes that determine the geologic record.

OCEAN 451 Marine Geochemistry (3) Study of chemical aspects of more abundant minerals in marine sediments, origin or mode of formation, isotopic and

chemical composition, rate of deposition, distribution and relative importance in major sedimentary cycle, influence on chemical composition of seawater. Prerequisite: one year of general chemistry.

OCEAN 452 Principles of Sediment Transport by Turbulent Flow (3) Sp Theoretical and experimental techniques used in studying erosion, transportation, and deposition of sediment. Initial motion of sediments, bed-load motion, suspension of sediment by turbulent flows, erosion and deposition of sediments, and applications of sediment transport theory to problems of geological interest. Joint with GEOL 452 and GPHYS 452. Prerequisite: GEOL 455 or GPHYS 455.

OCEAN 460 Oceanic Data Interpretation (5) Sp Collection and analysis of marine data. Laboratory analysis of samples, data handling, and modeling of marine problems. Prerequisites: 402, 421, 433.

OCEAN 485 Topics in Oceanography (1-4, max. 5) Specialized topics in oceanography. Various techniques in solving oceanographic problems. For students with senior standing. Prerequisite: permission of instructor.

OCEAN 499 Undergraduate Research (1-12, max. 24) AWSpS Research on assigned topics that may involve laboratory work, fieldwork, or literature surveys. Prerequisite: permission of instructor.

Courses for Graduates Only

OCEAN 500 Current Problems in Oceanography (1) Discussion of research topics that are currently being investigated within the school. Prerequisite: permission of instructor.

OCEAN 501 Marine Geological Processes (5) A Overview of petrologic and sedimentologic processes that generate, modify, consume oceanic geologic record; plate-margin, midplate basalt genesis; hydrothermal metamorphism of oceanic crust; sediment sources, accumulation, postdepositional modification; passive margin sediment accumulation; trench subduction zones, basalts and andesites of oceanic island arcs; continental accretion. For first-year oceanography students. Prerequisite: permission of instructor.

OCEAN 502 Physics of Ocean Circulation (5) Structure of ocean basins; physical properties of seawater and the equation of state; heat, salt, fresh water budgets; tidal potentials; Coriolis effect and geostrophic balance; major current systems and water masses; mixing, stirring in the ocean; simple waves; modern experimental methods in physical oceanography. Prerequisite: permission of instructor.

OCEAN 503 Ocean Circulation: Observations (3) Modern large- and mesoscale ocean observations, interpreted in terms of contemporary circulation theories. Spectrum of temporal variability; eddies and eddy fluxes; ventilation; advection and diffusion in the abyss; transports of heat and salt; climatic scale of variability; modern methods for determining circulation. Prerequisite: 502 or permission of instructor.

OCEAN 504 Physical Fluid Dynamics (3) Fundamentals of fluid mechanics as a basis for understanding problems in geophysical fluid dynamics. Cartesian tensors, derivation of the Navier-Stokes equation, Bernoulli's equation and potential flow, dimensional analyses, introduction to mathematical approximation techniques, flows with rotation, effects of density stratification. For physical oceanography graduate students. Prerequisite: permission of instructor.

OCEAN 506 Physics of Marine Geologic Processes (5) W Thermomechanics of hot material upwelling at spreading centers and formation of characteristic physical structures; lithosphere thickening with age and related geophysical observables; mechanics of subduction zones; fate of sinking slabs and deep-mantle recycling; geometry of plate tectonics on a sphere; causes of vertical motions at the earth's surface. Joint with GPHYS 506. Prerequisite: permission of instructor.

OCEAN 509 Geophysical Fluid Dynamics I (3) Large-scale dynamics of rotating stratified fluids, introductory fluid mechanics. Observed properties of oceanic, atmospheric circulation. Development of geostrophic flow, thermal-wind balance, velocity spirals. Potential vorticity, instability of large-scale flows, Ekman layers. Gravity, inertia, Rossby waves; ray theory, equatorial waveguide. Action, energy principles. Joint with ATM S 509.

OCEAN 510 Geophysical Fluid Dynamics II (3) Theories, models of large-scale dynamics of oceans, atmospheres. Potential vorticity, Q principles; Rossby waves, ray tracing; Green's function, setup of general circulation; atmospheric "channels" versus ocean "basins"; wave-mean flow interaction, mountain drag, internal momentum flux; "Lagrangian" motion of particles, tracers; cascades, eddy flux of heat, moisture, Q . Prerequisite: 509.

OCEAN 511 Methods and Measurements in Physical Oceanography (2) Principal instruments and experimental methods of physical oceanography. Devices and systems that measure pressure, temperature, electrical conductivity, sea state, and velocity. Prerequisite: permission of instructor.

OCEAN 513 Marine Hydrodynamics (4) Methods for solving problems in physical oceanography. Prerequisite: major standing in a physical science.

OCEAN 514 Seminar in Physical Oceanography (1, max. 9) Discussion of selected problems of current interest in physical oceanography. Prerequisites: 402 or 502, and permission of instructor.

OCEAN 515 Waves (4) Application of marine hydrodynamics principles to wave motion in oceans. Prerequisite: 513.

OCEAN 516 Ocean Circulation (4) Hydrodynamic theories concerning origin and characteristics of major ocean currents. Prerequisite: permission of instructor.

OCEAN 517 Oceanography of Inshore Waters (5) Theories and techniques of investigation and interpretation of conditions existing in inshore waters with particular reference to mixing and flushing and to areas adjacent to the state of Washington; use of dynamic models. Prerequisite: permission of instructor.

OCEAN 518 Seminar on Dynamical Oceanography (1, max. 9) Selected problems of current importance concerning the dynamics of the ocean. Concentrates on those topics that are considered fundamental and central of importance to most of the areas of applications.

OCEAN 519 Oceans and Climate Variation (3) Interchange of heat, water, and energy; study of budgets and of mechanisms of exchange. Prerequisite: ATM S 462.

OCEAN 520 Seminar (1) AWSp Introduction to current research topics for beginning graduate students.

OCEAN 521 Seminar on Chemical Oceanography (*, max. 9) Lectures, discussions, and readings on selected problems of current interest. Prerequisite: permission of instructor.

OCEAN 522 Radiochemical Tracers and Ocean Mixing (3) Distribution of natural and bomb-produced radioactive tracers in the ocean. Application of models used to derive information concerning time scales of (1) gas transfer at the water atmosphere interface; (2) whole ocean, thermocline, and deep-ocean water circulation; and (3) particulate settling in the marine environment. Knowledge of elementary differential equations suggested. Prerequisite: permission of instructor.

OCEAN 523 Advanced Problems in Chemical Oceanography (1-4, max. 18) Field and laboratory work on selected problems of current interest. Prerequisite: permission of instructor.

OCEAN 524 Aquatic Chemistry (3) Application of physical chemistry and thermodynamics to processes that control chemical composition of natural waters. Equilibrium approach. Acid/base chemistry, the carbonate system, dissolution and precipitation, metal ions in solution, oxidation-reduction chemistry, silicate mineral reactions. Prerequisite: 527 or permission of instructor.

OCEAN 525 Marine Chemical Dynamics (3) Application of reaction rate theory to the study of chemical processes not at equilibrium in the oceans. Nonequilibrium conditions in natural waters, transient states, basic kinetic theory, reaction rates at the air-sea and sediment-water interfaces, uptake and cycling rates of chemical species by biological systems. Prerequisites: CHEM 455, 456, 457, 460, or similar background.

OCEAN 526 Marine Organic Geochemistry (3) Sources, reactions, and fates of organic molecules in the marine environment along with the stable isotope geochemistry of marine organic substances. Prerequisites: CHEM 231, 232, or permission of instructor.

OCEAN 527 Marine Chemistry (3) Processes controlling the chemical composition of seawater. Physical chemistry and equilibrium concepts, biologically controlled cycles and kinetic concepts, and radioactive elements and rates of oceanic processes.

OCEAN 529 Biological Oceanography for Physical Scientists (5) Principles and practice of biological oceanography for students with strong background in physical sciences but little recent exposure to biology. Ecological principles at individual, population, and community levels; overview of discipline of biological oceanography; case studies of interdisciplinary problems shared with the physical sciences. Prerequisite: permission of instructor.

OCEAN 530 Biological Oceanography: Bacteria and Protozoa (3) Bacteria in the marine environment; fate of organic carbon in the ocean and the interrelationship of the carbon cycle with other biogeochemical cycles. Prerequisite: permission of instructor.

OCEAN 531 Biological Oceanography: Phytoplankton (3) Phytoplankton in the marine environment; ecology, primary productivity, and physiology. Phytoplankton growth and photosynthetic patterns; spatial and temporal distributions of phytoplankton; methods for determining distributions and rates of production and growth. Prerequisite: permission of instructor.

OCEAN 532 Biological Oceanography: Zooplankton (3) Distribution and abundance of pelagic animals in space and time; analysis of their interactions. Small-scale distributions and behavior, population dynamics and energetics, trophic structure and dynamics, pelagic community structure, models of populations and food chains, secondary production and biogeography. Prerequisite: permission of instructor.

OCEAN 533 Biological Oceanography: Benthos (3) Analysis of marine benthic communities; new research questions and methods; ecologically important physics of benthic boundary layer; theories, mechanics, and observations of deposit feeding; succession as consequence of physical processes and biological interactions. Environments include deep-sea, continental shelves, estuaries and intertidal, focusing on soft substrata. Prerequisite: permission of instructor.

OCEAN 534 Methods and Measurements in Biological Oceanography (2) Methods for bacteria, phytoplankton, and zooplankton population assessment. Rate measurements of phytoplankton, zooplankton, and bacterial production. Benthos measurements, including deep-sea environments. Prerequisite: permission of instructor.

OCEAN 535 Seminar in Biological Oceanography (*, max. 9) Lectures, discussions, and work on selected problems of current interest. Prerequisite: permission of instructor.

OCEAN 536 Marine Microbial Interactions (3) Structure, function, and dynamics of natural mixed-species populations of marine bacteria and their interactions with higher organisms; mixed-species culture methods; synecological field methods; species assemblages in specialized environments; mutualisms; sites and patterns of genetic exchange. Prerequisite: 530 or permission of instructor. (Offered alternate years.)

OCEAN 537 Marine Primary Productivity (3) Patterns and mechanisms of marine phytoplankton primary production. Small-to-global-scale patterns of production; environmental regulation of production; absorption of electromagnetic radiation; fluorescence; carbon fixation; trophic interactions; remote sensing and other optical methods. Prerequisite: 531 or permission of instructor. (Offered alternate years.)

OCEAN 538 Zooplankton Ecology (3) Life history strategies, dynamics and production of populations, vertical migration, interspecific interactions and community structure, models of complex assemblages of zooplankton, sampling methods and analysis, spatial heterogeneity. Prerequisite: 532 or permission of instructor. (Offered alternate years.)

OCEAN 539 Benthic Biological Processes (3) Processes characteristic of soft-bottom benthic environments; areas and methods of rapid current progress; open research questions; deposit feeding; passive larval recruitment; physical, chemical, geological, and biological feedbacks in ecological succession; scaling of laboratory systems. Prerequisite: 533 or permission of instructor. (Offered alternate years.)

OCEAN 540 Seminar in Geostatistics (1-3) Lectures and discussions on selected problems in the applications of statistics in earth science. Prerequisite: Q SCI 483.

OCEAN 541 Marine Reflection Seismology (3) Principles of ocean reflection acoustics; effect of frequency on reflection coefficient and attenuation; bandwidth and resolution; sound sources; hydrophones, acoustic noise, tow noise; multichannel techniques; migration of reflectors; normal move out and wave-equation; physical basis and numerical methods. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

OCEAN 542 Sediment Diagenesis and Maturation (3) Changes in cold sediment undergoing deep burial and heating examined in terms of processes influencing porosity and permeability reduction, dewatering, chemical and mineralogical rearrangements. Near-surface diffusion processes, transformations of clay minerals, organic reactions and maturation phenomena stressed in tracing history of sedimentary strata undergoing temperature changes and time in sinking, filling sedimentary basins.

OCEAN 543 Petrogenesis and Geochemical Evolution of Marine Igneous Rocks (3) Petrologic processes involved in generation and metamorphism of igneous rocks in oceanic basins. Emphasizing genesis of special petrotectonic assemblages, including ridge and "hot spot" basalts, oceanic islands, midplate volcanics, igneous sequences associated with oceanic island arcs. Includes geochemical characterization of important rock types. Prerequisites: 501, 506, GEOL 424 and 425 or equivalent, and permission of instructor.

OCEAN 544 Statistical Models in Oceanography (3) Multivariate analysis: regression, trend surface analysis, factor analysis, discriminant functions, and stochastic process models in oceanography. Prerequisite: Q SCI 483 or permission of instructor.

OCEAN 545 Thermomechanics and Mechanisms in Hydrothermal Systems (3) Thermal balance of hot material injected at a plate divergence; heat transport capability of fluid convection through cracks compared to thermal conduction; theory of hydrothermal penetration into hot rock by thermal contraction crack-

ing; development history of a hydrothermal system; effects of rock/water chemical interaction and mineral deposition; mineral stills. Joint with GPHYS 545. Prerequisite: permission of instructor.

OCEAN 548 Topics in Physical Oceanography (1-4, max. 9) Lecture series on topics of major importance in physical oceanography.

OCEAN 550 Seminar on Geological Oceanography (*, max. 9) Lectures, discussions, and field and laboratory work on selected problems of current interest. Prerequisite: permission of instructor.

OCEAN 551 Marine Sediments (2) Topics in interpreting environmental significance of marine sediments. Prerequisite: permission of instructor.

OCEAN 554 Techniques for Ocean Floor Research (3) Planning field programs; selection of equipment and survey procedures; collection, analysis, compilation, and presentation of bathymetric and sediment data; evaluation of techniques and results. Prerequisite: 551, which may be taken concurrently.

OCEAN 556 Advanced Marine Geology and Geophysics (*, max. 9) AWSp Contemporary problems in marine geology; concepts supporting or at variance with accepted hypotheses; discussion of recent advances. Prerequisite: permission of instructor.

OCEAN 560 Mechanics of Erosion and Sediment Transport (3) Physics of transportation of sediment by turbulent flows. Use of theoretical fluid mechanics to formulate and solve problems of bed-load and suspended-load transport. Joint with GEOL 560 and GPHYS 560. Prerequisites: 452 and either MATH 329 or GEOL 455 or GPHYS 455.

OCEAN 561 Seminar in Geological Fluid Mechanics (3) W Reading and discussion of topics of current interest in geological fluid mechanics. Course work includes a report on a specialized topic. Joint with GEOL 561 and GPHYS 561. Prerequisite: permission of instructor.

OCEAN 562 Mechanics of Sediment Transporting Flows (3) Comprehensive investigation of mechanics of turbulent near-bottom flows responsible for erosion and transportation of sediment, and how bed-load and suspended-load transport modify characteristics of these flows. Joint with GEOL 562 and GPHYS 562. Prerequisites: 452 and either MATH 329 or GEOL 455 or GPHYS 455.

OCEAN 570 Simulation Analysis of Marine Systems (3) Introduction to the analytical methods of systems ecology. Simulation models are used in comparative analyses of the structure, nutrient and energy flow, and sensitivity of response in representative aquatic ecosystems. Prerequisites: BIOL 472, FORTRAN, MATH 126, Q SCI 482, or permission of instructor.

OCEAN 571 Gravity and Geomagnetic Interpretation (3) Power of the numerical Fourier transform to compute potential fields; gravity and magnetic fields of source bodies of arbitrary shape; inversion of observational data to plausible source models; application of the techniques to a real problem on the computer. Joint with GPHYS 571. Prerequisites: MATH 328; PHYS 323 or equivalents or permission of instructor.

OCEAN 572 Geodynamics (3) Driving forces of plate tectonics and other large-scale motions. Critical review of measured data, energy balances, basic properties of low Reynolds number flow. Qualitative physics of processes and order-of-magnitude calculations, rather than complex mathematic theory. Critiques of some hypotheses. Joint with GPHYS 572. (Offered odd-numbered years.)

OCEAN 573 Terrestrial Magnetism (3) Advanced aspects of earth magnetism intended for specialists in this field. Extensive discussion of origin theories and their implications; physical basis and theories of magnetism in rocks; paleomagnetic techniques and results. Joint with GPHYS 573. Prerequisite: permission of instructor. (Offered alternate years.)

OCEAN 580 Marine Science in the Coastal Zone (4) Major oceanic and nearshore processes, conditions, and their influence on man's activities in coastal zone. Methods of understanding and accessing the accumulated knowledge on marine processes and its application to decision-making process. Lectures and discussions of biological, chemical, geological, and physical oceanography. Generation and use of data bases as interpretative tools.

OCEAN 590 Advanced Topics in Biological Oceanography (*, max. 18) Specialized research areas. Topic varies each year. Offered at Friday Harbor Laboratories. Prerequisite: permission of director of Friday Harbor Laboratories.

OCEAN 600 Independent Study or Research (*) AWSpS

OCEAN 700 Master's Thesis (*) AWSpS

OCEAN 800 Doctoral Dissertation (*) AWSpS



School of Pharmacy

Dean

Milo Gibaldi
T341 Health Sciences

Assistant Deans

Lynn R. Brady
Peggy S. Odegard

The School of Pharmacy prepares students for careers in pharmacy in a variety of settings, including community pharmacies, hospitals and other health-care institutions, the pharmaceutical industry, and government agencies. Students are trained in the biological, chemical, physical, and social sciences and in clinical and professional practice. Training programs lead to the Bachelor of Science in Pharmacy degree or to the Doctor of Pharmacy degree. Graduates meet the educational requirement for licensure in all fifty states, because the School of Pharmacy is fully accredited by the American Council on Pharmaceutical Education.

The School of Pharmacy is organized into Departments of Medicinal Chemistry, Pharmaceutics, and Pharmacy Practice. Information about undergraduate programs and advising may be obtained from the Office of Academic and Student Programs, T329 Health Sciences. Clinical clerkship and institutional externship training sites are provided by Children's Hospital and Medical Center, Group Health Cooperative Hospital, Harborview Medical Center, Providence Medical Center, Swedish Medical Center, University Hospital, Veterans Administration Hospital, Virginia Mason Hospital, and other Seattle area hospitals. Students also are assigned to a variety of community practice pharmacy sites for externships.

Bachelor of Science in Pharmacy Degree

This program complies with educational requirements for licensure to practice pharmacy. Admission to the three-year professional program requires a minimum of 90 credits of prepharmacy training, including sequences in biology, general chemistry, and organic chemistry, as well as courses in calculus, English composition, and microbiology. Admission is competitive, based on academic achievement, communicative skills, and aptitude for pharmacy. An applicant who is admissible to the University is not assured of admission to the School of Pharmacy. Students are ordinarily admitted to the baccalaureate degree program only at the beginning of Autumn Quarter; the deadline for submission of applications is March 15. Details on admission requirements, application procedures, and program content can be obtained from the Office of Academic and Student Programs.

The baccalaureate degree program provides basic training on biological, chemical, and physical properties of drugs and on the clinical and administrative aspects of drug utilization. Core courses are required in biochemistry, biopharmaceutics and pharmacokinetics, clinical pharmacy, medication distribution and control, human physiology, immunizing and antibiotic agents, medicinal chemistry, pathology, pharmacology, pharmacy law, physical principles of drug formulation, and social aspects of pharmacy and drug use. In the third year of the professional program, students must complete a clinical clerkship and externships in community and institutional pharmacies. The 238 credits required for graduation include an opportunity for developing areas of individual expertise; at least 32 elective credits must be professional in nature.

Medicinal Chemistry

Chairperson

Wendel L. Nelson

Graduate Program

Wendel L. Nelson, Graduate Program Coordinator

The Department of Medicinal Chemistry offers programs of graduate study leading to the degrees of Master of Science and Doctor of Philosophy. The primary area of research training of the Department of Medicinal Chemistry is in chemical and molecular aspects of drug action and of drug metabolism. Studies in the field include, for example, the relationship between chemical structure and biologic effect, function, and toxicity; delineation of the metabolic spectrum of drugs or foreign substances in man and animals; and the factors (environmental, disease, etc.) that affect this spectrum of metabolites, the study of the nature and catalytic properties of the enzymes responsible for metabolic reactions, and the molecular mechanisms by which such reactions occur.

Graduates from the program must possess the skills necessary to develop quantitative and qualitative methodologies to pursue studies at the whole animal, organ, microsomal, or purified enzyme level; to elucidate and evaluate the chemical transformations that occur in metabolic processes by isolation, purification, spectroscopic investigation, structural determination, and chemical synthesis; and, ultimately, to provide an understanding and rationale at the molecular level for events that occur at the biological level.

When substantive information is available, permission may be granted for the student to bypass the master's degree and proceed directly to the doctoral program. Evidence of reading competence in one foreign language (French, German, Japanese, or Russian) is required of all graduate students, and a student who has not satisfied this requirement prior to admission is expected to do so at the earliest opportunity. Participation in a cumulative examination process and at least two quarters of teaching experience are additional requirements for the doctoral program.

Admission Requirements

Students who intend to work toward a Master of Science or Doctor of Philosophy degree must apply for admission to the Graduate School and meet the requirements outlined in the Graduate Study and Research section of this catalog. Graduate students must satisfy the requirements for an advanced degree in force at the time the degree is to be awarded. Graduate study requires approval of the Graduate School and the Department of Medicinal Chemistry.

Special Requirements

Students with undergraduate degrees in pharmacy or in the biological or physical sciences are accepted for graduate study in medicinal chemistry. Undergraduates who plan to pursue graduate study may expedite their programs by selection of pertinent electives. Although the choice of electives varies with the student's ultimate goals, graduate study in medicinal chemistry requires adequate preparation in mathematics and in the biological and physical sciences.

Master of Science Degree

A student in the master's degree program must present at least 27 credits of course work, exclusive of thesis and nonthesis research. The student also must complete a research project, prepare an acceptable thesis, and pass a final examination.

Doctor of Philosophy Degree

A student in the doctoral program must present a minimum of 45 credits of course work, exclusive of dissertation and nonthesis research. Credits earned for the master's degree may be applied toward the doctoral degree. The student must pass a General Examination for admission to candidacy for the doctoral degree, complete a research project, prepare an acceptable dissertation, and pass a Final Examination. Research for the doctoral degree must be done at this university.

Financial Aid

Financial support in the form of research assistantships and fellowships may be available to students in good standing throughout their graduate careers. Availability of financial support varies from year to year, and prospective applicants should contact the graduate program coordinator for additional information.

Correspondence and Information

Graduate Program Coordinator
305A Bagley, BG-20

Pharmaceutics

Chairperson

René H. Levy

Graduate Program

René H. Levy, Graduate Program Coordinator

The Department of Pharmaceutics offers programs of graduate study leading to the degrees of Master of Science and Doctor of Philosophy.

Program Description

These programs train research scholars in the fundamental aspects of drug disposition and action in animals and man. Graduates possess expertise in quantitative analytical techniques and in the elaboration of mathematical models to describe the various processes of pharmacokinetics (drug absorption, distribution, and elimination). Scientists graduating from this program assume positions in academia, the pharmaceutical industry, or various government research institutions. Didactic training for the doctoral program includes courses in advanced pharmaceutics, mathematics, biostatistics, computer science, drug analysis, and metabolism. After the first year, permission may be granted for students to bypass the master's degree and proceed directly to the doctoral program.

Admission Qualifications

Students with undergraduate degrees in pharmacy or in the biological or physical sciences are accepted for graduate study in pharmaceutics. Undergraduates who plan to pursue graduate study may expedite their programs by selection of pertinent electives.

Financial Aid

Financial support in the form of teaching or research assistantships and fellowships may be available to students in good standing throughout their graduate careers. Prospective applicants should contact the graduate program coordinator for additional information.

Correspondence and Information

Graduate Program Coordinator
303 Bagley, BG-20

Faculty*Chairperson*

Wendel L. Nelson

Professors

Brady, Lynn R.,* 1959, M.S., 1957, Nebraska; Ph.D., 1959, Washington; pharmacognosy.

Fischer, Louis, 1935, (Emeritus), M.S., 1928, Ph.D., 1933, Washington; medicinal chemistry.

Hutric, Alain C., 1955, (Emeritus), M.S., 1952, Ph.D., 1954, California (San Francisco); pharmaceutical chemistry.

Krupski, Edward, 1947, (Emeritus), M.S., 1941, Ph.D., 1949, Washington; medicinal chemistry.

McCarthy, Walter C.,* 1949, (Emeritus), Ph.D., 1949, Indiana; medicinal chemistry.

Nelson, Sidney D., Jr.,* 1977, Ph.D., 1974, California (San Francisco); medicinal chemistry.

Nelson, Wendel L.,* 1965, Ph.D., 1965, Kansas; medicinal chemistry.

Trager, William F.,* 1972, (Chemistry), Ph.D., 1965, Washington; medicinal chemistry.

Associate Professors

Baillie, Thomas A.,* 1981, Ph.D., 1973, Glasgow (Scotland); M.Sc., 1978, London (England); medicinal chemistry.

Elmer, Gary W.,* 1971, M.S., 1967, Connecticut; Ph.D., 1970, Rutgers; pharmacognosy.

Assistant Professors

Meier, G. Patrick,* 1984, Ph.D., 1981, Wisconsin; organic chemistry.

Teng, Lin-nar-Loh, 1978, (Research), M.S., 1963, Wyoming; Ph.D., 1970, Washington; organic chemistry.

Lecturer

Howald, William M., 1983, B.S., 1967, Washington; mass spectrometry.

Faculty*Chairperson*

René H. Levy

Professors

Gibaldi, Milo,* 1978, Ph.D., 1963, Columbia; pharmacokinetics.

Hammarlund, E. Roy,* 1960, (Emeritus), M.S., 1949, Ph.D., 1951, Washington; pharmaceuticals.

Levy, René H.,* 1970 (Neurological Surgery), † Ph.D., 1970, California (San Francisco); pharmacokinetics.

Associate Professors

Shen, Danny D.,* 1984, Ph.D., 1975, State University of New York (Buffalo); pharmaceuticals.

Slattery, John T.,* 1978, (Anesthesiology), Ph.D., 1978, State University of New York (Buffalo); pharmacokinetics.

Assistant Professors

Bowdle, T. Andrew, 1983, ‡(Anesthesiology), M.D., 1980, Ph.D., 1983, Washington; anesthesiology.

Unadkat, Jashvant D.,* 1985, (Anesthesiology), Ph.D., 1982, Manchester (England); theoretical pharmacokinetics.

Pharmacy Practice*Chairperson*

William H. Campbell

Postgraduate Professional Pharmacy Programs*Doctor of Pharmacy Degree*

The Department of Pharmacy Practice offers a two-year Doctor of Pharmacy (Pharm.D.) program for persons who wish to practice pharmacy at an advanced level. Academic and clinical education is provided for individuals who have graduated from an accredited school or college of pharmacy and who are eligible for licensure in the state of Washington. The Pharm.D. curriculum offers two options: a joint Doctor of Pharmacy/general residency program and a Pharm.D.-only program. Because enrollment is limited, admission is competitive, based on academic achievement, letters of recommendation, and a personal interview. Students are admitted to the program July 1 of each year. The Department of Pharmacy Practice must receive all application materials by January 1. Details on application procedures and program content may be obtained from the director of the Doctor of Pharmacy program, or by requesting the brochure describing the Doctor of Pharmacy/residency program.

Students complete 50 credits in didactic courses including: advanced therapeutics, biostatistics, clinical pharmacokinetics, research methods, case conferences, and departmental seminars. Sufficient elective course opportunities exist to allow the student to develop specialized expertise. In addition, a minimum of 8 five-week rotations (48 credits) are spent in clinical clerkships and residency rotations that are individually precepted by faculty members of the Department of Pharmacy Practice.

The 2080-hour residency component is completed at the University Hospital and at Harborview Medical Center under the guidance of the Director of Pharmacy Services, V. de Paul Burkhardt. The residency consists of experience in clinical practice, drug distribution, and hospital pharmacy administration. An annual stipend is associated with the joint Pharm.D./Residency program.

Master of Public Health Degree

Students can earn the Master of Public Health degree through a collaborative program with the School of Public Health and Community Medicine. Students complete an American Society of Hospital Pharmacists-accredited general residency at Group Health Cooperative of Puget Sound concurrent with a two-year program of academic study. The academic portion is broad based, with a central theme of administration. Areas of training include health services, biostatistics, epidemiology, institutional administration, pharmacy administration, and advanced clinical pharmacy and therapeutics. This combination provides the student with a solid foundation for a career in institutional pharmacy administration and offers the opportunity for further career advancement in health services administration.

Enrollment is competitive and limited to two or three students. Applicants must be graduates of an accredited school or college of pharmacy and be eligible for licensure as a pharmacist. Students are admitted to the program starting on July 1 of each year. Applicants should register for the American Society of Hospital Pharmacists residency matching program by mid-December and complete all application materials by January 31. Additional information is available from Dr. Dale Christensen, Department of Pharmacy Practice.

Faculty*Chairperson*

William H. Campbell

Professors

Campbell, William H.,* 1975, M.S., 1969, Oregon State; Ph.D., 1971, Purdue; pharmacy administration.

Hall, Nathan A.,* 1952, (Emeritus), Ph.D., 1948, Washington; pharmacy practice.

Orr, Jack E., 1956, (Emeritus), Ph.D., 1943, Wisconsin; pharmacy practice.

Plein, Elmer M.,* 1938, (Emeritus), M.S., 1931, Ph.D., 1936, Colorado; pharmacy practice.

Plein, Joy B.,* 1970, M.S., 1951, Ph.D., 1956, Washington; geriatrics, interdisciplinary programs.

Associate Professors

Bauer, Larry A.,* 1980, (Laboratory Medicine), Pharm.D., 1980, Kentucky; clinical pharmacy.

Burkhart, V. dePaul, 1982, M.S., 1972, Maryland; hospital pharmacy.

Christensen, Dale B.,* 1976, (Health Services), M.S., 1972, Oregon State; Ph.D., 1977, Minnesota; pharmacy administration.

Horn, John R., 1978, Pharm.D., 1977, Cincinnati; clinical pharmacy.

Ivey, Marianne, 1978, Pharm.D., 1987, Washington; pharmacy administration.

Kradjan, Wayne A.,* 1971, Pharm.D., 1970, California (San Francisco); clinical pharmacy.

Assistant Professors

Edwards, W. Drew, 1976, M.S., 1971, Wisconsin; gastroenterology, management.

Ellsworth, Allan J., 1984, (Family Medicine), Pharm.D., 1977, Philadelphia College of Pharmacy and Science; clinical pharmacy.

Fassett, William E., 1980, M.B.A., 1983, Puget Sound; practice management/marketing.

Ried, L. Douglas, 1985, M.S., 1982, Ph.D., 1983, Minnesota; pharmacy administration.

Scott, Dale H., 1987, M.S., 1978, Ohio State; hospital pharmacy.

Stergachis, Andreas S.,* 1980 (Clinical), (Epidemiology), † M.S., 1976, Ph.D., 1979, Minnesota; reproductive epidemiology, drug epidemiology, health program evaluation, pharmacy administration.

Tartaglione, Teresa A., 1984, Pharm.D., 1982, Florida; clinical pharmacy.

Lecturers

Andrews, G. Amber, 1986, B.S.Pharm., 1985, Washington; pharmacy practice.

Davis, Paul W., 1983, M.A., 1962, Harvard; Ph.D., 1966, Michigan; pharmacy administration.

Dawson, Karan N., 1978, (Community Health Care Systems), † M.S., 1978, Washington; clinical practice.

Odegard, Peggy S., 1986, B.S.Pharm., 1985, Washington; pharmacy practice.

Course Descriptions**Courses for Undergraduates****Medicinal Chemistry**

MEDCH 350 Medicinal and Poisonous Plants (3)
A *Brady* Review of the history/ethnobotany, chemistry, and physiological activity of selected higher plants that are used medicinally or are poisonous. A perspective for the current popular use of herbal remedies is provided. For majors and advanced-level nonmajors. Prerequisite: BIOL 212 or equivalent.

MEDCH 400 Biophysical Medicinal Chemistry (3) Sp Trager Principles of physical organic chemistry; chemical bonding, stereochemistry, acids/bases, and reaction mechanisms relevant to processes of drug distribution, binding, specificity, metabolism, and elimination. Prerequisite: CHEM 236.

MEDCH 413 Immunizing and Antimicrobial Agents (3) Sp Brady, Elmer Chemical and biologic properties of agents used to prevent or treat infectious diseases, including diagnostic, prophylactic, and therapeutic uses of immunizing biologicals and spectrum, action mechanisms, resistance patterns, toxicity, and therapeutic applications of antibiotics. Prerequisites: MICRO 301, 302.

MEDCH 435 Diagnostic Medicinal Chemistry (3) W Edwards, S. Nelson Examination of clinical diagnostic tests with regard to the chemical or biochemical rationale of the testing method, interpretation of test results, and major factors influencing test values with special emphasis on the effects of medications. Clinical laboratory data from patients considered in light of these factors. Prerequisite: BIOC 406.

MEDCH 436 Diagnostic Medicinal Chemistry Laboratory (1) W Provides experience both in the use of selected diagnostic testing procedures that are dispensed in pharmacies and in the application of diagnostic procedures to drug-level monitoring. Prerequisites: 435, which may be taken concurrently.

MEDCH 440, 441, 442 Medicinal Chemistry (3,3,3) A,W,Sp Baillie, Elmer, Meier, S. Nelson, W. Nelson, Trager Study of the various classes of medicinal compounds with particular emphasis on biological activity, mechanism of action, biotransformation, and the structural and physical properties governing absorption, distribution, and excretion. Prerequisites: CHEM 236 and CONJ 342.

MEDCH 490 Metabolism of Drugs (3) W Baillie, Trager Processes of drug metabolism, their mechanisms, and their implications in modern therapy. Bioactivation of prodrugs and biotransformations in the inactivation and elimination of drugs, and the relationship to drug toxicity and drug design. Prerequisite: CHEM 236 or equivalent.

MEDCH 499 Undergraduate Research (*, max. 6) AWSpS Research problems in medicinal chemistry, pharmaceutical chemistry and pharmacognosy. Prerequisites: cumulative grade-point average of 2.50 and permission of instructor. Entry card required.

Pharmaceutics

PCEUT 310 Drugs in Our Society (3) S Designed to develop a general knowledge of drugs and an understanding of their proper use. Discussion of drug problems and methods for their control. For nonmajors only.

PCEUT 331 General and Physical Principles (4) A Unadkat Introduction to scientific bases of pharmacy, with emphasis on physical processes important in the manufacture, stability, and characteristics of various drug dosage forms. Prerequisite: CHEM 236.

PCEUT 405 Biopharmaceutics and Pharmacokinetics (3) A Slattery Drug release from dosage forms, absorption from different routes of administration, the resulting concentration time curves in blood and urine, and the role of these factors in bioavailability and drug product selection. Prerequisites: PHARM 333, 369.

PCEUT 408 Clinical Pharmacokinetics (4) W Levy Basic principles of pharmacokinetics and their application to the clinical setting, including: single-dose intravenous and oral kinetics, multiple dosing, nonlinear pharmacokinetics, determination of patient-specific dosage regimens, role of disease in drug requirements for the major pharmacologic classes of drugs, and mechanisms and importance of drug requirements. Prerequisite: 405.

PCEUT 410 Pharmacokinetics of Drug Interactions (3) Sp Shen The common pharmacokinetic mechanisms underlying clinically important interactions between drugs. Interactions involving gastrointestinal absorption, serum drug protein binding, excretory and metabolic clearance processes. Prerequisite: 406.

PCEUT 499 Undergraduate Research (*, max. 6) AWSpS Research problems in biopharmaceutics and clinical pharmacokinetics. Prerequisites: cumulative grade-point average of 2.50 and permission of instructor.

Pharmacy Practice

PHARM 301 Drugs and Your Health (3) Sp Dawson, Staff Consumer-oriented approach addressing a broad range of health-related issues, emphasizing rational use of prescription and nonprescription medications. Topics include general health care, how to use drugs appropriately, economic factors that impact upon health care, and use of self-help medications. Offered on credit/no credit basis only. Enrollment limited to nonmajors.

PHARM 304 Profession of Pharmacy (3) A Overview of the profession of pharmacy emphasizing practice opportunities, specializations, professional associations and publications, laws, ethics and professionalism, terminology, and basic pharmacotherapeutics of prescription and nonprescription drugs. Offered on credit/no credit basis only. Prerequisite: pharmacy majors; prepharmacy students by permission of instructor.

PHARM 305 Clinical Dispensing Pharmacy (1-3, max. 3) AWSpS Preparation and dispensing of prescriptions at Rubenstein Memorial Pharmacy in Hall Health Center and University Hospital outpatient pharmacy. For students with little or no experience in pharmacy wishing experience prior to internship, externship, or didactic course work. Under direct supervision of the Student Health Service pharmacist and University Hospital pharmacists. Offered on credit/no credit basis only. Prerequisites: pharmacy major and permission of instructor.

PHARM 315 Introduction to Pharmacotherapeutics (3) W Drug therapy, principles of pharmacology; pharmacologic-therapeutic classes of drugs; clinically important prototype drugs; drug information resources. Recommended: prior or concurrent courses in anatomy, physiology, and microbiology. Enrollment limited to nonmajors.

PHARM 333 Medication Distribution and Control (3) W Fassett Distribution of medication in ambulatory and inpatient settings. Design and supervision of distribution systems that prevent and detect medication errors and help ensure rational use of drug therapy. Professional responsibilities of pharmacists in dispensing medications pursuant to order of prescriber. Prerequisites: concurrent registration in 334 and PCEUT 331.

PHARM 334 Dispensing Practice and Calculations Laboratory (1) W Fassett Exercises in dispensing medications pursuant to order of prescriber. Intravenous admixtures, extemporaneous compounding, patient profiles, patient counseling, use of computers for outpatient dispensing. Required pharmaceutical calculations proficiency taught through exercises, computer-aided instruction, and assigned practice problems. Prerequisites: concurrent registration in 333 and PCEUT 331.

PHARM 340 Pharmacy, Health, and Society (3) A Campbell Overview of the health-care system, with an emphasis on factors of financing, organization, and patterns of use of pharmacy services; contemporary health issues, such as cost control, quality insurance, and national health insurance; and implications to pharmacy. Prerequisite: pharmacy major.

PHARM 369 Pharmacy Experience Project I (PEP I) (1) A Odegard Role of a pharmacist in practice. Overview of drug action. Students complete a practice-related project in a community or hospital pharmacy and complete a self-instructional program on introductory pharmacodynamics and pharmacokinetics. Offered on credit/no credit basis only. Prerequisite: pharmacy major standing.

PHARM 409 Applied Pharmacokinetics (2) Sp Bauer Pharmacokinetics of specific drugs. Influence of age, weight, sex, and disease states on patient-specific dosage regimens. Advanced kinetic concepts. Prerequisite: PCEUT 406 or permission of instructor.

PHARM 411 Medical Devices for Home Health Care (3) Sp Fassett Study of medical devices commonly provided by pharmacists to their patients, including their selection and adaptation for specific patient needs. Lectures include display and demonstration of actual devices. Enrollment limited. Prerequisite: 333.

PHARM 412 Nonprescription Drugs and Self-Care (3) Sp Pharmacist's counseling on self-care and use of nonprescription medications. Patient assessment, selection of nonprescription products if appropriate, advice to patients. Prerequisite: 484, which may be taken concurrently.

PHARM 415 Applied Drug Therapy in Nursing (3) Clinical applications of drugs in primary-care and hospital settings. Selected drugs compared and contrasted as to indications; efficacy; therapeutic, adverse effects; monitoring parameters; dosing principles; dosage forms; common drug interactions. Individualization of patient drug therapy requirements emphasized. Prerequisites: 315; CONJ 340-341-342; PATH 444 or equivalent; PN 323, 324.

PHARM 435 Social and Behavioral Aspects of Pharmacy Practice (3) W Christensen Overview of health, illness, and sick-role behavior, patterns of drug prescribing and use, drug-taking compliance, the aging process and drug services for the elderly. Practice-based communication techniques and skills presented, demonstrated, and practiced. Prerequisite: pharmacy major standing.

PHARM 450 Pharmacy Laws (3) A Study of the laws regulating the practice of pharmacy. These include federal, state, and municipal laws and professional ethics.

PHARM 451 Pharmacy Law Update (1) Sp Changes in federal and state statutes and regulations relating to drugs, controlled substances, pharmacy practice, and licensing of practitioners and pharmacies. Complements 450 and provides new information as statutes and regulations change. Prerequisite: 450.

PHARM 452 Contemporary Problems (1) Sp Discussion of current trends affecting the role of pharmacy in health-care delivery. Offered on credit/no credit basis only. Prerequisite: third-year standing.

PHARM 460 Principles of Professional Practice Management (3) W Campbell, Christensen, Ried Topics include organization of time and objectives, management of financial resources, management of inventory, and marketing management. Emphasis on developing specific skills, such as burden rate analysis, and financial ratio analysis. Primarily for students who are interested in managerial careers in community pharmacy practice. Prerequisite: 340.

PHARM 481 Pharmaceutical Marketing (3) A Introduction to marketing concepts as applied to delivery of pharmaceutical products and services. Trends in the pharmaceutical marketplace; focus on pharmaceutical industry practices as they affect community and institutional pharmacy. Prescriber and consumer behavior relative to legend and over-the-counter drugs. Prerequisite: pharmacy major.

PHARM 485 Computer Applications in Pharmacy Practice (3) A Christensen, Fassett Computer applications in pharmacy practice. Microcomputers, includ-

ing elementary computer concepts, with introduction to programming and applications languages. Programs used in clinical and administrative pharmacy functions (kinetics, prescription processing, and similar applications).

PHARM 470 Externship in Community Practice (8) Closely supervised study-experience periods in community pharmacies. Students participate in active community pharmacy under the supervision of clinical preceptor. Conferences on selected topics supplement work experience. Offered on credit/no credit basis only. Prerequisite: permission of instructor. Entry card required.

PHARM 471 Externship in Institutional Practice (4) Closely supervised study-experience periods in hospital or other institutional pharmacies. Students participate in active institutional pharmacy under supervision of clinical preceptor. Conferences on selected topics supplement work experience. Offered on credit/no credit basis only. Prerequisite: permission of instructor. Entry card required.

PHARM 472 Advanced Externship in Pharmacy Practice (*, max. 16) Advanced level externship in pharmacy in a community, institutional, long-term care, or specialty practice setting under direct supervision of a clinical preceptor. Offered on credit/no credit basis only. Prerequisite: permission of instructor. Entry card required.

PHARM 481 Introduction to Clinical Pharmacy (3) W Consideration of principles of patient monitoring and provision of drug information. Instruction in approaching a patient chart, interviewing patients, and medication counseling techniques. Consideration of variables affecting patient behavior. Prerequisites: PHCOL 401, 402.

PHARM 483 Introduction to Hospital Pharmacy (2) W Burkhardt Practice of hospital pharmacy, systems utilized, and basis they provide for patient care.

PHARM 484 Clinical Pharmacy (4) Sp Clinical roles of the pharmacist and study of more common diseases and their drug therapy. Methods of drug therapy monitoring, drug histories, laboratory tests, drug administration, and case method studies of drug therapy. The pharmacist's professional responsibilities for inpatient and outpatient care. Prerequisites: 481.

PHARM 485 Clinical Pharmacy (3) A Continuation of 484 with emphasis on disease states and their drug therapies. Lectures stress assessment of drug therapy and application of basic pharmaceutical sciences to selection of drugs in patient care. Prerequisite: 484.

PHARM 487 Clinical Pharmacy Clerkship (4) AWSpS Supervised experience in the clinical roles of pharmacy practice. Students participate in daily rounds, take drug-use histories, monitor drug therapy of patients, instruct patients about discharge medications, and provide drug therapy consultation to other health-care professionals. Offered on credit/no credit basis only. Prerequisites: 481, 484, and permission of instructor.

PHARM 488 Advanced Clinical Pharmacy Clerkship (*, max. 16) Advanced-level clinical pharmacy experience in institutional (hospital, nursing home, long-term-care facility) and ambulatory patient-care facilities under direct supervision of a clinical preceptor. Offered on credit/no credit basis only. Prerequisites: 487 and permission of instructor.

PHARM 489 Drug Information (4-8) AWSpS Supervised experience in performing clinical pharmacy activities relating to retrieval and analysis of drug information from various resources; preparation of responses to consultation requests presented to Drug Information Service; techniques of preparing written and verbal drug information reports; participation in preparation of a pharmacy newsletter. Prerequisite: permission of instructor. Entry card required.

PHARM 490 Fluid and Electrolytes and Parenteral Nutrition (2) Sp Edwards, Ivey Principles of fluid and electrolyte therapy, including saline, water, and acid-base balance. Carbohydrate, protein, lipid, vitamin, and mineral requirements in parenteral nutrition. Nutritional assessment, complications of parenteral nutrition, stability and compatibility of intravenous solutions, modifications of parenteral nutrition in pediatrics and specific disease states. Prerequisite: 481.

PHARM 491 Cancer Pharmacotherapeutics (2) Sp Black Pharmacotherapy of cancer, covering supportive care (antibiotics, antiemetics, analgesics, nutrition) to the antineoplastic agents themselves. Specialists in each area serve as guest lecturers. Designed for pharmacists. Prerequisite: third-year professional standing in pharmacy.

PHARM 492 Pharmaceutical Services for Long-Term Care (2) W Plein Scope of pharmaceutical services for long-term care (LTC) and systems for services. Responsibilities of the pharmacist for distributive, administrative, and clinical pharmacy services for nursing homes and other long-term-care facilities. Economic considerations in provision of LTC pharmaceutical services. Role of the consultant pharmacist for home-health-care organizations. Pharmaceutical services for independently living elderly. Prerequisite: pharmacy major.

PHARM 495 Special Studies in Pharmacy (*, max. 6) AWSpS Special studies of professional topics in pharmacy. An opportunity to expand the breadth and depth of understanding in specific pharmaceutical areas. Students usually undertake independent study under the individual direction of a faculty member. Prerequisite: permission of instructor. Entry card required.

PHARM 497 Drug Therapy for the Elderly (3) Plein Current knowledge of effects of aging on clinical use of drugs for elderly and aged patients. Drugs of choice and drug therapy monitoring. Multiple drug regimens in treatment of multiple pathologies. Prerequisite: 415 or 484 or permission of instructor.

PHARM 499 Undergraduate Research (*, max. 6) AWSpS Pharmaceutical research problems. Prerequisites: cumulative grade-point average of 2.50 and permission of instructor. Entry card required.

Courses for Graduates Only

Medicinal Chemistry

MEDCH 501, 502, 503 Advanced Medicinal Chemistry (4,4,4) A,W,Sp Baillie, Elmer, Meier, S. Nelson, W. Nelson, Trager Advanced study of the various classes of medicinal compounds, with particular emphasis on biological activity, mechanism of action, biotransformation, and the structural and physical properties governing absorption, distribution, and excretion. Prerequisite: permission of instructor.

MEDCH 520 Seminar (1, max. 5) AWSp Graduate students attend seminars and make one formal presentation per year while in residence; 1 credit per year is allowed. Offered on credit/no credit basis only.

MEDCH 521, 522 Advanced Medicinal Chemistry (3,3) W,Sp Baillie, Elmer, Meier, S. Nelson, W. Nelson, Trager Application of integrated data from the physical and biological sciences to problems of chemotherapy, including transport of drugs to site of action, biotransformation of drugs, interaction of drugs with enzyme systems, and recent advances in drug design. Prerequisites: CHEM 457, 531, and BIOC 442, or permission of instructor.

MEDCH 527 Drug Metabolism (3) W Juchau, S. Nelson Considerations of the biochemical mechanisms for the biotransformation of drugs and foreign compounds. Includes reaction mechanisms, ultrastructural considerations, induction mechanisms, methodology, kinetics of inhibition and activation, steroid and amine metabolism. Joint with PHCOL 527. (Offered odd-numbered years.)

MEDCH 541 Mass Spectrometry in Life Sciences (3) Sp Baillie, Howald Principles of modern mass spectrometry. Applications to problems in chemical, biological, and health sciences. Applications of mass spectrometric techniques to the structural determination and quantitative measurement of biologically important substances. Joint with CHEM 541. Prerequisite: permission of instructor. (Offered odd-numbered years.)

MEDCH 582 Topics in Medicinal Chemistry (1, max. 10) AWSp Discussion of pertinent articles from current literature. Offered on credit/no credit basis only.

MEDCH 600 Independent Study or Research (*) AWSpS Offered on credit/no credit basis only.

MEDCH 700 Master's Thesis (*) AWSpS Offered on credit/no credit basis only.

MEDCH 800 Doctoral Dissertation (*) Offered on credit/no credit basis only.

Pharmaceutics

PCEUT 501 Advanced Pharmacokinetics I (3) Sp Gibaldi, Levy, Shen, Slattery, Unadkat Drug absorption, distribution, excretion, metabolism, and effects in mammalian systems. Compartmental model and model-independent approaches examined. Drug disposition is studied in a physiologically realistic context taking nonlinear events into account. Aimed at development of innovative methods for data analysis and evaluation in biological systems. Prerequisites: 405 and 406 or equivalent, introductory calculus.

PCEUT 502 Advanced Pharmacokinetic Concepts (2) S Levy, Shen, Slattery, Unadkat Recent developments and emerging concepts in theoretical and experimental pharmacokinetics. Critical analysis of the current literature. Prerequisite: 501.

PCEUT 506 Pharmacokinetics (2) Sp Levy, Slattery Discussion format in which students are given reading assignments prior to class in the area of basic pharmacokinetics and examined orally over the material in class. Offered on credit/no credit basis only. Prerequisite: 406.

PCEUT 510 Pharmacokinetics of Drug Interactions (3) Sp Shen Common pharmacokinetic mechanisms underlying the clinically important interactions between drugs. Interactions involving gastrointestinal absorption, serum drug protein binding, excretory and metabolic clearance processes. Prerequisite: 406 or equivalent.

PCEUT 520 Seminar (1, max. 5) AWSp Graduate students attend seminars and make one formal presentation per year while in residence; 1 credit per year is allowed. Offered on credit/no credit basis only.

PCEUT 524 Advanced Pharmaceutics (2) Sp Unadkat Theoretical concepts in physical pharmacy with applications to pharmaceutical systems. Mass transport, reaction kinetics, surface phenomena, rheology, solid dosage forms, and sustained-release drug delivery. Prerequisite: CHEM 456.

PCEUT 583 Topics in Pharmaceutics (1, max. 15) AWSp Discussion of pertinent articles from current literature and recent laboratory results. Offered on credit/no credit basis only.

PCEUT 600 Independent Study or Research (*) AWSpS Offered on credit/no credit basis only.

PCEUT 700 Master's Thesis (*) AWSpS Offered on credit/no credit basis only.

PCEUT 800 Doctoral Dissertation (*) AWSpS Offered on credit/no credit basis only.

Pharmacy Practice

PHARM 501 Orientation to Pharm.D. (2) S Weekly meetings with faculty in Department of Pharmacy Practice to discuss current research and practice

interests of the faculty. Includes introduction to use of computer systems available to students in the department. Offered on credit/no credit basis only. Prerequisite: first-year Doctor of Pharmacy degree student status.

PHARM 505 Clinical Pharmacokinetics (3) W Bauer Clinically oriented introduction to advanced pharmacokinetic theories. Didactic presentation of the above materials of particular drugs or classes of drugs. Prerequisites: 484, 530, PCEUT 405, and permission of instructor.

PHARM 506 Clinical Pharmacokinetics (3) Sp Bauer Continuation of 505. Discussion sessions regarding the pharmacokinetics of a drug or class of drugs are required. An original research proposal developed by each student and presented in class. Prerequisites: 484, 530, 505, PCEUT 405, and permission of instructor.

PHARM 507 Topics in Clinical Pharmacokinetics (1, max. 12) AWSp Gibaldi New and important findings and trends in pharmacokinetics, biopharmaceutics, drug metabolism, and drug toxicity, with particular emphasis on clinical significance and applicability. Offered on credit/no credit basis only. Prerequisite: PCEUT 405 or equivalent.

PHARM 520 Seminar (1, max. 5) AWSp Graduate students must attend seminars and make one formal presentation per year while in residence; 1 credit per year is allowed. Offered on credit/no credit basis only.

PHARM 530 Seminar: Research Methods in Pharmacy Practice (3) Sp Christensen Research methods and protocols designed to help develop skills in preparing research proposals and conducting research in pharmacy practice. Selected research methods, sources of data, analysis designs, and statistical meth-

odologies. Prerequisites: graduate standing in pharmacy; one statistics course or permission of instructor.

PHARM 550 Pharmacotherapeutics for Older Adults (3) Plain Clinical use of drugs for older adults. Age-related pharmacokinetics, pharmacodynamics, and pharmacotherapeutics as applied to selecting and monitoring drug regimens for elderly patients. Problem solving regarding drugs of choice for older people with multiple pathologies. Open to Doctor of Pharmacy degree and health sciences graduate students.

PHARM 582 Primary Care Pharmacy II (2) A Erickson, Fuller, Kradjan Introduction to the use of protocols for monitoring chronic disease states, with practice in development of specific protocols for anticoagulation, diabetes, hypertension, and others. Prerequisite: permission of instructor.

PHARM 583 Advanced Clinical Pharmacy and Therapeutics I (6) Lecture-discussion format with extensive reading assignments for each topic. Disease states with current therapeutic approaches are the major emphasis. Infectious diseases, oncology and chemotherapy, and gastrointestinal diseases are covered. Prerequisite: graduate standing in pharmacy practice.

PHARM 584 Advanced Clinical Pharmacy and Therapeutics II (6) Lecture-discussion format with extensive reading assignments for each topic. Basic disease states with current therapeutic approaches are the major emphasis. Cardiovascular diseases, psychiatry and psychotropics, pulmonary diseases, renal diseases, and fluid and electrolytes. Prerequisite: 583.

PHARM 585 Advanced Clinical Pharmacy and Therapeutics III (6) Lecture-discussion-demonstration format with extensive reading assignments for each topic. Basic assessment skills important to the advanced pharmacy practitioner, protocol develop-

ment and implementation, neurological diseases, endocrine diseases, obstetrics and gynecology, pediatrics, and geriatrics. Prerequisite: 584.

PHARM 586 Clinical Case Conferences (1) AWSp Kradjan Biweekly clinical literature evaluation and case presentation conferences stressing current therapeutics and decision making. Prerequisite: 585.

PHARM 587 Advanced Clinical Clerkship: Inpatient Care (*, max. 15) AWSp Under faculty supervision, students participate in medical and pharmacy patient rounds in hospitals or long-term-care facilities, monitor drug therapy, instruct patients concerning proper use of medications, and provide drug consultation to other health-care providers. Offered on credit/no credit basis only. Prerequisites: 485 or equivalent, and permission of instructor.

PHARM 588 Advanced Clinical Clerkship: Outpatient Care (*, max. 15) AWSp Under faculty supervision, students refine skills in developing and maintaining a drug-use data base for ambulatory patients. Activities include taking drug histories, developing patient medication profiles, and documenting drug-use experience. Offered on credit/no credit basis only. Prerequisites: 485 or equivalent, and permission of instructor.

PHARM 589 Advanced Clinical Clerkship: Drug Information Services (*, max. 15) AWSp Under faculty supervision, students refine skills in the retrieval, analysis, and clinical use of drug information from library resources. Students receive training in the Drug Information Service, where they receive and respond to information requests. Offered on credit/no credit basis only. Prerequisites: 485 or equivalent, and permission of instructor.

PHARM 600 Independent Study or Research (*) AWSp Offered on credit/no credit basis only.



Graduate School of Public Affairs

Dean

Margaret T. Gordon
M253 Smith

The Graduate School of Public Affairs is a graduate professional school providing education and research for the public service. The school offers a program of study leading to the degree of Master of Public Administration, designed to prepare professional practitioners of management and policy analysis for all levels and areas of the public service. Graduates serve throughout the public sector as foreign service officers; city managers; city and county administrative officers; staff assistants to elected officials; program and policy analysts with budget offices, legislative staff units, and city and county councils; administrators for the performing arts; and line and staff officers for a multitude of state and federal agencies. In addition, a number of alumni are employed in the private and not-for-profit sectors, although usually in positions that involve substantial and continuing contact with the public sector.

Master of Public Administration Degree

The degree of Master of Public Administration is awarded upon satisfactory completion of 60 credits of course work, including a degree project. Students without prior experience in public service work also are expected to complete a supervised twelve-week internship. The program normally requires two full academic years, and, for those requiring an internship, the intervening summer. Foreign-language proficiency or a thesis are not required for the M.P.A. degree.

Program of Study

The school's curriculum provides a flexible framework within which students can develop a program of study consistent with their previous training, experience, and career goals. All students are required to complete a core curriculum of seven one-quarter courses (3 credits each) covering political institutions and processes, economic and social institutions and processes, techniques of analysis, organizational and administrative concepts, and the management of human and financial resources. After completion of the core course requirements, students are assisted, through advising, in utilizing their remaining courses to advance their respective career objectives. In so doing, students are encouraged to select an area of concentration consisting of a minimum of four courses in a given area, such as organization and management, policy analysis, foreign affairs, natural resources or urban affairs. With the approval of the program adviser, the student selects courses from those offered by the school and by other University units. Central to the program are courses offered by numerous other schools and colleges throughout the University, and courses taught by cooperating and participating faculty members serve as an integral part of the school's curriculum.

In addition to the basic course work and internship, students have the opportunity to participate in seminars at which distinguished public servants appear, in workshops, in conferences sponsored by the school, and in the activities of the Institute for Public Policy and Management.

Midcareer Education

A substantial number of students in the school are public servants with several years of public service who, on a part- or full-time basis, take graduate work at mid-career to prepare themselves for new and broader pol-

icy and managerial responsibilities. The University is one of eight institutions participating in the Education for Public Management program sponsored by the U.S. Office of Personnel Management. Under this program, a number of state and federal officials enroll each year in the Graduate School of Public Affairs for a special midcareer educational program emphasizing the administration of public policy.

Institute for Public Policy and Management

The Institute for Public Policy and Management constitutes the major research arm of the school. It performs a variety of roles concerned with problems of public policy and administration in the state of Washington, the Pacific Northwest, and the United States. The institute develops and administers programs to increase opportunities for cooperative interdisciplinary research by faculty members and graduate students on problems of public policy that have lasting significance. The institute publishes quarterly *Washington Public Policy Notes*, which is distributed to more than two thousand officials and organizations, as well as occasional papers, monographs, and reports. The institute also sponsors workshops, conferences, and symposia to enhance the abilities of those in the public sector and in the community-at-large to understand and address major public policy issues and to make public management decisions.

Admission Requirements

Admission to the program requires formal application to the University's Graduate School and to the Graduate School of Public Affairs. The school invites applications from students with such varied academic backgrounds as political science, economics, business administration, history, philosophy, social work, engineering, public health, or other fields in the social and physical sciences and the humanities. Admission is subject to the approval of the school's admissions committee. Consideration is given to the applicant's academic record, Graduate Record Examination test scores, a written statement of interest in a public service career, employment or other experience, letters of recommendation, and, where feasible, a record of personal interview.

In selecting students for admission, three basic standards are used: (1) The academic record must demonstrate the applicant's ability to do the graduate-level work required by the program. (2) The applicant must give evidence of clear commitment and strong motivation to seek a career in the public service. (3) The applicant must show promise of achievement in a professional career as well as potential to make a contribution to the public service.

Although there is no formal requirement with respect to specific undergraduate courses, each applicant's undergraduate preparation is carefully considered during the admission process. It is highly recommended that students seeking entry take courses in mathematics and statistics, economics, and government. Ideally, an entering student will have had at least two courses in each of these three areas. A student who lacks sufficient preparation in these areas may be required to demonstrate an aptitude or ability in a given area prior to admission or may be required to take appropriate courses in addition to the minimal course requirements for the degree.

A limited number of new students can be admitted to the program each year, and a new class is normally admitted for the year each Autumn Quarter. Applications for Autumn Quarter that are completed by March 15 will be ensured full consideration. Applications received after that date will be considered on a space-available basis.

Financial Aid

Limited assistance is available in the form of research assistantships, fellowships, scholarships, and part-time employment with public agencies. Among the opportunities available are the George A. Shipman and Robert J. Lavoie Public Affairs scholarships, the Asso-

ciation for Public Policy Analysis and Management minority fellowships, and the Scottish Rite Foundation of Washington Public Service fellowships. Students who wish to be considered for financial assistance should complete the appropriate section of the school's supplementary information form. Financial assistance is based on merit. Other forms of financial assistance, awarded primarily on the basis of financial need, are also available through the University. If possible, students interested in being considered for merit-based financial aid should notify the school by February 15 of the year prior to the year for which they seek to enter the program and should submit their completed applications not later than March 15. Students applying for need-based financial support must comply with all relevant established deadlines of the University, which in some cases may be earlier than March 15.

Additional information and a detailed description of the program may be obtained by writing to the Graduate Program Coordinator, Graduate School of Public Affairs, DP-30, University of Washington, Seattle, WA 98195, or by telephoning (206) 543-4920.

Faculty

Professors

Crutchfield, James A., 1949, (Emeritus), (Economics, Marine Studies),† M.A., 1942, California (Los Angeles); Ph.D., 1954, California (Berkeley); natural resource utilization and public policy.

Denny, Brewster C.,* 1961, M.A., 1948, Ph.D., 1959, Fletcher School of Law and Diplomacy; American foreign and defense policy, science and public policy.

Gordon, Margaret T.,* 1988, Ph.D., 1972, Northwestern.

Kroll, Morton,* 1958, (Political Science),† Ph.D., 1952, California (Los Angeles); organizational theory, comparative bureaucracy, ethics, arts management.

Locke, Hubert G.,* 1976, M.A., 1962, Michigan; criminal justice, urban policy, race and ethnic relations.

Lyden, Fremont J.,* 1962, (Political Science), M.P.A., 1952, Ph.D., 1960, Washington; organizational and systems theory, personnel management, program design and budgeting.

Miles, Edward L.,* 1974, (Marine Studies),† Ph.D., 1965, Denver; international law and organization; science, technology, and international relations; marine policy and ocean management.

Wen, Edward M., Jr.,* 1970, (Emeritus), (Civil Engineering),† M.Sc., 1947, Harvard; Ph.D., 1950, Johns Hopkins; technology policy and public science policy, marine affairs, decision theory, risk assessment, social process modeling.

Williams, Walter,* 1970, M.B.A., 1956, Texas; Ph.D., 1960, Indiana; high-level decision making, policy implementation.

Wolfe, Dael L., 1969, (Emeritus), M.S., 1928, Washington; Ph.D., 1931, Ohio State; science and public policy, development of human talent.

Zerbe, Richard O.,* 1976, (Civil Engineering), Ph.D., 1969, Duke; law and economics, cost-benefit analysis, economic history, environmental regulation.

Associate Professors

Brock, Jonathan, 1985, M.B.A., 1973, Harvard; labor relations, negotiation and mediation, public management, managing people.

Dobel, J. Patrick,* 1985, A.M., 1972, Ph.D., 1976, Princeton; political theory, ethics and public policy, organizational theory.

Hyman, Barry I.,* 1975, (Mechanical Engineering),† M.S., 1961, St. Louis; Ph.D., 1965, Virginia Polytechnic Institute; energy policy, technology and public policy, quantitative methods.

May, Peter J.,* 1979, (Political Science),† M.P.P., 1976, Ph.D., 1979, California (Berkeley); policy analysis, quantitative methods.

Miller, Ernest G.,* 1965, M.P.A., 1953, Washington; Ph.D., 1959, Princeton; management and organizational development, organization theory, administrative behavior.

Plotnick, Robert D.,* 1984, (Social Work),† M.A., 1973, Ph.D., 1976, California (Berkeley); economics of poverty, labor and social welfare policy, public policy.

Zumeta, William M.,* 1985, M.P.P., 1973, Ph.D., 1978, California (Berkeley); public management, policy analysis, education and manpower policies, regulation.

Assistant Professors

Leman, Christopher K.,* 1986, M.A., 1977, Ph.D., 1977, Harvard; natural resources management, organizational theory, policy analysis.

Sy, Karen,* 1984, ‡(Library and Information Science), M.S., 1968, Ph.D., 1984, Wisconsin (Madison); information systems, information policy, information dissemination and utilization.

Vaughn, Lea B., 1985, (Law),† J.D., 1978, Michigan; labor law, administrative law, public law.

Lecturers

Brown, Marsha D.,* 1976, M.A.T., 1967, Brown; Ed.D., 1980, Harvard; statistics, quantitative analysis, education policy.

Harris, Leighanne, 1978, M.Ed., 1973, Ph.D., 1979, Washington; human resource policy, educational policy, federal American Indian policy.

Narver, Betty J., 1976, M.A., 1973, Washington; education policy and finance, state and local fiscal issues, social and health policies.

Course Descriptions

Course for Undergraduates

PB AF 410 Summer Program in Policy Skills (15) Integrated materials basic to study and analysis of public organizations, policy and administration: microeconomic policy analysis, applied statistical analysis, communication skills for effective public service, public policy formulation and development. Faculty-team teaching approach. Offered on credit/no credit basis only. Open only to Sloan Fellows. Entry card required.

Courses for Graduates Only

PB AF 500 General Seminar (1, max. 9)

PB AF 501 Public Policy and Administration (3) Interaction between the bureaucracy and those institutions, organizations, and groups involved in the policy process. Analysis of current policy problems is made from this perspective. Joint with POL S 570.

PB AF 503 Administrative and Executive Leadership (3) Nature of executive life in the public sector, the function of leadership in implementing, making, and changing policy. Leadership styles, the relation of leadership to its constituencies and communities. Joint with POL S 572.

PB AF 504 Administrative Ethics (3) Moral dilemmas that confront public managers. Critical view of societal and political values that prescribe moral behavior. Organizational and professional ethics. Ethical problems of public organization managers. Systematic means for understanding, analyzing, and coping with moral issues that appear in a career.

PB AF 505 The Law of Public Administration (3) Legal framework of public administrative action in the United States, emphasizing constitutional requirements; operation of the administrative process; management of personnel, funds, and contracts; and judicial review of administrative activity. Primarily for students in the Graduate School of Public Affairs; others by permission of instructor.

PB AF 507 International Organizations and Ocean Management (3) Survey of the manner in which international organizations attempt to manage and regulate the uses of the ocean. Primary emphasis on the analysis of processes that support or constrain these organizations and on the search for alternative policies and organizations. Joint with IMS 507. Prerequisite: IMS 500 or permission of instructor.

PB AF 509 Public Organizational Theory (3) Approaches to the study of organizational behavior in a changing society, including consideration of formal and informal organization, personality needs, role playing, client relations, and sociopolitical and technological environment.

PB AF 510 Management Analysis (3) Survey of the theory, current practice, and experience relating to governmental organizations and their program objectives.

PB AF 513 Public Policy Analysis (3) Sp May Production and use of analysis to support public decisions. For people pursuing careers as public analysts or managers. Defining problems, devising alternative solutions, clarifying stakes in choices, predicting impacts of choices. Skills developed by working on specific policy problems. Assumes familiarity with statistics, microeconomic theory, and institutions and processes of American government.

PB AF 514 Policy Implementation (3) How policies are implemented and a set of analytic skills for anticipating and diagnosing implementation problems. Primarily for students who plan to become public-sector policy analysts or managers. Mastery of basic literature on implementation and its application to solving problems of public policy, including estimating feasibility of policy alternatives and identifying the sources of implementation failure, is expected. Prerequisites: microeconomics, organization theory.

PB AF 515 Decision Theory (3) Use of formal models and quantitative methods as an aid to decision making in the public sector. Both deterministic and probabilistic models are explored. Formal decision-analysis techniques are used to examine how uncertainty can be formally dealt with in a quantitative approach to decision making. Cost-benefit analysis and discounting and present value estimations are stressed. Prerequisite: basic statistics and economics courses.

PB AF 516 Microeconomic Policy Analysis (3) AW Plotnick, Zerbe Ways in which microeconomic analysis can contribute to the analysis of public sector issues. Supply and demand, consumer and firm behavior, competitive and monopoly markets, income distribution, market failure, government intervention. Policy applications of theory. Prerequisite: elementary economics.

PB AF 517 Economics of the Public Sector (3) Methods of analyzing effects of public expenditures and taxes on behavior of individuals and firms, on economic efficiency, and on equity and distribution of income. Theory and practice of intergovernmental fiscal relations. Application of theory to formulation of public policy. Prerequisite: 516.

PB AF 518 Macroeconomic Policy Analysis (3) W Plotnick, Zerbe Macroeconomic institutions and processes that influence formulation and implementation of public policy and provide context within which much of public management occurs. Particular attention given to application of macroeconomic and public finance theory to formulation and implementation of public policy. Prerequisite: principles of economics; recommended: 516.

PB AF 519 Policy Analysis Workshop (3) Techniques and methods required in social policy analysis, including the technical issues in developing, using, and interpreting research relevant for social policy and bureaucratic problems in using research and analysis in the policy process. Designed to aid future administra-

tors and analysts in performing policy analysis and in working with researchers to develop relevant studies and with the agency bureaucracy to integrate research and analysis. Prerequisite: permission of instructor.

PB AF 520 Federal Delivery Systems and Domestic Policy (3) Comparative study of the existing and proposed methods by which the federal government may deliver services or benefits. Students examine service programs administered by the federal government, grant programs, direct-payment systems, voucher systems, block grants, revenue sharing, and tax deduction and credit systems. Selected programs are examined to determine probable impact on beneficiaries, intergovernmental relations, and program accountability. Political and constitutional limitations are also discussed. Prerequisite: permission of instructor.

PB AF 521 Public Management: Program Planning and Design (3) Policy context of planning and programming, the institutionalization of purpose, the planning process, activity design, work scheduling and measurement, and program evaluation.

PB AF 522 Public Management: Budgeting (3) Budgeting as a management process. Study of formulation and administration of government budget, including the role of budgeting in the policy process, the approaches to budget formulation and analysis, the development of the PPB approach, and the aspects of budget administration, such as revenue estimating, allotment control, and cost accounting.

PB AF 523 Public Management: Personnel (3) Study of line-staff decision making in acquisition and use of human resources in public organizations, including evaluation of job responsibilities, establishment of compensation levels, collective bargaining, selection and placement, performance appraisal, incentive management, and training.

PB AF 524 Managing People in Public and Non-profit Agencies (3) Brock Emphasizes the role of the program manager rather than that of the personnel officer. Managing people within a variety of programmatic, bureaucratic, and political settings. Case studies and a video exercise.

PB AF 525 Organizational Development in Public Agencies (3) Miller Philosophies, theories, and models of behavioral science interventions in organizational diagnosis and development (OD). In addition to a review of the basic literature dealing with the OD approach, emphasis is placed on examination of case studies and class experience in OD applications, including organizational diagnosis, problem confrontation, and team building. Prerequisite: permission of instructor.

PB AF 527, 528 Quantitative Analysis, Advanced Quantitative Analysis (3,3) Brown, Hyman, May This two-quarter sequence applies quantitative methods to management and policy problems. Lectures, discussion, and computer exercises using statistical packages and microcomputers expose students to data and decision analysis. Exploratory data analysis, hypothesis testing, linear models, time-series analysis, decision analysis. Prerequisite: undergraduate course in mathematical or statistical reasoning.

PB AF 530 Financial Management in the Public Sector (3) Exploration of the managerial uses of accounting and other processes of financial management in the public sector. Topics covered include: financial planning and control, fund accounting, cost accounting, asset accounting, internal controls, auditing, financial analysis, and financial reporting. Prerequisite: permission of instructor.

PB AF 532 Economic Theory of Regulation (3) Zerbe Develops a political framework for analyzing regulations and regulatory reform; influence of legal history; theories of regulation and regulatory behavior. Joint with ECON 532. Prerequisite: 516 or ECON 400.

PB AF 533 Regulatory Policy (3) *Zerbe* Principles of regulation applied to case studies; transportation, environmental safety, communication, monopoly regulation; issues of deregulation and substitutes for regulation. Prerequisite: 532 or ECON 532.

PB AF 534 American Foreign Policy (3) *Denny* American foreign policy viewed whole, including defense policy, the relationships of foreign policy to domestic policies and priorities, and the full range of historical, constitutional, institutional, political, and theoretical questions related to the formation and the execution of foreign policy in this broad sense. Joint with POL S 534.

PB AF 535-536 Seminar in American Foreign Policy (3-3) *Denny* Foreign policy and defense policy formation and execution. Administration of national security programs, White House, Congress, state and defense departments, special problems, and case studies. Prerequisite: 534.

PB AF 537 Foreign Policy: Strategy, Intelligence, Arms Control (3) *Denny* Strategic relationship between the U.S.A. and the USSR in the post-World War II period. Tools of intelligence and strategic analysis, arms control, and domestic and allied consensus on strategic objectives. Each student analyzes a major policy issue and makes a policy proposal. Prerequisite: 534 or permission of instructor.

PB AF 540, 541 Social Management of Technology I, II (3,3) A,W *Wenk* Interaction of technology and society through general principles and case studies of contemporary issues. Systems analysis of technological enterprise, its scientific base, roles of capital, specialized manpower, organizational structure and management; decision making and institutional behavior; goal generation; strategies, risk assessment, and policy planning. 540: policy process. 541: policy analysis. Joint with CIVE 540, 541. Prerequisites: permission of instructor for 540; 540 for 541.

PB AF 545 Systems Theory and the Public Policy Process (3) *Lyden* Survey of systems theory approaches to the study and the analysis of public organizations and their environments, including systems analysis, cybernetics, information theory, and general and social systems theory.

PB AF 548 Economics of Labor and Human Resources (3) *Plotnick* Economic analysis of policy-related topics in human resources. Topics include labor demand and supply, education and occupation, wage structures and income inequality, discrimination, and poverty. Joint with ECON 548. Prerequisite: equivalent of ECON 400, or permission of instructor; not open to economics majors.

PB AF 550 Public Arts Policy and Management (3) *Kroll* Role of government in arts. Range of public support at federal, state, and local levels; reasons for its development and viability. Nature, evolution, functions of public arts agencies in implementing arts policy; relation of such agencies to their constituencies. Seattle, King County, and Washington State serve as case studies.

PB AF 551 Comparative Administrative Systems (3) Methodological problems of research in comparative administration. Theoretical and substantive aspects of administrative systems in urban-industrial and developing nations. Joint with POL S 579.

PB AF 552 Administrative Problems of Development (3) Problems of administering developing nation-states and regions, including theoretical aspects of development administration, bureaucratic change, administrative-political interaction in policy making, organizational development, political impact of administering major programs. Prerequisite: permission of instructor.

PB AF 553 Applied Cost-Benefit Analysis (3) Familiarity developed through problems and applications. Techniques of use stressed. Prerequisite: 516 or ECON 300 or 400 or permission of instructor.

PB AF 554 Advanced Seminar in Cost-Benefit Analysis (3) Techniques of, and theoretical foundation for, cost-benefit analysis as applied to the public sector. Joint with ECON 554. Prerequisite: 553 or permission of instructor.

PB AF 556 Public Policy, Administration, and Political Theory (3) Examines the meaning of democracy in the context of American public policies and administration. The perspective of individual and group participation in the policy process, the individual's role in organization, the functions of the public servant in the making of policy decisions, and the realities of policy formulation in relation to political values. Enables the student professionally committed to public activity to reflect in a discussion setting upon his or her position as a participant in the society in which he or she works. Joint with POL S 567.

PB AF 557 The Politics of Collective Bargaining in the Public Sector (3) *Brock* Seminar explores purposes served by establishment of collective bargaining, the benefits and beneficiaries of the bargaining process, and implications of bargaining for the political power of managers, union leaders, union rank and file, unorganized workers, and citizen-consumers. Both private and public sectors are discussed with focus on collective bargaining in government agencies. Participants need some background in organizational theory and are expected to engage in fairly extensive reading and in a research project.

PB AF 558 Mediation and Negotiation as Instruments of Public Management and Policy-Making (3) Possibilities offered by mediation and negotiation methods using a mixture of cases, readings, discussions, lectures, and guest speakers. Use of negotiation and mediation techniques to resolve disputes and disagreements over public-policy issues.

PB AF 561-562 Policy Development and Administration: Urban Affairs (3-3) A two-quarter graduate course in the structures, functions, and processes of government in cities, with special emphasis on the origin, content, and implementation of public policies. Major focus is on the political process at the municipal level: the distribution of influence, the political actors, the decision-making machinery, and the policy outputs. Of special interest to graduate and professional students preparing for careers in urban government.

PB AF 565 Seminar in Urban Public Policy Analysis (3) The use of methodology from public administration, political science, and economics to examine urban public policies. Emphasis on the relationships between research and public policy. Prerequisite: permission of instructor.

PB AF 567 The Administration of Justice: Policy, Law, and Politics (3) Contemporary problems, trends, and issues in American policing within the context of the history, role, and function of law enforcement in urban America. Emphasizes the external tensions between the stated ideals of a democratic society and the realities of institutionalized crime-control methods and procedures, internal conflicts between the quest for professionalization of the police function versus the demand for organizational effectiveness and accountability, and current efforts toward institutional change and functional reorganization.

PB AF 568 Seminar in Law and Justice (3) The current volatility in American law enforcement revolves around a number of policy issues that have emerged in the past decade and are considered crucial to the future role, organization, and function of urban policing. Nine of these issues are explored, with emphasis on their historic settings, the "actors" who shape their articulation, and the parameters of the debate, legal constraints on, and sociopolitical considerations in, the development of policy alternatives, and emerging patterns of resolution. Prerequisite: 567 or equivalent.

PB AF 569 Race and Public Policy (3) Way in which the persistent problem of race is expressed in the formation and implementation of social and public policy.

PB AF 571, 572, 573 Public and Educational Policy Issues in the Development of Human Talent (3,3,3) *Brown, Zumeta* Three (noncumulative) courses on policy issues involving education, training, the economy, and the development of the nation's human resources. Relationship between education, training, and work; underutilized workers; race and gender discrimination issues; the role of education/training in economic development. Joint with EDPGA 553.

PB AF 577 Risk Assessment for Environmental Health Hazards (3) A Context, methodologies, types of data, uncertainties and institutional arrangements for risk assessment. Both qualitative and quantitative approaches to the identification, characterization, and control of environmental hazards to health emphasized through didactic and case studies. Joint with ENV S 577, ENVH 577, and CEWA 577. Prerequisites: BIOST 511, EPI 511, or permission of instructor.

PB AF 580 United States Energy Policy (3) Energy policy formulation and implementation with emphasis on post-1973 developments. Energy conservation programs; changing roles of oil, coal, gas, nuclear, and solar energy; institutional, environmental and equity considerations; government research and development programs.

PB AF 581 Information in the Public Policy-making Process (3) Demystifying information base for policy-making in a democracy. Theoretical needs and opportunities for input of information associated with three branches of government and each phase of policy-making. Focus on actors who bring information to policymakers. Federal, state, and local comparisons. Joint with LIBR 585. Prerequisite: LIBR 500 or permission of instructor.

PB AF 583, 584, 585 Seminar in Science and Public Policy (3,3,3) Issues and problems relating to the interaction of science and scientists with the public policy-making process. Science versus the nature and values of political processes, and the continuing tensions between the two. The evolving interaction between scientific and technical knowledge and political power; scientific versus ethical judgments. Role of science in the establishment of national goals. Plans and proposals for increasing governmental competence to deal with public policy issues involving science and technology.

PB AF 586 International Science and Technology Policy (3) Seminar is designed: first, to analyze the relationships between research and development policy, capabilities, and national technological strategies for advanced industrial and less-developed countries; second, to deal with the international implications of particular technologies as countries try to make policy for them in regional and global organizations. Examples of specific technologies are chosen from such fields as space telecommunication, weather and climate modification, airline transportation, nuclear energy, and seabed exploitation.

PB AF 590, 591, 592 Midcareer Seminar (3,3,3) *Miller* Interdisciplinary seminar in public policy for midcareer executives. Open to participants in the Education for the Public Management Program; others by permission of instructor.

PB AF 593, 594, 595 Policy Development and Administration: Natural Resources (3,3,3) Interdisciplinary research seminar in natural resources policy development and administration. Major concern is with the processes of natural resources policy formulation and analysis, and the role of various sectors in influencing policy development and administration. Open to graduate and professional students in varied disciplines who are emphasizing preparation in natural resources fields. Prerequisite: permission of instructor.

PB AF 599 Special Topics (2-6, max. 6) Systematic study and analysis of special subject matter in public policy. Topic for each quarter varies, depending upon the needs of the school and the interests of students and faculty. May be repeated for credit. Prerequisite: permission of instructor.

PB AF 600 Independent Study or Research

PB AF 605- Degree Project (1-6)

School of Public Health and Community Medicine

Dean

Gilbert S. Omenn
F350 Health Sciences

Associate Dean

Patricia W. Wahl

The School of Public Health and Community Medicine offers graduate programs leading to the degrees of Master of Public Health, Master of Science, and Doctor of Philosophy. In the M.P.H. program, the student may select an area of emphasis in one of three fields: environmental health, epidemiology, or health services. These programs are directed particularly at preparing individuals for research, academic, or professional practice careers.

Admission requirements vary according to the field in which the student wishes to major and are given in the departmental descriptions that follow. Prior consultation with the departments is recommended. Applicants holding medical degrees have three options: one of the master's programs, research fellowship, or two-year residency in general preventive medicine, public health, or occupational medicine. For the medical student, a concurrent M.D.-M.P.H. program is offered. Ph.D. programs are offered in biostatistics and epidemiology, and proposals for Ph.D. programs in pathobiology and in Environmental and Occupational Health Sciences are being prepared. Doctoral studies in health services in collaboration with other school and campus departments are available.

Students may earn both Master of Public Health and Master of Science in International Studies degrees concurrently through a special program offered jointly by the School of Public Health and Community Medicine and the Henry M. Jackson School of International Studies (M.P.H.-M.A.I.S.). The interdisciplinary curriculum covers the complex relationship between public health problems of the developing world and the cultural, economic, and political environments in which they exist. Both schools provide tools to gain insights into community-based problems and to implement change. Another concurrent degree program is the M.P.H.-M.S.W. in maternal and child health offered jointly with the School of Social Work.

Other opportunities include training in the Radiological Sciences Group of the Graduate School, which offers the M.S. degree. The Master of Health Administration degree is offered by the Health Services Administration Group. These programs are described elsewhere in this bulletin. The school also offers a nontraditional, part-time extended M.P.H. program in the Department of Health Services for midcareer health professionals who are unable to participate in the in-residence master's program.

Biostatistics

F600 Health Sciences

The Department of Biostatistics offers Master of Science and Doctor of Philosophy degrees in quantitative

methods applied to the medical and biological sciences, and to the ecological sciences in conjunction with the Center for Quantitative Science in Forestry, Fisheries, and Wildlife. Biology, medicine, and ecology are undergoing major changes in their development as quantitative sciences. As technological advances find expression in new research tools, new theoretical concepts are being employed in the analysis of quantitative data. The techniques and viewpoints of mathematics and statistics, traditionally peripheral to biology, medicine, and ecology, are rapidly being woven into the fabric of the life sciences, thereby providing exciting new opportunities in research and teaching.

Many universities have instituted programs relating mathematics or statistics to one particular biological field. The aim of the program at this university is to give students the opportunity to bring together one or more branches of mathematics with selected fields of biology, medicine, or ecology.

Admission Requirements

Students may enter the program from an undergraduate major in mathematics, statistics, or a biological field. An applicant must have completed or be in the process of completing two years of calculus, one course in linear algebra, and one course in probability theory.

In addition to fulfilling graduate admission requirements, an applicant must submit three letters of recommendation from persons competent to evaluate the applicant's abilities, a narrative statement concerning the applicant's purpose and interest in entering the program, and an official Graduate Record Examination score report, for which only verbal and quantitative sections are required. Recommendation for selection of candidates is made by a faculty admissions committee, with review of applicants beginning in February for admission Autumn Quarter. The application deadline is April 1.

Master of Science Degree

The Master of Science degree program includes two pathways: (1) biostatistics and (2) quantitative ecology and resource management.

The student must complete required course work, demonstrate competence in computer programming, write a thesis, and pass a first-year examination. This examination is offered at the conclusion of a student's first year, and, if a student does not pass, it can be retaken the next year. A student also may receive a non-thesis Master of Science degree by successfully passing the first- and second-year qualifying examinations.

Doctor of Philosophy Degree

Students working for the Doctor of Philosophy degree follow either the biostatistics, quantitative ecology and resource management, or individual pathway. The biostatistics pathway emphasizes the theory and application of statistics to the health sciences. The quantitative ecology and resource management pathway applies statistics and mathematical modeling techniques to ecological and natural resource problems. Students in the individual pathway usually emphasize applied mathematics and its use in mathematical biology.

In addition to the course work, the program requires competence in computer programming, research experience, passing scores on all examinations (first- and second-year examinations, biology examinations, and General Examination), and a dissertation.

Correspondence and Information

Director, Graduate Program in Biostatistics and Biomathematics
Department of Biostatistics, SC-32

Faculty

Chairperson

Norman E. Breslow

Professors

Bare, B. Bruce,* 1969, ‡(Forest Resources), M.S., 1965, Minnesota; Ph.D., 1969, Purdue; harvest scheduling, biometry, forest land management, taxation, finance, management science.

Breslow, Norman E.* 1967, Ph.D., 1967, Stanford; clinical trials, epidemiology, survival and categorical data.

Crowley, John J.* 1981, M.S., 1970, Ph.D., 1973, Washington; survival analysis: cancer clinical trials and carcinogenesis studies; statistical methods in epidemiology.

Davis, Kathryn A. B.* 1974, M.A., 1966, Michigan; Ph.D., 1974, Washington; density estimation, cardiovascular data analysis, clinical trials.

DeRouen, Timothy A.* 1975, (Community Dentistry), † M.S., 1969, Ph.D., 1971, Virginia Polytechnic; applications to the epidemiology of cardiovascular and sexually transmitted diseases.

Diehr, Paula,* 1970, (Health Services), M.S., 1967, Ph.D., 1970, California (Los Angeles); application of statistics to health services research, multiple regression.

Feigl, Polly,* 1969, M.A., 1957, Ph.D., 1961, Minnesota; application of statistics to biomedical studies and cancer patient data systems.

Fisher, Lloyd D., Jr.* 1966, (Applied Mathematics), M.A., 1965, Ph.D., 1966, Dartmouth; cardiovascular data analysis, clinical trials, multivariate statistics, longitudinal data analysis.

Fleming, Thomas R.* 1984, (Statistics), † M.A., 1974, Ph.D., 1976, Maryland; survival analysis, cancer-related trials, sequential analysis.

Ford, E. David,* 1985, ‡(Fisheries, Forest Resources, Statistics), Ph.D., 1968, University College (London); simulation of plant physiology and ecological processes, analysis of spatial processes.

Gallucci, Vincent F.* 1972, ‡(Fisheries, Forest Resources), M.S., 1966, State University of New York (Buffalo); Ph.D., 1971, North Carolina State; biomathematics and population dynamics.

Hallstrom, Alfred P.* 1975, (Research), M.S., 1962, Ph.D., 1968, Brown; application of statistics to biomedical data, cardiovascular applications, emergency medical services.

Kronmal, Richard A.* 1964, (Statistics), † Ph.D., 1964, California (Los Angeles); nonparametric density estimation, computer algorithms, cardiovascular data analysis.

Martin, Donald C.* 1972, (Psychiatry and Behavioral Sciences), M.S., 1961, Ph.D., 1968, Florida State; statistical computing, randomization tests, approximations for probability functions.

Moolgavkar, Suresh H.* 1984, ‡(Epidemiology), M.B.B.S., 1966, Bombay (India); Ph.D., 1973, Johns Hopkins; cervix and breast carcinoma epidemiology.

Perrin, Edward B.* 1962, ‡(Health Services), M.A., 1956, Columbia; Ph.D., 1960, Stanford; health information systems, stochastic modeling, research methodology.

Peterson, Arthur V., Jr.* 1975, M.S., 1971, Ph.D., 1976, Stanford; survival data methodology, competing risks, design of medical studies, random number generation.

Prentice, Ross L.* 1974, M.S., 1968, Ph.D., 1970, Toronto; survival analysis, case-control and cohort study methods, biostatistical consulting.

Thompson, Donovan J.* 1966, (Emeritus), M.A., 1947, Minnesota; Ph.D., 1951, Iowa State; sampling, community trials, community health surveys.

van Belle, Gerald.* 1974, M.A., 1964, Ph.D., 1967, Toronto; clinical trials, applied statistics, screening, epidemiology.

Wahl, Patricia W.* 1971, Ph.D., 1971, Washington; multivariate statistical techniques, especially regression analysis applied to cardiovascular data.

Wellner, Jon A.* 1983, (Statistics),† Ph.D., 1975, Washington; large-sample theory, asymptotic efficiency, empirical processes, survival analysis.

Associate Professors

Benedetti, Jacqueline K.* 1980, (Research), (Medicine), Ph.D., 1974, Washington; clinical trials methodology, categorical data.

Blumenstein, Brent A.* 1983, (Research), M.S., 1970, Ph.D., 1974, Emory; computer applications in biostatistics, cancer clinical trials, applied statistics.

Conquest, Loveday L.* 1978, ‡(Fisheries), M.S., 1972, Stanford; Ph.D., 1975, Washington; biological applications and statistics.

Green, Stephanie J.* 1984, (Research), M.A., 1973, Indiana; Ph.D., 1979, Wisconsin; longitudinal data analysis, clinical trials, cancer research.

Kopecky, Kenneth J.* 1978, (Research), M.S., 1975, Ph.D., 1977, Oregon State; clinical trials design and analysis, survival data analysis, epidemiologic methodology, goodness of fit, biomedical and cancer-related applications.

O'Sullivan, Finbarr, 1987, (Statistics),† Ph.D., 1983, Wisconsin; inverse problems, statistical computing, applied statistics.

Polissar, Lincoln.* 1974, M.A., 1968, Ph.D., 1974, Princeton; cancer data analysis, epidemiologic methods, medical care.

Self, Steven G.* 1984, M.S., 1977, California State (Long Beach); Ph.D., 1981, Washington; longitudinal data analysis, survival time models, clinical trials.

Temkin, Nancy R.* 1977, (Neurological Surgery),† M.S., 1971, Connecticut; Ph.D., 1976, State University of New York (Buffalo); clinical trials, recovery models, statistical modeling—epileptic phenomenon, survival analysis.

Assistant Professors

Cain, Kevin C.* 1984, M.S., 1977, Michigan; Ph.D., 1982, Harvard; survival time models, decision analysis.

McKnight, Barbara.* 1982, M.S., 1979, Ph.D., 1981, Wisconsin; survival analysis and competing risks, carcinogenesis testing, epidemiology, and diabetes research.

Raghunathan, T. E., 1987, Ph.D., 1987, Harvard; sample surveys, longitudinal studies, Bayesian techniques.

Thornquist, Mark D., 1985, M.A., 1978, M.S., 1982, Ph.D., 1985, Wisconsin (Madison); ordinal response, repeated measures data, categorical response.

BIOST 473 Application of Statistics to Health Sciences (4) Standard statistical techniques with examples drawn from health sciences literature. Critical interpretation of research results, and introduction to the computer for data processing and statistical analysis. The sequence 472, 473 is the equivalent of 511. Prerequisite: 472 or equivalent.

Courses for Graduates Only

BIOST 511 Medical Biometry I (4) AS Presentation of the principles and methods of data description and elementary parametric and nonparametric statistical analysis. Examples are drawn from the biomedical literature, and real data sets are analyzed by the students after a brief introduction to the use of standard statistical computer program packages (e.g., SPSS, BMDP, MINITAB). Statistical techniques covered include description of samples, comparison of two sample means and proportions, simple linear regression and correlation.

BIOST 512 Medical Biometry II (4) W Further analysis of qualitative data, including basic epidemiologic statistics, life table, log rank test. Introduction to one- and two-way analysis of variance; fixed, random, and mixed models; multiple comparisons. Examples from the biomedical literature and computer analyses of real data. Prerequisite: 511 or 473 or equivalent.

BIOST 513 Medical Biometry III (4) Sp Factorial and other experimental designs. Multiple regression, analysis of covariance, discriminant analysis; use of transformations, dummy variables, variable selection procedures, detection of outliers; elements of multiple logistic and Cox regression. Examples from biomedical literature, computer analyses of real data, and report writing. Prerequisite: 512 or permission of instructor.

BIOST 514 Biostatistics I (4) Mathematically sophisticated presentation of principles and methods of data description; graphics; point, confidence interval estimation; hypothesis testing; relative risk; odds ratio; Mantel-Haenszel; chi-square test (matrix algebra required). Examples drawn from biomedical literature; real-data sets analyzed using statistical computer package. Prerequisite: biostatistics majors or permission of instructor.

BIOST 515 Biostatistics II (4) Mathematically sophisticated introduction to linear models; multiple regression, correlation; residual analysis; dummy variables; analysis of covariance; one-, two-way analysis of variance; randomized blocks; fixed, random effects (repeated measure, factorial designs); multiple comparisons (matrix algebra required). Real biomedical data sets analyzed. Prerequisite: 514, biostatistics major, or permission of instructor.

BIOST 521 Biostatistics for Experimentalists (4) Statistical aspects of design, data analytic models appropriate to classes of experiments most commonly employed in biomedical sciences. One-, two-way analyses of variance; factorial, crossed, nested, repeated measures designs. Clean, messy real-data sets analyzed using BMD or SAS computer programs. Prerequisites: 511, or 472 and 473, or equivalent.

BIOST 522 Applications of Vital and Health Statistics (3) Analysis of routinely collected data on the health status and care of populations, with emphasis on the potential and limitations of this approach. Stressed are the importance of such data for the development and the evaluation of programs and the recognition of new hazards. Joint with EPI 522. Prerequisite: 472 or equivalent or permission of instructor.

BIOST 523 Computer Applications in Biostatistics (4) Multiple regression emphasized. Other topics (analysis of variance, analysis of covariance, path analysis, and discriminant analysis) treated in less detail as subsets of multiple regression. Factor analysis and automatic interaction detector also used. Examples from the health services and social science literature stressed. Modified case-method approach used, with each student assigned a data set to analyze throughout the class. Prerequisite: 511 or 473.

BIOST 524 Design of Medical Studies (3) Design of medical studies, with emphasis on randomized controlled clinical trials. Bias elimination, controls, treatment assignment and randomization, precision, replication, power and sample size calculations, stratification, and ethics. Suitable for graduate students in biostatistics and for research-oriented graduate students in other scientific fields. Joint with STAT 524. Prerequisites: 511 or equivalent, and one of 513, STAT 421, 423, 512, or EPI 512; or permission of instructor. (Offered even-numbered years.)

BIOST 529 Sample Survey Techniques (3) Design and implementation of selection and estimation procedures in sample surveys. Emphasis on the sampling of human populations, although principles apply to other sampling problems. Topics include simple, stratified, and cluster sampling, multistage and two-phase procedures, optimal allocation of resources, estimation theory, replicated designs, variance estimation, national samples and census materials. Joint with QMETH 529 and STAT 529. Prerequisite: 511, STAT 421 or 423, QMETH 500 or equivalent; or permission of instructor.

BIOST 534 Statistical Computing I (3) Computational methods in statistics: sorting, searching, and calculation of order statistics; data interpolation and approximation; numerical methods for least squares and principal components; computational geometry; calculation of probabilities; data structures and data-base management. Joint with STAT 534.

BIOST 535 Statistical Computing II (3) Computational methods in statistics: generation of pseudo random numbers, Monte Carlo quadrature, variance reduction techniques, design of Monte Carlo studies, nonlinear optimization, nonlinear least squares, selected special topics. Joint with STAT 535.

BIOST 536 Categorical Data Analysis in Epidemiology (4) A Summary of univariate categorical data analysis; introduction to multivariate analysis of categorical epidemiologic data using multiplicative models. Experience at interpretation; familiarity with available programs gained by analysis of *bona fide* data, critiques of analyses appearing in literature. Joint with EPI 536. Prerequisites: 513 and EPI 514, or 515, or permission of instructor.

BIOST 537 Survival Data Analysis in Epidemiology (4) W Introduction to multivariate analysis of survival data using multiplicative models. Application to epidemiologic studies. Familiarity with interpretation and available computer programs gained by analysis of *bona fide* sets of data and critiques of analyses appearing in the literature. Joint with EPI 537. Prerequisite: 536 or permission of instructor.

BIOST 570 Linear Models (3) Review of linear algebra and matrix manipulations. Statistical distribution theory for quadratic forms of normal variables. Fitting of the general linear model by least squares. Computer-data analysis for classical experimental designs. Joint with STAT 570. Prerequisites: STAT 421, 423, or 513; and STAT 513; and a course in matrix algebra.

BIOST 571 Topics in Applied Regression Analysis (3) Advanced statistical methods course for biostatistics and other graduate students already familiar with the general linear hypothesis. Develops extensions of usual linear least squares theory and discusses effects of departures from this theory. Examples of analyses for nonstandard problems are presented and computers are used for homework assignments. Analyses of residuals, use of transformations, polynomial models, methods of model selection, and robust methods. Joint with STAT 571. Prerequisites: 513, 570, a matrix algebra course, or permission of instructor.

BIOST 572 Topics in Applied Linear Models (3) W Advanced topics in applied regression analysis: generalized linear models; nonlinear regression; robust regression. ANOVA models with random effects: meth-

Course Descriptions

Courses for Undergraduates

BIOST 472 Introduction to Statistics in Health Sciences (4) Description and examples of common concepts in biostatistics. Probability, point and confidence interval estimation, hypothesis testing including two-sample and paired *t* and chi-square tests, introduction to simple linear regression. Examples in health sciences stressed.

ods of estimation; mixed, nested, and unbalanced designs; repeated measures and longitudinal data. Statistical computing and data analysis. Joint with STAT 572. Prerequisites: 570, 571.

BIOST 573 Statistical Methods for Categorical Data (3) Sp Exact and asymptotic methods of analysis for 2x2 contingency tables. Maximum likelihood estimation of logistic regression models for binary response variables, and selected examples of the use of these models in epidemiologic and clinical research. Introduction to the theory and applications of log linear models for discrete data. Selected special topics. Joint with STAT 573. Prerequisites: 571 and STAT 581, or permission of instructor.

BIOST 574 Multivariate Statistical Methods (3) W Use of multivariate normal sampling theory, linear transformations of random variables, one- and two-sample tests, profile analysis, partial and multiple correlation, multivariate ANOVA and least squares, discriminant analysis, principal components, factor analysis, robustness, and some special topics. Some computer use included. Joint with STAT 574. Prerequisite: 570 or permission of instructor.

BIOST 576 Statistical Methods for Survival Data (3) Statistical methods for censored survival data arising from follow-up studies on human or animal populations. Parametric and nonparametric methods, Kaplan-Meier survival curve estimator, comparison of survival curves, log-rank test, regression models including the Cox proportional hazards model, competing risks. Joint with STAT 576. Prerequisites: STAT 581 and either 513, STAT 423, or equivalent. (Offered alternate years.)

BIOST 577 Advanced Design and Analysis of Experiments (3) Concepts important in experimental design: randomization, blocking, confounding. Application and analysis of data from randomized blocks designs, Latin and Graeco-Latin squares, incomplete blocks designs, split-plot and repeated measures, factorial and fractional replicates, response surface experiments. Joint with STAT 577. Prerequisite: 570 or STAT 421 (minimum 3.0) or permission of instructor.

BIOST 578 Special Topics in Advanced Biostatistics (*, max. 3) Advanced-level topics in biostatistics offered by regular and visiting faculty. Joint with STAT 578. Prerequisite: permission of instructor.

BIOST 579 Advanced Data Analysis (4) Resampling methods; jackknife, bootstrap, cross-validation. Smoothing techniques; local averages; projection-pursuit regression; recursive partitioning regression. Selected aspects of linear regression. Robust-resistant methods. Density estimation. Clustering techniques. The EM-algorithm. Graphical exploratory methods. Prim-81. Joint with STAT 579. Prerequisites: 571 and STAT 513 or permission of instructor.

BIOST 580 Seminar in Biostatistics (*, max. 9) AWSp Presentation and discussion of special topics and research results in biostatistics. Speakers include resident faculty, visiting scientists, and advanced graduate students.

BIOST 590 Biostatistical Consulting (*) AWSpS Training in consulting on the biostatistical aspect of research problems arising in the biomedical field. Students, initially under the close supervision of a faculty member, participate in discussions with investigators leading to the design and/or the analysis of a quantitative investigation of a problem. With experience, independent associations of student and research worker are encouraged, with subsequent review by faculty of resulting design and analysis. Prerequisite: permission of instructor.

Environmental Health

F463 Health Sciences

Undergraduate Program

Bachelor of Science Degree

This curriculum focuses on environmental conditions in the community and workplace that affect the health and well-being of people, and the means by which these conditions may be eliminated or controlled. Traditional public health topics are covered, including water, wastewater, food protection, housing, vectors, and epidemiology. Other subject matter covered includes industrial hygiene, toxicology, hazardous waste management, and environmental health regulation. Graduates from this curriculum have career opportunities in public health, occupational health, and environmental protection.

Admission Requirements: Junior standing. CHEM 140, 150, 151, 160, 231, 232, 241, 242; BIOL 210, 211, 212; MATH 124; MICRO 301, 302; and ENGR 331.

Graduation Requirements: 36 credits in environmental health; BIOST 472, 473, EPI 420; one-quarter internship.

Correspondence and Information

Undergraduate Program Adviser
F461 Health Sciences

Graduate Program

The Department of Environmental Health offers two graduate degrees, Master of Science and Master of Public Health. The M.S. degree programs are directed to the study of industrial hygiene and safety, industrial hygiene and radiological health, environmental health sciences-toxicology, and environmental health sciences-technology. The M.P.H. degree program is designed for persons with a doctorate seeking education and clinical training in occupational medicine and preventive medicine.

The industrial hygiene and safety program (M.S.) focuses on technical, psychological, and administrative aspects of the prevention or control of industrial disease and accidental injury. The industrial hygiene and radiological health program focuses on the prevention and control of industrial disease, emphasizing the health effects and control measures relating to radiation sources.

The environmental health sciences program (M.S.) focuses on research on the health effects of toxic substances (toxicology) and on community problems associated with toxic substances and their control, hazardous-waste disposal, and traditional areas of environmental health, such as water and wastewater treatment (technology). Students who select the toxicology emphasis participate in laboratory research on molecular and biochemical processes involved in chemically induced toxic responses, such as soft-tissue (brain, lung, and liver) damage, teratogenesis, or carcinogenesis. In the technology emphasis, students may focus their research on the monitoring and control of hazardous substances and biological agents contaminating surface and ground waters, or on hazardous-waste management. This may involve field and laboratory activities.

The M.P.H. degree program provides didactic instruction and participation in field studies involved with industrial or work-related health problems. Research efforts focus on the etiology and prevention of occupational disease. In most cases, this program is taken in conjunction with a postgraduate residency.

The Department of Environmental Health cooperates with the Department of Health Services in a three-year, part-time Extended Master of Public Health degree program designed for midcareer public and community health professionals. Students continue their employment, are required to attend one-month summer sessions for three years, and must meet at the University for five weekends during the academic year. The curriculum is designed to provide advanced knowledge and skills for planning, organizing, and evaluating community and environmental health programs.

Admission Requirements

Prerequisites for admission to the M.S. graduate programs in industrial hygiene and environmental health sciences include Bachelor of Science or equivalent degree in environmental health, a physical science, a biological science, or engineering, and submission of Graduate Record Examination scores.

Prerequisite for admission to the M.P.H. program is a doctoral degree.

Graduation Requirements

The graduate programs are designed for seven quarters of study, including field applications and research, requiring completion of a minimum of 60 credits plus 9 credits of thesis, and submission of an acceptable thesis.

Financial Aid

Traineeships and tuition support are available for a limited number of students. This support comes from federal and private sources awarded to the department or school. A few research assistantships are available to second-year students.

Research Facilities

Specialized laboratories exist for research in industrial hygiene chemistry, trace organics and heavy metals, environmental microbiology, electron microscopy, controlled exposure to environmental factors, toxicology, and radiological sciences. Field research is facilitated through an extensive consultation or service program conducted by this department for labor and industry in Washington State.

Correspondence and Information

Graduate Program Coordinator
Department of Environmental Health, SC-34

Faculty

Chairperson

Sheldon D. Murphy

Professors

Boatman, Edwin S.,* 1968, (Emeritus), (Pathobiology), M.Sc., 1961, Ph.D., 1967, Washington; microanatomy and morphometry of experimental/human lung disease, bacterial/viral morphology, asbestos analysis.

Jackson, Kenneth L.,* 1963, (Radiology), Ph.D., 1954, California (Berkeley); physiological and biochemical mechanisms in radiation biology.

Loop, John W., 1959, †(Radiology), M.D., 1952, Harvard.

Mottet, N. Karle,* 1959, (Pathology), † M.D., 1952, Yale; effects of trace elements, especially methylmercury and arsenic, on growth and development.

Murphy, Sheldon D.,* 1983, Ph.D., 1958, Chicago; metabolic and mechanistic aspects of pesticide toxicology, toxic interactions, toxicology of environmental contaminants.

Omenn, Gilbert S.,* 1971, (Medicine), † M.D., 1965, Harvard; Ph.D., 1972, Washington; genetic predisposition to environmental and occupational hazards.

Robkin, Maurice A.* 1967, (Nuclear Engineering),† Ph.D., 1961, Massachusetts Institute of Technology; bionuclear engineering, biological effects of environmental pollution.

Shepard, Thomas H.* 1962, ‡(Obstetrics and Gynecology, Pediatrics), M.D., 1948, Rochester; embryology.

Wilson, John T., Jr.* 1974, M.D., 1950, Columbia; Sc.D., 1956, Cincinnati; environmental and occupational medicine, industrial toxicology.

Woods, James S.* 1982, (Research), M.S., 1968, Ph.D., 1970, Washington; M.P.H., 1978, North Carolina; biochemical toxicology and environmental chemicals, chemical effects of heme and porphyrin metabolism, occupational and environmental epidemiology.

Associate Professors

Breyse, Peter A.* 1957, (Emeritus), M.S., 1954, Washington State; M.P.H., 1957, Pittsburgh; exposure of population to contaminants.

Checkoway, Harvey.* 1987, (Epidemiology),† M.P.H., 1975, Yale; Ph.D., 1978, North Carolina; occupational and environmental health epidemiology.

Costa, Lucio G.* 1983, (Research), Dott.Pharm., 1977, Milano; neurotoxicology of pesticides and metals, receptor responses to chemical exposures, developmental neurotoxicity of ethanol, biological markers of neurotoxicology.

Covert, David S.* 1975, (Research), (Civil Engineering), M.S., 1971, Ph.D., 1974, Washington; atmospheric chemistry, aerosol physics, air pollution, meteorology.

DeRoos, Roger L.* 1983, M.S., 1964, M.P.H., 1968, Ph.D., 1973, Minnesota; institutional environmental health, environmental management and manpower.

DeWalle, Foppe B.* 1977, (Research), M.Sc., 1970, Wageningen (Netherlands); Ph.D., 1973, Washington; toxic trace pollutants in the environment, advanced waste-treatment process, small water and wastewater treatment systems.

Doolittle, Theus L.* 1970, M.S., 1955, California (Los Angeles); Ph.D., 1963, Southern California; physical performance measurement, job-related physical performance measurement, cardiorespiratory fitness and exercise.

Eaton, David L.* 1979, (Environmental Studies),† Ph.D., 1978, Kansas; hepatobiliary disposition of xenobiotics, biochemical and environmental toxicology.

Fantel, Alan G.* 1974, (Research), ‡(Pediatrics), M.A., 1969, Oregon; Ph.D., 1974, Washington; embryology, teratology.

Faustman, Elaine M.* 1983, Ph.D., 1980, Michigan State; molecular mechanisms of teratogenesis, mutagenesis, and carcinogenesis; reproductive toxicology, N-nitroso compounds, risk assessment methodology.

Geraci, Joseph P.* 1973, M.S., 1969, Ph.D., 1972, Washington; radiation hepatic injury, neutron effects on gastrointestinal system, radiation carcinogenesis, biological effects of nuclear weapons.

Hatlen, Jack B.* 1952, (Emeritus), M.S., 1958, Washington; environmental health program planning and management, environmental health manpower training.

Horstman, Sanford W.* 1975, M.S., 1969, Ph.D., 1971, Cincinnati; industrial hygiene, measurement and control of physical/chemical agents, workplace hazards.

Kalman, David A.* 1978, Ph.D., 1978, Washington; organic chemistry of toxic agents, detection and fate of chemical hazards in natural or man-made environments.

Koenig, Jane Q.* 1975, (Research), M.S., 1961, Ph.D., 1963, Washington; respiratory physiology, health effects of air pollutants, lung response of susceptible groups.

Luchtel, Daniel L.* 1972, Ph.D., 1969, Washington; electron microscopy, cell biology, lung anatomy and pathogenesis of pulmonary disease, pollutant effects at cellular level, mechanisms of carcinogenesis.

Milner, John E.* 1966, (Medicine), M.D., 1961, Washington; skin diseases related to occupational irritants and allergies.

Morgan, Michael S.* 1974, Sc.D., 1972, Massachusetts Institute of Technology; applied respiratory physiology and inhalation toxicology.

Nevissi, Ahmad.* 1973, (Research), ‡(Fisheries), Ph.D., 1973, Arkansas; radiochemistry.

Rosenstock, Linda.* 1980, (Medicine),† M.D., 1977, M.P.H., 1977, Johns Hopkins; occupational/general internal medicine.

Assistant Professors

Bigos, Stanley J., 1980, ‡(Orthopaedics), M.D., 1975, Missouri; orthopaedics.

Guffey, Steven E.* 1987, Ph.D., 1987, North Carolina; industrial exhaust ventilation design, modeling of pressure and flow relationships.

Omicinski, Curtis J.* 1983, (Pharmacology), Ph.D., 1980, Washington; biochemical toxicology and pharmacology, molecular mechanisms of carcinogenesis.

Ongerth, Jerry E.* 1984, M.S., 1966, Ph.D., 1973, Michigan; hazardous-waste management, water-quality treatment, geological modeling of waste treatment.

Wilkinson, William E.* 1984, ‡(Nursing), M.P.H., 1978, Tulane; D.P.H., 1982, Texas; occupational epidemiology and surveillance, occupational health-service delivery.

Lecturers

Freeman, Stanley H., 1976, M.A., 1959, State University of New York (Buffalo); industrial safety, program organization and administration.

Hibbard, Richard P., 1971, (Emeritus), B.S., 1949, Toledo; industrial ventilation, controlling airborne contaminants.

Monteith, Lee E., 1981, M.S., 1956, Washington; industrial hygiene, analytical and environmental chemistry.

Morris, Sharon L., 1982, B.A., 1965, Reed; occupational safety and health education, continuing education.

Treser, Charles D., 1980, M.P.H., 1976, Michigan; environmental health practice, policy making and analysis, environmental health regulation, hazardous substances management.

Course Descriptions

Courses for Undergraduates

ENVH 305 Toxic Chemicals in the Environment (3) W Eaton, Omicinski Basic principles governing the behavior and effects of toxic chemicals released into the environment; sources, distribution, and fate of toxic chemicals in the environment; chemicals and cancer; chemicals and birth defects; ecological effects of chemicals, government regulation of chemical hazards. Joint with ENV S 305. Prerequisites: BIOL 101-102, and CHEM 102 or equivalent.

ENVH 411 Introduction to Environmental Health (3) AW Treser Relationship of people to their environment, how it affects their physical well-being and what they can do to influence the quality of the environment and to enhance the protection of their health. Emphasis on environmental factors involved in transmission of communicable diseases and hazards due to exposure to chemical and physical materials in our environment.

ENVH 430 Methods in Environmental Sampling and Analysis I (3) Sp Field sampling methods are studied and selected laboratory analyses of various

waters and wastes are conducted. Official methods for characterizing physical and chemical quality of water and wastes are demonstrated. Microbiological criteria are emphasized for student participation, including: enumeration of subgroups in populations, selective inhibitor, characteristics of normal flora, rationale of "indicator" organisms. Prerequisites: junior standing, 440, MICRO 301 and 302, and permission of instructor.

ENVH 440 Water and Waste Sanitation (4) A Hatlen Study of the health implications of water use and sewage disposal methodology. Focal concerns include water-quality evaluation, pollution factors, individual and public water and sewage facilities, site selection criteria, and legislative and agency activities. The knowledge and skills required for effective field performance by the environmental health specialist are emphasized.

ENVH 441 Food Protection (3) W Hatlen Protection of food products during production, processing, and distribution. Emphasis on prevention of food-borne diseases and chemical contamination of foods at the retail level. Prerequisite: MICRO 301 or permission of instructor.

ENVH 442 Vector Control and Housing (3) Sp Hatlen Study of the impact and control of rodents and arthropod vectors of disease, including consideration of economic poisons used, their regulation, and safety measures. Housing practices and conditions affecting health in residential (private and multiple dwelling) and institutional (schools and hospitals) settings are examined and control measures reviewed.

ENVH 445 Solid and Hazardous Wastes (3) Sp Ongerth Examination of the public health, environmental, economic, and materials conservation impact of solid wastes on the environment; the amounts and sources of solid wastes, methods of storage, transportation and disposal, identification of present problems and future needs. Prerequisite: environmental health major or permission of instructor.

ENVH 449 Respiration, Circulation, and Environmental Health (2) Morgan Structure and function of the respiratory and cardiac systems and the changes that may be produced by specific air pollutants, such as ozone, carbon monoxide, SO₂. Air quality criteria and the economic costs of disease are discussed. Several classroom demonstrations. Prerequisites: sophomore standing, CEWA 461, or permission of instructor. (Offered odd-numbered years.)

ENVH 453 Industrial Hygiene and Safety (3) A Horstman, Morgan Review of occupational health and safety hazards, including causes, effects, evaluation, prevention, and legislation. Prerequisite: 411 or permission of instructor.

ENVH 454 Industrial Hygiene Sampling and Instrumentation (2) W Series of laboratory experiments illustrate the use of a wide spectrum of industrial hygiene sampling equipment. Included are airflow calibration, chemical calibration, detector tubes, personnel sampling devices, both continuous and discrete reading instruments. Instrumentation for noise also covered. Prerequisite: 453.

ENVH 457 Industrial and Environmental Noise (2) Sp Horstman Industrial and community noise problems, including sources, effects, measurement, control, and legislation. (Offered even-numbered years.)

ENVH 460 Accident Prevention (2) A Freeman Discussion of the accident process and the classification of accidents, including epidemiologic indexes. Analysis of accident statistics and research studies relating to control planning; survey of existing programs and legislation. Term field project and report.

ENVH 461 Air Pollution Control (3) Fundamental concepts of air pollution. Emission sources, atmospheric dispersion, ambient concentrations, adverse effects, governmental regulations, emission standards,

air-quality standards, processes and equipment for controlling emissions. Joint with CEWA 461. Prerequisite: senior standing.

ENVH 471 Environmental Health Regulation (2) W Treser Introduction to administrative regulation and process. Authority, jurisdiction, and structure of environmental control programs and agencies; the regulatory process; agency acquisition and retention of information; administrative actions; enforcement of environmental health laws; major statutes and cases impacting programs. Prerequisite: environmental health major or permission of instructor.

ENVH 479 Environmental Research Design (1) ASp Designed to assist in the development of environmental health research projects. Common research designs, methodology, principles, and problems with emphasis on effective research problem definition, implementation, and data presentation.

ENVH 480 Environmental Health Problems (*, max. 6) AWSps Individual projects involving library, laboratory, or field study of a specific environmental health problem. Prerequisite: environmental health major or permission of instructor.

ENVH 482 Field Practice—Technology (2-6) AWSps Assignment to a local health department for supervised application of public health practices and environmental control techniques. Offered on credit/no credit basis only. Prerequisites: environmental health major and permission of departmental adviser.

ENVH 483 Field Practice—Program Planning (6) AWSps Assignment to a local health department for supervised observation and experience in environmental health program planning. Offered on credit/no credit basis only. Prerequisites: environmental health major and permission of departmental adviser.

ENVH 484 Field Practice—Community Resources (3) AWSps Assignment to a local health department for training in the utilization of community resources. Offered on credit/no credit basis only. Prerequisites: environmental health major and permission of departmental adviser.

ENVH 497 Environmental Health Special Electives (* AWSps) Off campus course for non-environmental health majors.

ENVH 499 Undergraduate Research (* AWSps) Individual research on a specific topic in environmental health upon which specific conclusions, judgments, or evaluation can be made or upon which facts can be presented. Prerequisite: environmental health major or permission of instructor.

Courses for Graduates Only

ENVH 511 Environmental and Occupational Health (3) W Morgan, Wilkinson Effects of exposure to chemical, physical, and biological agents, using a problem-oriented approach embracing the community and workplace environments. Current issues, using specific cases from recent literature as basis for classroom discussion and written assignments.

ENVH 512 Hazardous Waste Disposal (3) S Generation, collection, transportation, and ultimate disposal of hazardous waste on land. Alternatives include physical-chemical elimination, resource recovery, and process modifications. In-depth engineering and cost aspects of alternatives. Health and engineering implications of TSCA, RCRA, CWA, and CERCLA.

ENVH 515 Environmental and Occupational Toxicology (4) Sp Eaton Principles of toxicology, with emphasis on the biological fate and mechanisms of toxic action of chemicals encountered in the workplace and general environment. Joint with ENV S 515. Prerequisites: organic chemistry, introductory physiology and biochemistry, or permission of instructor.

ENVH 533 Molecular Toxicology (2) A Omlećinski Advanced discussion of molecular mechanisms whereby chemical, physical, and biological agents produce their harmful effects on biological tissues. Joint with PHCOL 533. Prerequisites: 511, 515; or PHCOL 401, 402, 403; or PHCOL 511, 512, 513; or permission of instructor. (Offered even-numbered years.)

ENVH 550 Microscopy of Particulates (2) A Luchtel Modern microscopical instrumentation and the techniques used to identify, describe, and study the wide variety of particles, dusts, and fibers that occur in our societal and industrial environments. Sample preparation methods, theory, and practical use of light microscopy, transmission electron microscopy, and scanning electron microscopy. Prerequisite: permission of instructor.

ENVH 551 Environmental Cell Biology (2) Sp Luchtel Effects of environmental pollutants on the biochemical and ultrastructural properties of cells. Defense mechanisms of the lung and effects of air pollutants on lung cells treated as a model system for the various kinds of interactions between pollutants and cells. Validity and limitations of the scientific method for establishing exposure and safety levels. Prerequisite: permission of instructor.

ENVH 552 Presence and Fate of Toxic Chemicals (3) Kalman Chemical and physical processes determining distribution and fate of chemical hazards, detection of low levels of hazardous compounds, and environmental evaluation and prediction. Fundamental chemical concepts and measurable properties of individual compounds to interpret and relate measurements. Prerequisite: admission to graduate program or permission of instructor.

ENVH 553 Instrumental Methods for Industrial Hygiene Measurement (Lecture) (3) W Kalman Methods, instrumentation, and theory of atmospheric sampling and analysis, emphasizing evaluation of potential occupational hazards and exposures. Prerequisite: 453 or permission of instructor.

ENVH 555 Instrumental Methods for Industrial Hygiene Measurement (Laboratory) (3) W Monteith Utilizes typical instrumental techniques and analytical methods for the evaluation of potential occupational exposures. Prerequisites: 453 or permission of instructor and concurrent registration in 553.

ENVH 557 Industrial Ventilation I (3) Sp Hibbard Principles of control of the industrial environment, including noise and hazardous chemicals, with special emphasis on design of exhaust-ventilation systems. Prerequisite: 453 or permission of instructor.

ENVH 558 Industrial Ventilation II (2) W Hibbard Laboratory exercises, case-study problems, and field surveys emphasize the practical application of the principles of industrial ventilation as the major control method of airborne health hazards in the industrial environment. Prerequisite: 557.

ENVH 560 Organizing Industrial Safety Programs (3) W Freeman Organization of safety programs in major industries is explored; governmental, management, and union motivations are related to safe working conditions; and functions and responsibilities of line and staff safety are described in detail. Industrial accident prevention plan is developed.

ENVH 561 Administering Industrial Safety Programs (3) Sp Freeman Focus on day-to-day operation of industrial safety programs with emphasis on workman's compensation, uses of statistics, protective equipment, hazard analysis, behavioral aspects of accident causation, safety communications, and accident investigation and reporting. Prerequisite: 560 or permission of instructor.

ENVH 562 Technical Aspects of Safety and Health (4) A Freeman Explores specific hazards associated with major industries, as well as the general

hazards common to all industries. Fire protection, machine guarding, systems safety techniques, functional testing, and explosives safety.

ENVH 564 Health and Safety Problems in Industry (2) Sp Freeman, Horstman Provides wide spectrum of practical examples of industrial processes and occupational health and safety problems, as practiced in an industrial milieu; serves as a case-study sequence for the didactic course work in several programs. Provides opportunity to approach and analyze health and safety problems using a multidisciplinary approach.

ENVH 566 Introduction to Ergonomics (3) W Kraning Basic principles of ergonomics applied to problems of worker and management of working environment. Topics include measurement of physical work capacity, problems of fatigue and heat stress, applied biomechanics, worker-machine interactions and communication, design of displays and controls. Prerequisite: basic human physiology or permission of instructor.

ENVH 567 Industrial Carcinogens (3) W Luchtel Emphasis on cancers of industrial significance. Classification of occupational carcinogens according to human and animal experiences, along with the concept of permissible exposure levels.

ENVH 569 Occupational Fitness (3) Sp Doolittle Interaction between physical requirements of occupational tasks and the individual's capacity to perform; jobs requiring manual material handling. Techniques of job analysis, validation of standards, criteria for new design or redesign, and employee screening. Prerequisite: 566 or permission of instructor.

ENVH 572 Clinical Occupational Medicine (3) S Rosenstock Comprehensive overview of clinical occupational medicine. Introduction to principles of occupational disease, occupational history taking, and physician involvement in workers' compensation. Approaches to diagnosis and management of occupational diseases based on organ systems. Prerequisite: possession of an M.D. degree or equivalent or permission of instructor.

ENVH 575 Occupational Lung Diseases (2) Sp Wilson Reviews the epidemiology, clinical features, diagnosis, and prevention of occupational lung disorders, including pneumoconiosis, industrial bronchitis, occupational asthma, and cancer. Discussion of pulmonary function tests, health effects of smoking, irritant gases, and occupational infections. Primarily for physicians and medical students. Prerequisite: permission of instructor.

ENVH 577 Risk Assessment for Environmental Health Hazards (3) A Ormenn, Faustman Examines the context, methodologies, types of data, uncertainties, and institutional arrangements for risk assessment. Both qualitative and quantitative approaches to the identification, characterization, and control of environmental hazards to health emphasized through didactic and case studies. Joint with ENV S 577, CEWA 577, and PB AF 577. Prerequisite: 515, BIOST 511, EPI 511, or permission of instructor.

ENVH 580 Environmental Health Seminar (1, max. 6) AWSps Current environmental health research and environmental control programs. Offered on credit/no credit basis only.

ENVH 581, 582, 583 Environmental Health Reading (1,1,1) A,W,Sp Koenig, Luchtel Critical reading of selected basic and applied research publications on environmental health problems and programs. Must be taken in sequence.

ENVH 584 Occupational Health and Safety Legislation (2) Sp Kleinman, Morris Occupational health and safety legislation in the United States and other nations, the social issues leading to passage of such legislation, effectiveness of the legislation, policy issues, and proposed solutions.

ENVH 590 Selected Topics (1-6) AWSpS In-depth study of a current environmental health topic. May be taken with HSERV 590 and EPI 590. Offered on credit/no credit basis only. For more information and permission, consult department program adviser.

ENVH 599 Field Studies (2-6, max. 6) AWSpS Assignment to an environmental research or service program for application of evaluation techniques. Offered on credit/no credit basis only.

ENVH 600 Independent Study or Research (*) AWSpS Prerequisite: permission of departmental adviser.

ENVH 700 Master's Thesis (*) AWSpS Prerequisite: permission of departmental adviser.

Epidemiology

F263 Health Sciences

Graduate Program

James L. Gale, Graduate Program Coordinator

The Department of Epidemiology offers three graduate degrees in the field of epidemiology for individuals intending to become academicians, highly qualified research specialists, or well-trained practitioners. The Master of Science degree requires concentration on courses and research in epidemiology as preparation for technical specialization or as a prelude to the Doctor of Philosophy program. The Master of Public Health degree requires course work in health services and environmental health in addition to epidemiology and thesis research. The Ph.D. course requirements differ from the M.S. program requirements primarily in the degree and complexity of research for the dissertation. Course work includes a basic series on epidemiology, one or more courses in biostatistics, and seminars. Electives are dictated by the student's special interest and experience. The department also offers postdoctoral research training and a two-year residency in general preventive medicine with emphasis on epidemiology for physicians.

Special Requirements

An applicant should have a degree in medicine, dentistry, or veterinary medicine or be a qualified holder of a master's or higher degree in a relevant field, such as nursing, microbiology, or biostatistics, or in an appropriate social science. Others who will be considered are students enrolled in medical school and recommended for the M.D.-Ph.D. program and, occasionally, individuals with a baccalaureate degree whose prior work experience is appropriate.

Financial Aid

Federally financed research training stipends are available on a limited basis. Some opportunities for work on various research projects or for aid in teaching may provide partial assistance.

Research Facilities

University facilities include well-equipped laboratories and access to computers. Various opportunities for field research are provided in Seattle and elsewhere in the state, including the Fred Hutchinson Cancer Research Center, which is staffed, in part, by members of the departmental faculty.

Correspondence and Information

Graduate Program Coordinator
Department of Epidemiology, SC-36

Faculty

Chairperson

Noel S. Weiss

Professors

Daling, Janet R.,* 1978, M.A., 1973, Ph.D., 1977, Washington; maternal and child health and cancer research.

Emanuel, Irvin,* 1964, (Pediatrics),† M.A., 1956, Arizona; M.D., 1960, Rochester, M.S.P.H., 1966, Washington; epidemiology of maternal and child health problems.

Foy, Hjordis M.,* 1965, M.D., 1953, Karolinska Instit. (Sweden); M.S., 1967, Ph.D., 1968, Washington; epidemiology and control of infectious disease.

Gale, James L.,* 1969, M.D., 1961, Columbia; M.S., 1969, Washington; epidemiology and control of infectious disease, international health.

Grayston, J. Thomas,* 1960, (Pathobiology), M.D., 1948, M.S., 1952, Chicago; epidemiology and control of infectious disease.

Henderson, Maureen M.,* 1975, (Health Services), (Medicine),† M.B.B.S., 1949, D.P.H., 1956, Durham (England); epidemiology of chronic diseases.

Holmes, King K.,* 1967, ‡(Medicine, Microbiology), M.D., 1963, Cornell; Ph.D., 1967, Hawaii; clinical epidemiology and pathogenesis of infectious diseases.

Lee, John A. H.,* 1966, M.B.Ch.B., 1949, M.D., 1955, Edinburgh (Scotland); D.P.H., 1952, London (England); epidemiology of neoplastic disease.

Moolgavkar, Suresh H.,* 1984, (Biostatistics), M.B.B.S., 1966, Bombay (India); Ph.D., 1973, Johns Hopkins; cancer epidemiology, development of quantitative methodology.

Perine, Peter L.,* 1981, (Pathobiology), M.D., 1966, Kansas; M.P.H., 1973, Washington; international health, sexually transmitted diseases, diseases caused by pathogenic spirochetes and their molecular biology.

Peterson, Donald R.,* 1960, (Emeritus), M.D., 1947, Oregon; M.P.H., 1958, California (Berkeley); epidemiology.

Stamm, Walter E.,* 1976, ‡(Medicine), M.D., 1971, Harvard; infectious diseases.

Thomas, David B.,* 1975, M.D., 1963, Washington; M.P.H., 1969, D.P.H., 1972, Johns Hopkins; cervix and breast carcinoma epidemiology.

Weiss, Noel S.,* 1973, M.D., 1967, Stanford; M.P.H., 1969, D.P.H., 1971, Harvard; chronic disease epidemiology.

Worthington-Roberts, Bonnie S.,* 1971, M.S., 1967, Ph.D., 1971, Washington; maternal and child nutrition.

Associate Professors

Checkoway, Harvey,* 1987, ‡(Environmental Health), M.P.H., 1975, Yale; Ph.D., 1978, North Carolina; occupational epidemiology.

Connell, Frederick A.,* 1976, ‡(Health Services, Pediatrics), M.D., 1972, New York; M.P.H., 1978, Washington; maternal and child care, health services.

DiGiacomo, Ronald F.,* 1974, ‡(Animal Medicine), D.V.M., 1965, Pennsylvania; M.P.H., 1974, Washington; comparative epidemiology and zoonoses.

Eisenberg, Mickey S., 1976, ‡(Medicine), M.D., 1971, Case Western Reserve; Ph.D., 1978, Washington; emergency medicine.

Handsfield, H. Hunter, 1979, ‡(Medicine), M.D., 1968, Columbia; infectious diseases.

Hoover, J. Joanne,* 1972, (Research), M.D., 1960, Illinois; M.P.H., 1972, Washington; cardiovascular epidemiology.

Koepsell, Thomas D.,* 1979, (Medicine), (Health Services),† M.D., 1972, Harvard; M.P.H., 1979, Washington; epidemiology of chronic diseases, particularly seizure disorders, applications of epidemiologic concepts to medical practice, epidemiology approaches to health services research.

Moore, Donald E., 1977, ‡(Obstetrics and Gynecology), M.D., 1967, Case Western Reserve; reproductive endocrinology.

Nolan, Charles M., 1980, ‡(Medicine), M.D., 1969, Arkansas; infectious diseases.

Rivara, Frederick P. II, 1984, ‡(Pediatrics), M.D., 1974, Pennsylvania; M.P.H., 1980, Washington; ambulatory pediatrics.

Shy, Kirkwood K.,* 1979, ‡(Obstetrics and Gynecology), M.D., 1973, Wayne State; M.P.H., 1979, Washington; gynecology.

Siscovick, David S.,* 1987, ‡(Medicine), M.D., 1976, Maryland; M.P.H., 1981, Washington; preventive cardiology.

Yamanaka, William K.,* 1974, Ph.D., 1969, California (Berkeley); public health and international nutrition.

Assistant Professors

Bell, Thomas A.,* 1980, (Pediatrics),† M.D., 1971, Tufts; M.P.H., 1974, California (Berkeley); infectious diseases and child health.

Beresford, Shirley A.,* 1987, M.A., 1973, Cambridge (England); Ph.D., 1981, London (England); cancer control and health promotion.

Chu, Joseph,* 1981, (Obstetrics and Gynecology), M.D., 1975, Georgetown; M.P.H., 1981, Washington; women's health care.

Davis, Scott,* 1981, M.S., 1977, Rochester; Ph.D., 1980, Washington; cancer epidemiology, disease etiology.

Kreiss, Joan K.,* 1985, (Medicine),† M.D., 1978, Washington (St. Louis); M.S.P.H., 1984, California (Los Angeles); infectious disease, international health.

Lednar, Wayne M.,* 1985, (Clinical), M.S., 1973, Massachusetts; Ph.D., 1975, North Carolina; M.D., 1979, George Washington; epidemiology of infectious and chronic diseases and injury prevention.

Martin, Diane K.,* 1978, ‡(Health Services), M.A., 1972, Temple; Ph.D., 1979, Washington; health-care organization and behavior.

Pendergrass, Thomas W., 1978, ‡(Pediatrics), M.D., 1971, Tennessee; hematology, oncology.

Psaty, Bruce M., 1984, (Medicine),† M.D., 1981, Indiana; M.P.H., 1986, Washington; cardiovascular disease, health-care delivery systems.

Stanford, Janet L.,* 1986, M.P.H., 1982, Emory; Ph.D., 1986, Johns Hopkins; cancer and women's health.

Stergachis, Andreas S.,* 1980, (Clinical), (Pharmacy Practice),† M.S., 1976, Ph.D., 1979, Minnesota; reproductive epidemiology, drug epidemiology, health program evaluation, pharmacy administration.

Stevens, Nancy G.,* 1982, ‡(Family Medicine), M.D., 1979, M.P.H., 1982, Washington; family medicine.

Vaughan, Thomas L.,* 1982, M.D., 1978, Illinois; M.P.H., 1983, Washington; cancer and adverse reproductive outcomes particularly as related to environmental and occupational exposures.

White, J. Emily,* 1982, M.S., 1978, Ph.D., 1982, Washington; cancer control research and prevention, epidemiologic methods, Alzheimer's disease.

Yerby, Mark S., 1981, ‡(Medicine, Neurological Surgery), M.D., 1976, Vermont; M.P.H., 1983, Washington; epidemiology, epilepsy, dementia.

Instructor

Sherry, Bettylou, 1985, M.S., 1978, Ph.D., 1986, Washington; nutrition and maternal and child health.

Course Descriptions

Courses for Undergraduates

EPI 420 Introduction to Epidemiology (3) A Gale For the undergraduate student wishing to devote only one quarter to a course in epidemiologic methods. Description of ways in which variation in disease occurrence is documented and how that variation is studied to understand causes of disease. Entry card required.

EPI 497 Epidemiology Special Electives (*) AWSpS Off-campus course for medical students. Prerequisite: permission of adviser.

EPI 499 Undergraduate Research (*) AWSpS Prerequisite: permission of adviser.

Courses for Graduates Only

EPI 511 Introduction to Epidemiology (4) A Gale For the graduate student wishing to devote only one quarter to a course in epidemiologic methods. Description of ways in which variation in disease occurrence is documented, and how that variation is studied to understand causes of disease. Term paper. Prerequisite: graduate standing. Entry card required.

EPI 512 Epidemiologic Methods I (3) A Koepsell, Weiss Principles and methods of epidemiology. Causal inferences, measures of excess risk, classification and misclassification, confounding, and effect modification. Designed for students who want to take 513. Prerequisites: prior or concurrent enrollment in BIOST 511 or equivalent and permission of instructor.

EPI 513 Epidemiologic Methods II (3) W Koepsell, Weiss Continuation of 512. Considers how designs of epidemiologic studies may be constructed to maximize etiologic inferences. Prerequisite: 512.

EPI 514 Application of Epidemiologic Methods (4) Sp Practical experience in analysis of data. Students analyze data sets currently on file using contemporary epidemiologic methods as taught in 512 and 513. Prerequisites: 512, 513 and epidemiology major.

EPI 520 Infectious Diseases Epidemiology (3) Sp Foy Principles and practices of epidemiology, appropriate for the study of communicable diseases. Methods for epidemiological investigation of infections taught by reading and discussing classical descriptions of disease outbreaks and analyzing current papers on the subject. Term paper outlining a protocol for a research study related to infectious agents required. Prerequisite: 511 or permission of instructor.

EPI 521 Epidemiology of Maternal and Child Health Problems (3) W Emanuel Consideration of the contribution of epidemiology to the understanding of the etiology of various perinatal problems, including congenital malformations, fetal, infant, and maternal mortality, abortion, neonatal morbidity, complications of pregnancy, prematurity, and mental retardation, together with the evaluation of control problems. Prerequisites: graduate, medical, or dental school standing and 511, or permission of instructor.

EPI 524 Epidemiologic Studies of Cancer Etiology and Prevention (3) W Thomas Current knowledge of the role that chemicals, radiation, viruses, familial factors, immunodeficiencies, and benign diseases play in the etiology of various cancers, as determined from studies in human populations; the epidemiologic characteristics of most major types of cancer; applications of epidemiologic principles to planning and evaluating programs of primary, secondary, and tertiary cancer prevention. Prerequisite: 511.

EPI 526 Zoonotic Diseases (3) A DiGiacomo, Rausch Explores the public health aspects of zoonotic diseases, their epidemiology and current approaches to control. Focuses on the major viral, rickettsial, bacterial, protozoal, helminthic, and fungal diseases transmitted from wild and domesticated animals to man in North America. Joint with ANMED 526. Prerequisites: graduate standing and permission of instructor.

EPI 528 Exposure Measurement in Epidemiology (3) White Principles and methods of measuring exposures and covariates in epidemiological studies. Validity and reliability of measures, questionnaire design, effects of measurement error, maximizing response rates, quality-control procedures, measurement of specific exposures. Prerequisite: 513.

EPI 531 Problems in International Health (3) A Survey of the relationship of the sociocultural, political, economic, and demographic characteristics of developing countries to disease occurrence and to the solution of health problems. Prerequisite: graduate or medical student standing.

EPI 532 Epidemiology of Infectious Diseases of Third-World Importance (3) Means of assessing the impact of infectious diseases on the health of communities through surveillance and appropriate survey techniques. Appropriate strategies for research in third-world settings.

EPI 536 Categorical Data Analysis in Epidemiology (4) A Summary of univariate categorical data analysis; introduction to multivariate analysis of categorical epidemiologic data using multiplicative models. Experience at interpretation; familiarity with available programs gained by analysis of *bona fide* data, critiques of analyses appearing in literature. Joint with BIOST 536. Prerequisites: 514 and BIOST 513; or BIOST 515; or permission of instructor.

EPI 537 Survival Data Analysis in Epidemiology (4) W Introduction to the multivariate analysis of survival data using multiplicative models. Application to epidemiologic studies. Familiarity with interpretation and available computer programs gained by analysis of *bona fide* sets of data and critiques of analyses appearing in the literature. Joint with BIOST 537. Prerequisite: 536 or permission of instructor.

EPI 542 Clinical Epidemiology (2) Weiss Principles and methods involved in studying outcome of illness. Prerequisite: 511 or 512 and 513.

EPI 583 Epidemiology Seminar (1, max. 3) Current epidemiologic research and application of epidemiologic research in the practice of public health.

EPI 590 Selected Topics in Epidemiology or International Health (2-6, max. 6) AWSpS Tutorials are arranged for a small number of students for in-depth examination of an area of epidemiology or international health, usually of current nature. Seminar format. Prerequisite: 511. Also a special summer format presenting introductory material. May be taken with ENVH 590 and/or HSERV 590. For more information and permission, consult the department program adviser.

EPI 591 Current Literature in Epidemiology (1, max. 6) AWSpS Weiss Open only to doctoral students who have passed the department preliminary examination. Articles pertaining to epidemiology and related subjects selected from the current literature to be distributed and read by all participants. Faculty members and enrolled students alternate being responsible for conducting sessions and choosing articles to read.

EPI 598 Teaching Methods in Epidemiology and/or Preventive Medicine (1-3) AWSpS Supervised teaching experience in public health and in epidemiology. Student formulates an outline for a course in epidemiology or related subject. Student makes one or more formal presentations to class and is encouraged to use modern educational methods and teaching media. Student constructs test questions on lecture subjects. Prerequisite: EDPSY 449 or equivalent.

EPI 600 Independent Study or Research (*) AWSpS Offered on credit/no credit basis only. Prerequisite: permission of departmental adviser.

EPI 700 Master's Thesis (*) AWSpS Offered on credit/no credit basis only. Prerequisite: permission of departmental adviser.

EPI 800 Doctoral Dissertation (*) AWSpS Offered on credit/no credit basis only. Prerequisite: permission of departmental adviser.

Health Services

F346 Health Sciences

Graduate Program

The Department of Health Services offers a two-year graduate program in health services leading to the Master of Public Health degree and maintains primary responsibility for the graduate program in Health Services Administration (an interdisciplinary degree-granting program of the Graduate School described in the Interdisciplinary Graduate Degree Programs section of this catalog). The department also offers a three-year extended degree program in community health management leading to the M.P.H. degree for employed professionals working full-time and, in addition, participates in the training of doctoral students from other departments on campus by offering a specialization in health services under the Doctoral Studies Program.

The M.P.H. program in health services gives priority to individuals who have completed their professional health training such as physicians, dentists, and nurses. Others who have had substantial experience in the health field are also considered. This program offers a general curriculum that includes introduction to health systems, epidemiology, current issues regarding the provision of medical care, and methodological training for research and program evaluation. Examples of areas of concentration include studies of patient and provider behaviors; evaluation of local, state, and federal health programs; and the impact of technology on medical care costs and benefits. There are two special programs, one in maternal and child health, offered jointly with the Department of Epidemiology, and one in international health. The maternal and child health program offers in-depth interdisciplinary training in issues related to reproductive and family health. The academic track in international health is available to students enrolled in an M.P.H. degree program in the School of Public Health and Community Medicine. The program focuses on community health and primary health-care systems of the developing world. Students learn the basic principles of public health and to identify the social, political, and economic determinants of illness. They also learn about the planning, management, and evaluation of health-care systems. Students are required to complete the core M.P.H. courses, a series of international health courses, and a thesis project on a topic relating to third-world health.

A student's program of studies in the other areas may vary in accordance with his or her concentration of study and career objectives. If deemed appropriate by their advisers, students may take courses in other departments of the University. Community agencies and resources are used extensively. Students with a background in medicine may qualify to receive concurrent credit for residency training in preventive medicine.

Doctoral study in health services is available to qualified students on campus who are enrolled in the doctoral programs of other departments (e.g., anthropology, biostatistics, economics, epidemiology, geography, medicine, nursing, operations research, organizational theory, political science, psychology, social work, sociology, etc.). Students in the Doctoral Studies Program take four courses in health services and focus their dissertation on original research that relates the basic discipline to a specific health services issue (e.g., health behavior, health-care organizations, costs, quality and utilization of health-care services, etc.).

Extended M.P.H. Degree Program

The extended M.P.H. degree program is a three-year, part-time program delivered through a combination of intensive four-week summer sessions on the University campus, independent/directed study, and intensive weekend (Friday-Saturday) seminars during the aca-

demic year. Designed for mid-career public and community health professionals with three or more years of experience in the health-care field, the program provides knowledge and skills required at mid- and upper-level practice and management positions for health professionals. In addition to the core courses in epidemiology, biostatistics, and environmental health, the prescribed course work includes a broad exposure to the health-care system plus specific management training in accounting, finance, personnel management, economics, organization theory, and program planning and evaluation.

SPECIAL REQUIREMENTS

Applicants must submit, in addition to Graduate School admission requirements, a program application, at least three letters of recommendation, Graduate Record Examination scores, and a goal statement. A minimum of three years' work experience in the health-care field is required. Applicants are accepted to begin in the program Summer Quarter. Deadline for priority consideration is December 1. Applications will be accepted through March 1 and considered on a space-available basis. Because the program is self-sustaining, the tuition rate differs from the usual on-campus programs.

Certificate Program

MEDEX Northwest is a program designed to train physician assistants. It provides primary-care, midlevel practitioners by training already experienced medical personnel. A fully accredited physician assistant program conforming to standards developed and administered by the American Medical Association, MEDEX Northwest annually places twenty-four students in a variety of sites in Washington, Alaska, Oregon, Idaho, and Montana.

MEDEX Northwest is an twenty-one-month program. The first nine months consist of intense clinical and didactic instruction at the University. The six subsequent months are spent in a variety of inpatient and outpatient clinical rotations. The final six-month preceptorship is an on-the-job experience tailored to the practice of individual primary-care preceptors and emphasizing diagnosis and treatment. At the completion of the program, students are eligible to sit for the national certifying examination for physician assistants.

Special Requirements

Applicants to the M.P.H. program must, in addition to completing Graduate School admission requirements, submit at least three letters of recommendation and scores from the Graduate Record Examination. At least three years of medical or health-care experience are required. In general, applicants are accepted only for Summer and Autumn quarters of each year. The application deadline is April 1. Students interested in pursuing a doctoral-level concentration in health services should contact the Director of the Doctoral Studies Committee regarding special requirements.

Financial Aid

Every attempt is made to ensure that students admitted are not prevented from pursuing graduate studies due to inadequate finances. A limited number of fellowships, assistantships, scholarships, and loans are available each year. However, students admitted should be prepared to utilize their own resources to finance their graduate education.

Research Facilities

In addition to utilizing University facilities, the program makes use of community health-care delivery systems and agencies for research and training.

Correspondence and Information

M.P.H. Degree Program: Graduate Program Coordinator, Department of Health Services, SC-37.

Extended M.P.H. Degree Program: Graduate Program Manager, Department of Health Services, SC-37.

Doctoral Studies: Committee Director, Department of Health Services, SC-37.

MEDEX Northwest, Physician Assistant Program: Program Director, HA-45.

Maternal and Child Health Program, SC-36.

M.H.A., Health Services Administration, Graduate Program Coordinator, Department of Health Services, SC-37.

Faculty

Chairperson

Edward B. Perrin

Professors

Bergman, Abraham B., 1964, ‡(Pediatrics), M.D., 1958, Case Western Reserve; ambulatory pediatrics.

Bergner, Marilyn, 1972, Ph.D., 1970, Columbia; health-status measurement.

Campbell, William H., 1975, ‡(Pharmacy Practice), M.S., 1968, Oregon State; Ph.D., 1971, Purdue; pharmacy administration.

Conrad, Douglas A., 1977, (Finance and Business Economics), (Community Dentistry), ‡ M.H.A., 1973, Washington; M.B.A., 1976, Ph.D., 1978, Chicago; alternative vertical and horizontal market structures in health care, hospital and health administration, cost effectiveness of dental treatment.

Day, Robert W., 1968, M.D., 1956, Chicago; M.P.H., 1958, Ph.D., 1962, California; health-information systems.

Gilson, Betty S., 1969, (Emeritus), M.D., 1943, Minnesota; health-status measurement.

Henderson, Maureen M., 1975, ‡(Epidemiology, Medicine), M.B.B.S., 1949, D.P.H., 1956, Durham (England); internal medicine.

Inui, Thomas S., 1976, (Medicine), ‡ M.D., 1969, Sc.M., 1973, Johns Hopkins; health-related behavior.

LoGerfo, James P., 1974, (Medicine), ‡ M.D., 1968, Rochester; M.P.H., 1974, Washington; quality-of-care assessment.

Mayer, Jonathan D., 1977, ‡(Family Medicine, Geography), M.A., 1975, Ph.D., 1977, Michigan; urban geography, transportation, medical geography, geographic philosophy and methods.

Milgrom, Peter, 1974, ‡(Community Dentistry), D.D.S., 1972, California (San Francisco); management of fearful and phobic dental patients, dental care quality.

Novack, Alvin H., 1979, ‡(Pediatrics), M.D., 1958, Temple; ambulatory pediatrics.

Patrick, Donald L., 1987, M.S., 1968, Ph.D., 1972, Columbia; social and behavioral sciences.

Perrin, Edward B., 1962, (Biostatistics), M.A., 1956, Columbia; Ph.D., 1961, Stanford; health information services, research methodology.

Rosenblatt, Roger A., 1974, ‡(Family Medicine), M.D., 1971, M.P.H., 1971, Harvard; research into the organization and delivery of health services.

Tompkins, Richard K., 1975, (Medicine), ‡ M.D., 1965, Colorado; clinical decision making.

Wagner, Edward H., 1984, M.D., 1965, State University of New York (Buffalo); M.P.H., 1972, North Carolina (Chapel Hill); health services research, health promotion and disease prevention.

Associate Professors

Belcher, Donald W., 1976, ‡(Medicine), M.D., 1962, Pennsylvania; ambulatory medicine.

Carter, William B., 1975, (Family Medicine), M.S., 1971, Nebraska; Ph.D., 1975, Washington; health behavior.

Chapko, Michael K., 1978, (Research), (Community Dentistry), ‡ M.A., 1970, Hunter; Ph.D., 1972, City University of New York; evaluation research, health behavior.

Christensen, Dale B., 1976, ‡(Pharmacy Practice), M.S., 1972, Oregon; Ph.D., 1977, Minnesota; pharmacy administration.

Connell, Frederick A., 1976, (Epidemiology, Pediatrics), M.D., 1972, New York; M.P.H., 1978, Washington; maternal and child health.

DeRoos, Roger L., 1983, ‡(Environmental Health), M.S., 1964, M.P.H., 1968, Ph.D., 1974, Minnesota; institutional environmental health, environmental management and manpower.

Dayo, Richard A., 1986, (Medicine), ‡ M.D., 1975, Pennsylvania State; M.P.H., 1981, Washington; patient behavior, clinical epidemiology and functional status assessment.

Durham, Mary L., 1979, M.A., 1974, Ph.D., 1978, Oklahoma; long-term care.

Gordon, Michael J., 1973, ‡(Family Medicine, Medical Education), M.A., 1970, Ph.D., 1973, Michigan State; clinical judgment and implications for medical education and chronic disease management.

Koepsell, Thomas D., 1979, (Medicine), (Epidemiology), ‡ M.D., 1972, Harvard; M.P.H., 1979, Washington; epidemiology of chronic diseases, particularly seizure disorders, applications of epidemiologic concepts to medical practice, epidemiology approaches to health services research.

Larson, Eric B., 1977, ‡(Medicine), M.D., 1973, Harvard; internal medicine.

Madden, Carolyn A., 1975, (Economics, Public Affairs), M.A., 1974, Ph.D., 1976, Johns Hopkins; health economics and policy.

Rockey, Paul H., 1976, ‡(Medicine), M.D., 1970, Chicago; M.P.H., 1978, Washington; ambulatory medicine.

Trivedi, Vandan M., 1974, (Finance and Business Economics), M.S.E., 1969, Ph.D., 1974, Michigan; operations research models for hospitals and health-care systems.

Wood, Robert W., 1979, ‡(Medicine), M.D., 1970, Rochester; internal medicine.

Assistant Professors

Beil, Michelle A., 1985, M.S.W., 1967, Ph.D., 1984, Washington; maternal and child health policies and programs.

Buchner, David M., 1984, (Medicine), M.D., 1977, Kansas; M.P.H., 1984, Washington; geriatric health promotion.

Hedrick, Susan C., 1983, (Research), M.A., 1975, Ph.D., 1982, Michigan State; health services.

Hoare, Geoffrey A., 1986, Ph.D., 1984, Pennsylvania; health management and organization.

Lin, Elizabeth Hlok-Boon, 1984, (Family Medicine), M.D., 1979, Stanford; M.P.H., 1984, Washington; cultural aspects of medical care, disease prevention, health promotion.

Martin, Diane K., 1978, (Epidemiology), M.A., 1972, Temple; Ph.D., 1979, Washington; health-care organization and behavior.

Pearlman, Robert A., 1981, ‡(Medicine), M.D., 1975, Boston; M.P.H., 1980, Washington; gerontology.

Rhodes, Lorna A., 1984, ‡(Anthropology), M.A., 1971, Ph.D., 1973, Cornell; medical anthropology, symbolic anthropology, South Asia, religion, psychiatry.

Ried, L. Douglas, 1985, ‡(Pharmacy Practice), M.S., 1982, Ph.D., 1983, Minnesota; pharmacy administration.

Shaul, William, 1980, ‡(Pediatrics), (Medical Education), M.D., 1973, Pennsylvania State; ambulatory pediatrics.

St. Clair, Patricia A., 1986, Sc.D., 1986, Johns Hopkins; public health nursing and prenatal care utilization behavior.

Lecturers

Altamore, Rita A., 1982, M.D., 1977, Boston; M.P.H., 1983, Washington; medical care for uninsured poor and unemployed.

Bailweg, Ruth Ann, 1981, B.S., 1969, Southern Oregon State; women's health care and women's professional roles, utilization of physician assistants.

Gloyd, Stephen S., 1986, M.D., 1973, Chicago; M.P.H., 1983, Harvard; international public health.

Kundert, Kathryn L., 1983, B.S., 1974, California (Santa Cruz); educational development in cross-cultural settings, geriatric issues and the physician assistant.

Richardson, Mary, 1978, M.H.A., 1978; program evaluation.

Stoll, Henry W., 1978, B.A., 1971, Brown; physician assistant education, curriculum development and physician assistant professional issues.

Wiscomb, Kenneth, 1985, physician assistant certification; primary care, emergency medicine.

Course Descriptions**Courses for Undergraduates**

HSERV 451 Anatomy and Physiology for the MEDEX Practitioner (6) A *Brown, Stoll* Students are taught the anatomy and physiology of the following organ systems: EENT, respiratory, cardiovascular, gastrointestinal, genitourinary, gynecologic, integumentary, musculoskeletal, and neurologic. Focus on clinical examples of anatomic and physiologic principles encountered in primary-care practice. Prerequisite: admission to the MEDEX program.

HSERV 452 Basic Clinical Pathology for the MEDEX Practitioner (3) W *Goldfogel, Stoll* Basic pathological and pathophysiological concepts of diseases commonly encountered in primary-care practice. Pathophysiology studied per organ system. Prerequisite: admission to MEDEX program.

HSERV 453 Basic Clinical Skills for the MEDEX Practitioner (6) A *Kundert, Stoll* Provides the student with mastery of a screening history and physical examination and thoroughness in data-collection skills. Branching examinations of major organ systems and medical record-keeping and verbal presentation skills by the problem-oriented method are taught. Prerequisite: admission to the MEDEX program.

HSERV 454 Principles of Clinical Problem Solving for the MEDEX Practitioner (6) W *Altamore, Kundert* Problem-oriented approach to the assessment of common primary-care conditions. Introduction to relevant laboratory and radiologic procedures.

HSERV 456 Pediatrics for the MEDEX Practitioner (5) Sp *Bailweg* Designed to acquaint students with basic primary-care pediatrics; includes pediatric physical diagnosis and history taking; child development; and common pediatric problems. Concepts of prenatal care, health maintenance of children, and well-child care are covered. Prerequisite: admission to MEDEX program.

HSERV 457 Behavioral Science Skills for the MEDEX Practitioner I (3) A *Lurie* Process skills and interpersonal skills needed for primary-care practice, assessment skills needed for the diagnosis of emotional problems, and management skills used in primary-care practice to deal with these problems. Prerequisite: admission to the MEDEX program.

HSERV 458 Behavioral Science Skills for the MEDEX Practitioner II (3) W *Lurie* In-depth coverage of common emotional problems seen in primary care. Topics include crisis intervention, child abuse, death and dying, life planning, behavioral modification, human sexuality, alcohol and drugs, and family therapy techniques. Prerequisite: admission to MEDEX program.

HSERV 459 Behavioral Science Skills for MEDEX Practitioner III (3) Sp *Lurie* In-depth approaches to assessment and management of specific primary-care problems, including posttraumatic stress disorders, SIDS, violent patient, relevance of male/female issues to primary care, and emotional and sexual needs of disabled persons. Advanced interviewing skills with videotaped feedback included. Prerequisite: admission to MEDEX program.

HSERV 460 Principles of Patient Management for the MEDEX Practitioner I (2) W *Bailweg, Ellsworth* Systematic approach to patient management applicable to a primary-care setting. Half of course devoted to drug therapy and its administration with text developed specifically for the course; other half includes record keeping by a problem-oriented system, health maintenance, risk factor identification, and nonpharmacologic therapeutic modes. Prerequisite: admission to MEDEX program.

HSERV 461 Principles of Patient Management for the MEDEX Practitioner II (2) Sp *Altamore, Picou* Expansion of disease-oriented patient management (as taught in Patient Management I) to include knowledge and skills in health promotion and disease prevention. Prerequisite: admission to the MEDEX Program.

HSERV 462 Emergency Medicine and Technical Skills for the MEDEX Practitioner (6) *Wiscomb* Emergency conditions, what immediate actions to take, how to organize a management and referral plan for major and minor emergent conditions. Life support, orthopaedic injuries, head injuries, shock, chest pain, respiratory distress, the acute abdomen, poisonings, burns, wound care, suturing, casting. Prerequisites: 451, 453, 457, or permission of instructor.

HSERV 463 Clinical Clerkships for the MEDEX Practitioner I (19) *Wiscomb* Full-time clinical clerkship spent in institution-based or specialty practice settings, such as occupational health, surgery, emergency medicine, psychiatry, or geriatrics. Prerequisite: admission to MEDEX Northwest Physician Assistant program.

HSERV 464 Special Clinical Topics for the MEDEX Practitioner (2) Sp *Stoll* Lecture series in clinical medicine relevant to the practice of physician assistants, such as sexually transmitted diseases and commonly encountered endocrine disorders. Prerequisite: admission to MEDEX program.

HSERV 465 Clinical Clerkships for the MEDEX Practitioner II (19) *Wiscomb* Continuation of clinical clerkships spent in institution-based or specialty practice settings, with emphasis on inpatient medicine. Prerequisite: admission to the MEDEX Northwest physician assistant program.

HSERV 466 Family Practice Clerkship for the MEDEX Practitioner I (19) A *Bailweg, Wiscomb* Family practice under the supervision of physicians throughout the Pacific Northwest. Common primary-care problems. Students and preceptors are educated in the utilization and management of the MEDEX in practice. Students write protocols for primary-care problems and complete a programmed text in pharmacology. Offered on credit/no credit basis only. Prerequisite: admission to MEDEX program.

HSERV 467 Family Practice Clerkship for the MEDEX Practitioner II (19) W *Bailweg, Wiscomb* Further experience in primary-care practice with emphasis on independent patient management by the student supervised by family practitioners. Offered on credit/no credit basis only. Prerequisite: admission to MEDEX program.

HSERV 475 Comparative Systems of Healing (5) S *Medical anthropology.* Ways in which and extent to which "health" and "sickness" are culturally constituted. Epistemological, as well as pragmatic, limitations of the organism-centered cartesian, biomedical approach to sickness, medicine, and health. Joint with ANTH 475.

HSERV 499 Undergraduate Research (*) AWSpS**Courses for Graduates Only**

HSERV 511 Introduction to Health Services and Community Medicine (3) A *Perrin* Introduction to health services for nonmajors that includes history and organization of the health services system; interrelationships among elements and personnel in the system; and determinants of health, disease, and use of health care. No credit given if 512-513 taken for credit. Prerequisite: graduate standing or permission of instructor.

HSERV 512-513 Health Care Behavior, Organization, and Financing I and II (3-3) A,W Historical, epidemiological, social, economic, political forces that shape structure, functioning of health services. Trends in health, illness, and in organization, financing, regulation of public/personal health services. No credit given if 511 taken for credit. Prerequisite: graduate standing in health services or permission of instructor.

HSERV 514 Advanced Topics in Health Services (3) S Continuation of 513. Extensive examination of the structure, organization, financing, regulation, and outcomes of health services and analysis of how emerging technological, political, legal, and economic forces influence changes in the health-care system. Prerequisites: 512-513.

HSERV 516 Health Services Research Methods (3) Sp *Koepsell, Lin* Rigorous, methodologic training in conducting health services research. Guided conceptualization, design; subject selection; measurement choices; data collection; analysis. Covers theory, principles; discussion sessions focus on practical applications. Prerequisites: 511 or 512-513; BIOST 511 (BIOST 512 and 513 or 523 recommended); EPI 512 and 513 or equivalent; or permission of instructor.

HSERV 519 Comparative International Health Systems (2) Sp *Belcher* Guest lecturers present their experiences with various health-care systems (e.g., Canada, Sweden, United Kingdom, Ghana, Tanzania, Israel, China), including interaction between the sociopolitical setting, resources, and population health needs for each health system discussed. Students have opportunity to acquire in-depth information about one country's health system.

HSERV 520 Methods in Applied Community Research (2) S Skills and knowledge necessary to conduct orderly investigations of specific problems in preparation for M.P.H. thesis. Problem identification, posing research questions, literature review, consideration of theoretical and practical context, choosing a study design, population and sample, data collection, recognizing potential errors. Prerequisite: registration in Extended M.P.H. Degree program or permission of instructor.

HSERV 521 Organization Theory and Behavior in Health Services (3) AW Introductory course in organization and management in health-care settings. Role of professionals within context of generic organization and management issues common to any organization. Concept of control. Prerequisite: registration in Extended M.P.H. Degree program or permission of instructor.

HSERV 522 Personnel Management for Health Professionals (3) WSp Designed for midcareer health services professionals developing strategies and skills in human resource management. Focuses on policy and practice issues important to handling day-to-day personnel problems—selection, promotion, performance appraisal, discipline, grievances. Prerequisite: registration in Extended M.P.H. Degree program or permission of instructor; non-business majors.

HSERV 523 Financial Management for Health Professionals (3) S Intensive review of basic accounting principles and terminology, introduction to financial management and managerial accounting, in-

cluding budgeting for managerial control, planning, cost accounting, financing health programs. Managerial accounting. Prerequisites: BOST 472 and 473, or BOST 511; registration in Extended M.P.H. Degree program or permission of instructor; non-business majors.

HSERV 524 Systems Analysis for Health Professionals (3) S Management science and approaches developed as applied to problems in public health. Conceptual understanding of processes and application of systematic, rational approach to managerial problem solving, including cost-benefit, cost effectiveness analysis. Prerequisites: BOST 472 and 473, or BOST 511; registration in Extended M.P.H. Degree program; non-business majors.

HSERV 527- Introduction to Health Services—Extended Degree (4-) A Definition of health and its determinants, including the role of health services. Contrasting aspects of personal health services and public health. Blending of traditional public health and personal health and medical care. Prevention in health care with consideration of screening, sensitivity, and specificity. Prerequisite: registration in Extended M.P.H. Degree program.

HSERV -528- Provision of Health Services—Extended Degree (-2-) W Consideration of factors that influence the utilization of health services, including socioeconomic and cultural. Health belief systems and health behavior, with specific consideration of the effects of these factors on utilization of services and prevention. Prerequisites: 527-, registration in Extended M.P.H. Degree program.

HSERV -529 Issues in Health Services—Extended Degree (-2) Sp Rationale for evaluation of health services; quality control and its relation to costs. Patient protection and participation in determining medical care. Regulation of new drugs and devices. Criteria for the use of new technology. Ethical considerations, including informed consent. Prerequisites: -528-, registration in Extended M.P.H. Degree program.

HSERV 531 Special Studies in Community Medicine (1-12) AWSps Experience in variable time blocks in community health activities in agencies delivering and planning health services. Sites include neighborhood clinics, health planning bodies, medical practice settings, public health agencies, special problem clinics and facilities, environmental programs and services. Prerequisite: medical student standing or permission of instructor.

HSERV 537 Topics in Maternal and Child Health I (2) Bell Historic, legislative, structural, and economic basis for maternal and child health services in the United States. Seminar format, in which students critically review assigned readings and prepare questions for class discussion. Prerequisite: graduate standing or permission of instructor.

HSERV 538 Topics in Maternal and Child Health II (2) Hickok Preconceptional through postnatal period. Prenatal care, nutrition, prenatal diagnosis, maternal and perinatal mortality, family planning. Political, social, and economic impacts of these issues. Prerequisite: graduate standing or permission of instructor.

HSERV 539 Topics in Maternal and Child Health III (2) Sherry, St. Clair Normal and abnormal growth and development (neurological cognitive, psychological, social) from infancy to adulthood. Techniques for assessing growth and development evaluated; neurological, cognitive, psychological, social development. Seminar format. Prerequisite: graduate standing or permission of instructor.

HSERV 540 Ambulatory Care Organization and Management (3) A Richardson Organizational and managerial aspects of ambulatory medical services. The organizational focus relates to the ambulatory services provided within the structure of the United States

health services system. The managerial aspect relates to specific administrative issues involved in the operation of health services facilities, including financial control, marketing, personnel, evaluation, and regulation. Prerequisites: 512-513.

HSERV 541 The Organization and Role of Hospitals (3) W Rambeck External environment and internal organization of hospitals; community-hospital relationships, hospital ownership, governing board and medical staff functions and organization; and the role of hospitals in the delivery of health services and their relationship with other elements of the health-care system. Emphasis on issues and trends. Prerequisites: 511 or 512-513.

HSERV 542 Long-Term Care (3) A Winn Provides a learning experience for graduate students in health services administration and planning and other graduate students that will increase their ability to identify and solve the problems related to long-term care with which they will be confronted in their employment. Students are exposed to available knowledge in the field; effective problem-solving attitudes and techniques for organizing information and/or developing strategies, and present actors and agencies in the field. Prerequisites: 511 or 512-513 and permission of instructor.

HSERV 545 Quality of Health Care: Evaluation and Assessment (3) Sp Altamore, LoGerfo Survey of methods used to assess components of medical care services and an analysis of their application to care by physicians, nurses, physician extenders, social services, hospitals, nursing homes, and emergency services. An overview of legal and professional quality assurance mechanisms also is presented, with analysis of their actual and potential impact. Prerequisites: 511 or 512-513, BOST 511, or equivalent.

HSERV 546 Problems in Contemporary Public Health Practice (3) Sp DeRoos History and development of local public health departments. Traditional vs. new roles and critical interactions with public and private agencies. Examples drawn from areas of current concern (e.g., prostitution and venereal disease; health promotion and disease prevention; dental health; environmental programs; alcoholism; emergency medical services; mental health services; jail medical care). Prerequisites: 511 or 512-513 or permission of instructor.

HSERV 550 Economic Studies of Health Care (3) W Watts Examination of health-care issues from an economic perspective, including supply and demand factors, health insurance, industry organization, and government regulation. Prerequisites: 511 or 512-513 or permission of instructor.

HSERV 551 Hospital and Medical Law (4) Sp Coe Philosophy and application of law as it relates to the hospital and other health-care facilities. Discussion of legal process and the relation of the law and public policy. Prerequisites: 511 or 512-513.

HSERV 552 Politics of Health Care (3) Sp Hagens Range of health-care problems and issues dealt with by governments; conceptual frameworks for analyzing government actions; the processes involved in the formulation, implementation, and evaluation of health-care policy. Prerequisites: 511 or 512-513 or permission of instructor.

HSERV 553 Hospital Financial Management (3) Sp Tiscornia Third course in a three-course sequence dealing with the management of health services institutions and programs. Topics covered are: health services law, hospital and program policy decisions, financial planning, and hospital design and architecture; and the presentation of hospital survey and health services research project reports. Prerequisites: 511 or 512-513 and ACCT 500 or 501 or permission of instructor.

HSERV 554 Sociology of Health and Illness: An Organizational and Managerial Perspective (3) A Patrick Critical examination and discussion of sociological approaches—methodological, theoretical, and empirical—in the health-care field. Particular attention is paid to applied studies in the field and, more broadly, to the implications for decision making from the sociological perspective. Joint with SOC 561. Prerequisites: 511 or 512-513 or undergraduate major in sociology or permission of instructor.

HSERV 555 Seminar in Health-Care Finance (3) W Conrad Practical applications (through case studies) of corporate finance principles in health-care field. Building on FIN 502, applies theoretical framework to health-care financial problems of varying complexity, including capital investment analysis, leasing vs. borrow-to-buy decision, debt capacity analysis, and bond refunding. Prerequisite: FIN 502 or permission of instructor.

HSERV 556 Quantitative Decision Making for Health Services Management (3) Sp Trivedi Applications of various quantitative techniques for problem solving, monitoring, controlling, and decision making in health services. Emphasis on identifying problem area, communications with consultant at a technically sophisticated level, and evaluation of the quality and applicability of analyst's work. Quantitative methods include statistical, mathematical, operations research, and industrial engineering techniques. Prerequisites: QMETH 500 or BOST 511, and OPMGT 502 or permission of instructor.

HSERV 557 Health Behavior and Preventive Medicine (3-4) W Carter Effective delivery of preventive health services is integrally and inseparably linked to voluntary health behavior. Clinical issues and psychosocial theory related to a broad spectrum of health behaviors. Emphasized: identifying effective preventive services; psychosocial and decisional bases for health actions; provider-patient interactions; and research and clinic-based strategies for changing beliefs and behaviors. Prerequisites: 511 or 512-513 or permission of instructor.

HSERV 558 Strategies of Health Promotion (3) Sp Buchner, Carter Major types of health promotion strategies in use; attention to strengths, weaknesses, and potential utility of alternative strategies. Programs employing social engineering (e.g., legal regulation, social marketing), behavioral modification, education examined in terms of efficacy, cost effectiveness in modifying health-hazardous lifestyles, environmental exposures. Prerequisites: 511 or 512-513.

HSERV 559 Medical Geography (3) Mayer Geography of disease, consideration to health systems planning. Distributions, diffusion models, migration studies. Application of distance, optimal location models to health systems planning; emergency medical services, distribution of health professionals; cultural variations in health behavior. Joint with GEOG 580. Prerequisites: familiarity with social science research, health-related issues.

HSERV 560 Advanced Seminar in Health Economics (3) Sp Conrad, Watts Selected topics in health economics, including risk and insurance, medical malpractice, the market for physician services, and industry regulation. Joint with ECON 547. Prerequisites: 550 or ECON 546 and advanced-level microeconomic theory, or permission of instructor.

HSERV 562 Health Policy Seminar (3) S Sloma, Watts Provides an opportunity to gain and apply tools of policy analysis. Alternative techniques of gathering, synthesizing, and analyzing available information in a timely fashion. Written and oral presentation to a policy audience on "real" health issues. Prerequisite: 552 or permission of instructor.

HSERV 563 Advanced Health Services Financial Management (3) Sp Lehman Develops financial management skills through case studies in budgeting,

pricing, and monitoring the total financial requirements for health-care institutions. Topics include budgeting principles, cost analysis, rate setting, reimbursement, profit planning, short- and long-term capital financing, and financial feasibility analysis. Prerequisite: 553 or permission of instructor.

HSERV 564 Advanced Seminar on Medical Sociology (3) Sp Cook Development and testing of theories related to illness behavior, health occupations, and professions, and the organization of health services. Emphasis on provider-patient relationships and the sociology of health-care-delivery organizations. Joint with SOC 563. Prerequisite: 554 or admission to health services doctoral opportunities program or graduate status in sociology or permission of instructor.

HSERV 570 Seminar in Health Services Management (4) W Dowling, Hoare Examination of decision making, change implementation, and control processes in health-services-delivery organizations. Emphasizes (1) behavioral, organizational, and situational factors affecting the management role in health organizations, and (2) management strategies for analyzing problems and implementing changes to improve organizational performance. Seminar/case study format. Prerequisites: 511 or 512-513 or 541 or permission of instructor.

HSERV 571 Techniques For Strategic Planning and Marketing in Health Services (4) Sp Haines Basic planning model involving seven steps and five technical capabilities. Application of the model and employment of specific techniques in making decisions and programming action with respect to health services and facilities, with emphasis on inpatient and ambulatory-care programs. Prerequisites: 511 or 512-513 or permission of instructor.

HSERV 572 Health Planning: Implementation and Goals (3-4) A Blackman How to design realistic implementation strategies at the beginning of a planning process to optimize the impact of planning on real world of problems. Students prepare several sets of strategies dealing with planning in community, organizational, and committee settings. Course presents techniques that can be used in designing planning programs. Demonstrates relationship between change implementation strategies and development of goals for change. Students learn how change is brought about, how decisions are made, and how things get done at both the organization and community levels. Prerequisites: 511 or 512-513 or substantial experience in an operating setting or agency.

HSERV 573 Program Evaluation (3) A Theory, practice, and politics of evaluation. All types of evaluative activities considered from simple feedback mechanisms to the evaluation of large-scale ongoing programs and social experiments. Emphasis on development of familiarity with, and applications of, experimental and quasiexperimental evaluation. Case studies drawn from the health field used to illustrate the various types of evaluation. Prerequisite: background in quantitative methods.

HSERV 574 Community Health and Needs Assessment (3) Connell Approaches and tools to identify, measure health/health-care problems in defined communities. Uses, limitations of available data; community surveys; public health surveillance methods; problem identification; needs assessment techniques; measurement issues; analytic methods; data presentation for program, policy planning. Prerequisite: graduate standing in public health or permission of instructor.

HSERV 576 Marketing Health Services Seminar (3) Sp MacStravic, Scott Application of planning, design, development, and promotional strategies for health services. Relevant literature, appropriate marketing concepts and techniques to health services, achieving organizational goals within community opportunities and constraints. Examples of successful and unsuccessful marketing programs. Prerequisites: 512-513, or permission of instructor.

HSERV 581- Research Design and Problem Analysis in Health Services I (2-) W Carter, Perrin Lecture/seminar in the application of scientific method to health services research, designed to provide a common orientation to Doctoral Opportunity Program students. Offered on credit/no credit basis only. Prerequisites: 511 or 512-513 or admission to Doctoral Opportunity Program or permission of instructor.

HSERV 582 Research Design and Problem Analysis in Health Services II (-1) Sp Carter, Perrin Continuation of 581-. Offered on credit/no credit basis only. Prerequisite: 581- or permission.

HSERV 590 Selected Topics in Health Services (*) AWSpS By individual arrangement, the student and faculty member(s) develop a program of reading and conference appropriate to the topic selected by the student. The topic chosen will be within the special competence of the faculty participating in the course, in the areas of health-care delivery and health-care administration. Also special summer format presenting introductory material may be taken with ENVH 590 and/or EPI 590. For more information and permission, consult department program adviser.

HSERV 591, 592 Seminar in Special Topics I, II (1-4, max. 4; 1-4, max. 4) AWSpS, AWSpS Special topics related to current issues in health services. Topics determined by expressed interest of students and faculty; also includes participation of health professionals. Prerequisites: 511 or 512-513.

HSERV 595, 596, 597 Field Analysis Project/Research Project (1-3,3,3) A.W.Sp Supervised research in a selected topic related to student's concentration in graduate study. Includes survey of literature, development of approach, and written paper on conclusions. Prerequisite: successful completion of first-year curriculum and internship in graduate program in health services administration and planning.

HSERV 600 Independent Study or Research (*) AWSpS Prerequisite: permission of instructor.

HSERV 700 Master's Thesis (*) AWSpS Prerequisite: permission of instructor.

Pathobiology

F161 Health Sciences

Graduate Program

George E. Kenny, Graduate Program Coordinator

The Department of Pathobiology offers a research training program leading to the degree of Master of Science. A proposal has been submitted for authorization of a Doctor of Philosophy degree program in pathobiology. Pathobiology is the study of pathogenic biological agents and their interaction with their host, primarily mankind. The agents studied, with primary emphasis on their antigenic structure, include viruses, bacteria, mycoplasmas, chlamydiae, protozoa, parasites, and tumors. The host responses studied are primarily immunologic.

As a discipline, pathobiology stands at an interface of fundamental biology and clinical medicine. The ultimate goal is to determine means of detecting, understanding, and preventing disease. Diseases studied include respiratory infections (viral and microbial), sexually transmitted diseases, cancer, trypanosomiasis, helminthic infections, and diarrhea. Course work includes basic courses in pathobiology, with additional courses required in biostatistics, epidemiology, microbiology, and biochemistry. Electives may be selected from these fields as well as from other basic medical sciences, such as pathology and genetics. Major emphasis is placed on the production of knowledge

through the research program where the thesis or dissertation ordinarily results in publication. To the holder of a doctoral degree, the department also offers postdoctoral research training. Applicants for degree programs should apply to the graduate program coordinator, and applicants for postdoctoral training should apply directly to individual faculty members.

Special Requirements

The applicant for the M.S. program should have a baccalaureate degree in biological science. Courses in biochemistry and microbiology are required, and students entering the curriculum without such background will be required to correct the deficiency. Persons holding professional doctorates (medicine, dentistry, veterinary medicine) are also encouraged to enter the graduate program.

Financial Aid

Some financial aid may be available in the form of research assistantships funded primarily through federal research grants held by faculty members.

Research Facilities

Laboratories are specifically equipped for biochemical and immunochemical work. Although most students work at the University site, opportunities for training also exist at the Fred Hutchinson Cancer Research Center, the Pacific Medical Center, and the Biomembrane Institute.

Correspondence and Information

Graduate Program Coordinator
Department of Pathobiology, SC-38

Faculty

Chairperson

George E. Kenny

Professors

Boatman, Edwin S.* 1968, (Emeritus), ‡(Environmental Health), M.Sc., 1961, Ph.D., 1967, Washington; morphology and ultrastructure of microorganisms and structure of lungs.

Buchanan, Thomas M.* 1975, (Microbiology), (Medicine), † M.D., 1967, Washington; immunology of gonorrhea and leprosy.
Cooney, Marion K.* 1965, (Emeritus), M.S., 1953, Ph.D., 1962, Minnesota; medical virology.

Grayston, J. Thomas,* 1960, ‡(Epidemiology), M.D., 1948, M.S., 1952, Chicago; epidemiology of infectious diseases, infections of chlamydia and respiratory tract.

Hakomori, Sen-Itiroh,* 1967, ‡(Biochemistry, Chemistry), (Microbiology), † M.D., 1951, D.Med.Sci., 1956, Tohoku (Japan); membrane biochemistry and glycoproteins.

Kenny, George E.* 1961, (Microbiology), M.S., 1957, North Dakota; Ph.D., 1961, Minnesota; antigenic structure.

Kuo, Cho-chou,* 1971, B.M., 1960, National Taiwan, Ph.D., 1970, Washington; chlamydiae.

Perine, Peter L.* 1981, ‡(Epidemiology), M.D., 1966, Kansas; M.P.H., 1973, Washington; international health, sexually transmitted diseases, diseases caused by pathogenic spirochetes biology.

Rausch, Robert L.* 1977, (Zoology), (Animal Medicine), † D.V.M., 1945, Ohio State; M.S., 1946, Michigan State; Ph.D., 1949, Wisconsin; parasitology.

Wang, San-pin,* 1966, M.P.H., 1952, Michigan; M.D., 1944, D.Med.Sci., 1959, Keio (Tokyo); chlamydiae.

Associate Professors

Carter, William G.* 1981, Ph.D., 1974, California (Davis); membrane biochemistry and glycoproteins.

Thouless, Margaret E.* 1980, (Animal Medicine), M.Sc., 1967, Ph.D., 1974, Birmingham (England); gastroenteritis viruses.

Assistant Professors

Campbell, Lee Ann,* 1985, M.S., 1979, Ph.D., 1982, Pennsylvania State; molecular biology.

Clausen, Henrik, 1986, (Research), D.D.S., 1982, Royal Dental (Copenhagen); carbohydrate chemistry and biochemistry.

Parsons, Marilyn, 1986, (Research), Ph.D., 1979, Stanford; molecular biology, eukaryotic cells.

Roberts, Marilyn C.,* 1981, M.S., 1977, Ph.D., 1978, Washington; molecular biology and infectious diseases.

Course Descriptions

UCONJ 420 Biological Safety Practices (1) A Kenny See University Conjoint courses.

PABIO 497 Pathobiology Special Electives (*) AWSpS Off-campus course for medical students.

PABIO 499 Undergraduate Research (*) AWSpS

Courses for Graduates Only

PABIO 511 Pathobiological Frontiers (3) Molecular and immunological concepts of infectious and non-infectious diseases presented in format suitable for graduate students knowledgeable in health-related areas who are not in biology-oriented programs. Allergy, immune responses, nature of infectious agents, prevention of disease with emphasis on newly defined diseases and disease agents. Prerequisite: permission of instructor.

PABIO 521 Tissue Culture and Virology (3) General concepts, techniques, and applications of tissue culture with emphasis on use of tissue culture for viral diagnosis and propagation. Nutrition, growth characteristics, and metabolism of animal cell cultures. Laboratory experiments give practical experience in tissue culture and virology. Prerequisite: permission of instructor.

PABIO 522 Antigenic Analysis of Microorganisms (3) Theory and techniques for antigenic analysis of complex mixtures, including microorganisms. Recent advances in separating antigens, identifying antigenic determinants, and antigenic mapping of proteins. Laboratory includes a special problem of the student's choice. Prerequisite: permission of instructor.

PABIO 524 Methods for Ultrastructure of Microorganisms (3) W Boatman Specific methods for the investigation of the ultrastructure of microorganisms are described following discussion of the design and operation of the electron microscope. Lectures cover the morphology and structure of bacteria, mycoplasmas, and bacterial and animal viruses. Instruction is given in operating the electron microscope, in the examination of specimens, and in producing photographic data. Students are expected to pursue a small topic of their choice. Prerequisite: permission of instructor.

PABIO 525 Cell Surface Membrane in Cell Sociology and Immunology (2) Sp Carter, Hakomori, Sekiguchi Structure and function of cell surface membranes in relation to various immunobiological and pathobiological phenomena (differentiation, organization, infection, cancer, etc.) are covered. Joint with MICRO 525. Prerequisites: BIOC 440, 441, 442, MICRO 447, and permission of instructor.

PABIO 526 Protein Antigens (3) Lecture and laboratory covering purification, characterization, and quantitation of protein antigens from pathogenic microorganisms. Principles of the techniques and laboratory skills. Entry card required.

PABIO 580 Pathobiology Seminar (1, max. 9) AWSpS Research reports from both students and faculty members are presented and discussed. Topics include immunochemistry, viruses, membranes, infectious diseases, immune response. Prerequisite: permission of instructor.

PABIO 581 Current Literature in Pathobiology (1, max. 12) AWSpS Critical evaluation of recent articles on infectious agents. Emphasis on literature dealing with immunological, biochemical, and molecular studies of selected pathogenic microorganisms and viruses. Prerequisite: graduate student standing in pathobiology; others by permission of instructor.

PABIO 583 Seminars on Frontier Membrane Research (1, max. 4) Structure and function of cell surface membranes for postdoctoral fellows and graduate students. Discussion on experimental design based on current topics of cell surface structure and function among researchers in the Department of Pathobiology and in the Division of Biochemical Oncology of the Fred Hutchinson Cancer Research Center. Advanced sequel to 525.

PABIO 590 Selected Topics (1-6, max. 6) AWSpS Buchanan, Carter, Chen, Cooney, Hakomori, Kenny, Kuo, Rausch, Stibbs, Thouless, Wang In-depth study of disease agents and host response, usually related to a current problem, and focusing on characteristics of the disease agent. Seminar format. Small groups of students by arrangement with faculty member. Offered on credit/no credit basis only. Prerequisites: enrollment in pathobiology graduate degree program and permission of instructor.

PABIO 598 Didactic Pathobiology (*, max. 12) AWSp Kenny Supervised lecture and laboratory teaching experience for Ph.D. candidates. Teaching is in pathobiology laboratory courses, depending on interests of the student. Prerequisite: permission of instructor.

PABIO 600 Independent Study or Research (*) Offered on credit/no credit basis only. Prerequisite: permission of department Chairperson.

PABIO 700 Master's Thesis (*) Offered on credit/no credit basis only. Prerequisite: permission of department Chairperson.



Reserve Officers Training Corps Programs

Aerospace Studies

202 Clark

The Air Force Reserved Officer Training Corps program (AFROTC) is designed to motivate, educate, and commission highly qualified students for active duty as officers in the U.S. Air Force. The curriculum develops the professional knowledge, in both theory and application, that an Air Force officer needs to be an effective manager and leader in the aerospace environment.

General Program Requirements

The freshman- and sophomore-level courses are open to all students between the ages of fourteen and twenty-six attending a state or community college full time. Any qualified male or female student may enroll in these general military courses. The junior and senior classes are open to qualified students who have received credit for the general military courses and have been competitively selected for entry.

Commissioning Requirements

Students who successfully complete the AFROTC program and receive an academic degree from the University are offered commissions as second lieutenants in the Air Force.

General Military Course

The basic division courses consist of one classroom hour and one leadership laboratory hour per week during the freshman and sophomore years. Uniforms and textbooks are provided. Students may enter the freshman class at the start of Autumn, Winter, or Spring quarters. Sophomore students may enter at the start of Autumn Quarter and take the freshman- and sophomore-level courses concurrently. A four-week field training course, taken during the summer between the sophomore and junior years, is required for entry into the professional officer courses. Students receive pay and travel costs for field training.

Except for sophomore cadets on AFROTC scholarship, students incur no active duty service commitment by taking general military courses, and students may drop the courses at any time.

Professional Officer Courses

Cadets selected for enrollment in professional officer courses are enlisted in the Air Force Reserve and receive tax-free monthly subsistence pay of \$100. They are furnished texts and uniforms. Junior- and senior-level classes consist of three hours of academic classes and one hour of leadership laboratory per week.

Financial Assistance

The Air Force offers 3½-, 3-, 2½-, and 2-year scholarships for engineering and certain specific and certain premedicine majors. In addition, scholarships are available for highly qualified pilot, navigator, and missile launch officer candidates. AFROTC scholarships pay tuition, certain fees, and full textbook reimbursement.

In addition, scholarship winners receive a \$100 subsistence allowance per month. To take advantage of these scholarships, students should apply directly to the AFROTC department.

Two-Year Program

To provide for those students unable to take the general military courses, a two-year professional officer course is available on a highly competitive basis. The two-year program is open to graduate students and other students who have two years remaining until graduation.

Students in this program are required to attend a six-week field training course at an Air Force base during the summer preceding program entry. The student is paid during the six-week period. Upon return to the campus, students pursue the professional officer course. Uniform, texts, and \$100 monthly subsistence are provided.

Two-year scholarships may be available for qualified students. Students interested in this program should contact the AFROTC department nine to twelve months prior to the Autumn Quarter they desire to enter.

Faculty

Chairperson

Robert G. Lambert

Professor

Lambert, Robert G., 1988, M.A., 1976, Colorado.

Assistant Professors

Drysdale, Kenneth R., 1988, M.S., 1987, Golden Gate.

Lucero, Louis D., 1986, M.B.A., 1981, Central Michigan.

Sparrow, Gary T., 1988, M.S., 1984, Air Force Institute of Technology.

Sveen, James E., 1987, M.B.A., 1985, South Dakota.

Course Descriptions

Courses for Undergraduates

A S 101, 102, 103 Aerospace Studies 100 (1,1,1)
A,W,Sp Lambert, Drysdale Focuses on the basic characteristics of air doctrine; U.S. Air Force mission and organization; functions of U.S. strategic offensive and defensive, general-purpose, and aerospace support forces. One-hour leadership laboratory consisting of Air Force customs and courtesies, Air Force environment, and drill and ceremonies is mandatory.

A S 211, 212, 213 Aerospace Studies 200 (2,2,2)
A,W,Sp Lucero Factors contributing to changes in military conflict; development of air power from beginnings through two world wars; evolution of air power concepts and doctrine; role of technology in growth of air power; history of air power employment in military and nonmilitary operations in support of national objectives; and assessment of oral communicative skills. Additional one-hour leadership laboratory is mandatory.

A S 331, 332, 333 Aerospace Studies 300 (3,3,3)
A,W,Sp Sveen Leadership and management fundamentals. Blocks of instruction on extensive communicative skills development and military ethics. Case studies used to examine Air Force leadership and management situations. Mandatory leadership laboratory provides advanced leadership experiences in officer-type activities, giving students the opportunity to apply the principles.

A S 431, 432, 433 Aerospace Studies 400 (3,3,3)
A,W,Sp Sparrow Needs for national security, evolution of American defense strategy and policy, methods for managing conflict, alliances and regional security to preserve American interests, arms control and the threat of war. The military as a profession, officership, the military justice system, communicative skills development. Mandatory leadership laboratory of advanced leadership experiences and orientation for initial active duty.

Military Science

104 Clark

The Department of Military Science offers the college student several elective options for the attainment of an Army officer's commission in reserve or active forces through Army Reserve Officer Training Corps (ROTC) while pursuing the academic degree of his or her choice. The program is highly competitive for commissioning.

Traditional Four-Year Program

Open to freshman and sophomore men and women, this program may lead to a commission in either the Regular Army or the Reserve (Army or National Guard). Academic studies include courses in military history and tactics, principles of leadership, techniques of instruction, management and staff procedures, logistics, physical conditioning, and military law. Extracurricular activities include such options as Rangers, rifle team, color guard, training exercises, field trips, and related activities. A student incurs no obligation of any kind during the first two years of the four-year Army ROTC program. Basic course grades are included in the grade-point average.

Placement credit toward completion of ROTC courses may be given for prior ROTC or military training. Veterans routinely receive full credit for the first two years of Army ROTC and may enter the advanced course directly. All military textbooks and uniform items are furnished without charge. Students in the advanced course receive a tax-free monthly stipend of \$100 for a maximum of twenty months. In the advanced course, cadets are required to participate in the leadership development program, which is a practicum of skills and principles taught during the previous two years. Between their junior and senior years, cadets attend a six-week summer camp during which they receive varied and challenging training and for which they are paid both for the time at camp and for travel expenses to and from the camp location. Upon entering the advanced course, students agree to complete the course, to accept a commission upon graduation, if offered, and to serve on active duty for three years after commissioning or three to six months' active duty training, with the balance of service in the Army Reserve or National Guard.

Two-Year Program

This program is open to qualified undergraduate and graduate students with at least two years in school remaining and who have completed 45 credits. Students may qualify for entrance into the advanced course under this program in either one of two ways.

First, they may participate in a special summer program offered on the University campus. This is a two-week program covering the freshman and sophomore years of the normal basic ROTC work (M SCI 101, 102, 103, and M SCI 201, 202, 203). Fees are not charged for registration in this program, and students are free to register for and to take other University courses during Summer Quarter. Participation in the program includes individually arranged classwork to accommodate each student's summer work or academic program. Students who have taken some military science courses but who have not completed all courses in the first and second year of ROTC may also arrange to complete the remaining course requirements during this summer program.

The second alternative under this program requires attendance at a basic camp for six weeks at Fort Knox, Kentucky. Completion of this basic camp also qualifies students for direct entry into the advanced course. While at camp, students receive pay plus travel expenses to and from the camp location, and they can compete for two-year scholarships. Academic subjects covered in the two-year program are the same as those covered in the four-year programs. Both programs have the same military obligation.

Two- and Three-Year Scholarship Program

This program is open to students enrolled in ROTC. Selections are made on a regional level based upon the recommendation of the professor of military science. The scholarship provides financial assistance during the remaining years of the student's enrollment. Each scholarship pays for tuition and a flat rate for books and laboratory expenses and provides, in addition, \$100 per month, tax free. All other advantages and obligations are the same as those of the four-year scholarship program.

Four-Year Scholarship Program

Application for this program should be made while the student is still in high school. Selection of students is made on a nationwide competitive basis. This program may lead to a commission in the Regular Army or the Army Reserve. All tuition, a flat rate for books and laboratory expenses, and uniform items, plus tax-free retainer monthly pay of \$100 for a maximum of four years, are provided by the Army. The program requires four years of academic study on campus, as well as a six-week advanced camp training period between the junior and senior years, for which the cadet is paid for both time and travel expense to and from the camp location. Academic studies are identical to those of the traditional four-year program. The student must sign a contract (with the consent of parents if under eighteen years of age) wherein he or she agrees to complete the program, to enlist in the Reserve, to accept a commission if offered, and to serve on active duty for four years after commissioning.

Additional information concerning the Army ROTC program may be obtained by writing: University of Washington; Professor of Military Science; 104 Clark, DU-20; Seattle, Washington 98195, or by visiting the Army ROTC offices at 104 Clark, telephone (206) 442-7570.

Faculty

Chairperson

Gary M. Weersing

Professor

Weersing, Gary M., 1985, M.S., 1980, Troy State; military science.

Assistant Professors

Dautremont, Lynn, 1987, B.S., 1980, Kentucky; military science.

Halverson, Barry, 1987, B.S., 1982, Maryland (College Park); military science.

Kilgore, Gary, 1987, Ph.D., 1987; Washington; military science.

Knapp, Gary, 1984, B.S., 1976, United States Military Academy; military science.

Pesano, Gary, 1985, M.A., 1982, Webster; military science.

Pleasant, Kenneth, 1986, M.A., 1976, Central Washington; military science.

Ruffin, John, 1987, B.S., 1984, Troy State; military science.

Wabnitz, Steven, 1987, B.S. 1979, Maryland; military science.

Course Descriptions

Courses for Undergraduates

M SCI 101, 102, 103 Military Science I: Basic (1,1,1) AWSp,AWSp,AWSp History, organization, and mission of the United States Army and the ROTC. Relationship to the citizen's military and civilian obligations. Functions and organization of the United States defense establishment. Fundamentals of leadership and management in military environment. Control, prevention, and treatment of combat or emergency medical situations. Leadership laboratories and two field training exercises during the year.

M SCI 201, 202, 203 Military Science II: Basic (2,2,2) AWSp,AWSp,AWSp Develops proficiency in delivering and evaluating oral instruction. Presents a perspective on the Soviet military tradition; an evaluation of tactical methodology of the Soviet army to include conventional weapon systems employment. Fundamentals of military map reading, aerial photography, compass and field navigation are taught and applied. Leadership laboratories and two field training exercises during the year.

M SCI 301, 302, 303 Military Science III: Advanced (3,3,3) AWSp,AWSp,AWSp Small-unit tactics, emphasizing the importance of firepower, movement, and communications. Duties, responsibilities, and methods of employment of basic military units. Leader's role in directing and coordinating individuals and military units from squad to company level. Students are introduced to the planning and conduct of individual and group physical conditioning activities, stressing positive motivation to establish high standards of morale and esprit. Principles and techniques of command, control, military management, and leadership are taught and practiced throughout the academic year. Leadership laboratories and three field training exercises during the year. Prerequisites: completion of basic training; basic camp or 9 credits of 100- and 200-level courses.

M SCI 305 Practicum-Techniques of Military Instructions (3) Analysis, review of techniques used in military training and instructions. Students plan, rehearse, deliver, provide written critique on block of military instruction from the Military Qualification Skills Manual. Prerequisites: admission to ROTC advanced course, permission of instructor, completion of 9 credits of 300- or 400-level courses.

M SCI 401, 402, 403 Military Science IV: Advanced (2,3,2) AWSp,AWSp,AWSp The Army officer's position in contemporary world and impact on problems within the military service. Use of a developmental study to provide awareness of personal responsibilities and official relationships of an Army officer. Organization and functions of command. Staff relationships. Coordination of administration, logistics, and planning for military operations. Basic concepts of legislative and executive authority for Uniform Code of Military Justice (to include a study of UCMJ and the officer's authority and responsibility within the military justice system). Problem-solving techniques used by small-unit leaders, emphasizing coordination and planning by the junior officer. Leadership laboratories and three field training exercises during the year. Prerequisites: completion of basic training; basic camp or 9 credits of 100- and 200-level courses.

Naval Science

305 Clark

The Department of Naval Science offers University students an opportunity to engage in study that leads to a commission in the U.S. Navy or Marine Corps while working toward a baccalaureate degree. The Naval Reserve Officer Training Corps (NROTC) unit functions in conjunction with the Department of Naval Sci-

ence. An NROTC student may select an academic major within certain limitations (i.e., some majors that normally lead to immediate graduate education, such as prelaw or premedicine, are not consistent with the mission of the NROTC program). Technical and engineering majors are highly recommended, because the responsibilities of naval officers have become more technical in nature.

In addition to their University curricula, NROTC students attend naval science courses in history and customs, navigation, naval engineering and weapons systems, naval operations, and leadership/management. In addition, each student must attend one drill session and one naval science laboratory session per week. During the summer, students may have a four-to-six-week training cruise to put into practice earlier classroom training. All ROTC students take the same naval science classes during the first two years. Students who elect to be commissioned in the Marine Corps take Marine Corps subjects during their third and fourth years.

Any University student may take any naval science course without enrolling in the NROTC Program. Two programs are offered.

Navy-Marine Scholarship Program

Each year, men and women are accepted for scholarship status in the four- and two-year ROTC scholarship programs. Eligibility for the four-year program is based upon nationwide competition and selection by a central selection committee. Application must be made by December 1 of the academic year preceding appointment as midshipman. Those selected are provided educational benefits, including subsidy by the Navy of all tuition, fees, textbooks, and uniforms, plus \$100 per month in subsistence pay.

For the two-year scholarship program, applications from current sophomores, or juniors enrolled in five-year programs of study, must be received by mid-March. Those chosen by a central selection committee attend a six-week course of instruction at the Naval Science Institute (NSI) at Newport, Rhode Island, during the summer prior to their junior year. Successful completion of NSI instruction qualifies these students for enrollment in the advanced course in the NROTC program. NSI graduates can qualify for scholarship based on class standing. All scholarship students are appointed as midshipmen, USNR, and upon graduation are commissioned as regular officers in the Navy or Marine Corps, after which they serve on active duty for four years.

Navy-Marine College Program

Each year, men and women are accepted for three- and two-year nonscholarship college programs. For the three-year program, the professor of naval science accepts applications from qualified students throughout the freshman year. Applications for the two-year program are accepted from current sophomores in community colleges or four-year colleges and must be received prior to mid-March.

Those students selected for the two-year program attend a six-week course of instruction at the NSI during the summer prior to their junior year. Successful completion of the NSI instruction qualifies students for enrollment in the advanced course in the NROTC program. Students in the NROTC college program pay their own college expenses but receive monthly subsistence pay of \$100 during their junior and senior years, including the intervening summer. The Navy furnishes all uniforms and textbooks used in naval science courses.

All college program students are eligible for a scholarship after completing one academic term, with scholarship awards based on academic grades and participation within the midshipman battalion. The two-year college program students also may win a scholarship for superior performance at the NSI. Upon graduation,

college program students are commissioned in the Navy Reserve or Marine Corps Reserve and serve on active duty for three years.

Additional information concerning the NROTC programs may be obtained by writing the University of Washington; Professor of Naval Science; 317 Clark, DU-40; Seattle, Washington 98195; or by visiting the NROTC unit on campus.

Faculty

Chairperson

Anthony W. Stoeckel

Professor

Stoeckel, Anthony W., 1984, M.A., 1973, Washington.

Associate Professor

Blanchino, R. L., 1984, M.S., 1972, M.A., 1981, Pepperdine.

Assistant Professors

Cochran, Mark A., 1984, B.S., 1979, Arizona State.

Cook, William H., 1986, M.A., 1979, Pepperdine; human resources management, public service.

Disher, Timothy A., 1985, B.S., 1981, U.S. Naval Academy.

Gillette, Karl L., 1986, B.S., 1978, Citadel; business.

Hawley, Michael D., 1986, B.A., 1981, U.S. Naval Academy; engineering.

Course Descriptions

Courses for Undergraduates

N SCI 111 The Naval Service (3) A General introduction to the Navy, its organization, missions, roles,

tasks, and operating methods. The relationship to the other services within the Department of Defense is emphasized.

N SCI 112, 113 Naval Ship Systems I, II (3,3) W,Sp Study of the varied ship systems operational in the Navy today, including the principles of characteristic propulsion systems and auxiliary machinery and the elements of ship stability and damage control. An introduction to nuclear propulsion, gas turbines, and auxiliary power systems.

N SCI 211 Naval Weapon Systems (3) A Concept of naval weapons systems and the systems approach, the techniques of linear analysis of ballistics and weapons, the dynamics of basic components of weapons control systems. The tools are provided for understanding the basic principles that are involved in all modern naval weapon systems, gas turbines, and auxiliary power systems.

N SCI 212, 213 Sea Power Practicum I, II (2,2) W,Sp A comprehensive study of the role of sea power in the history of the United States, the current status of the various elements of the nation's sea power as they influence the development and implementation of national security policy, and the economic effects of the elements of sea power (the Navy, the merchant marine, port facilities, fisheries, and oceanographic capabilities).

N SCI 311 Navigation (3) A The science and practice of maritime coastal navigation, including visual fixing, dead reckoning, and piloting methods. Computation of tides and currents and nautical rules of the road.

N SCI 312 Celestial Navigation (3) W Theory and practice of celestial navigation. The student performs the complete "day's work" of the ship's navigator.

N SCI 313 Naval Operations (3) Sp Introduction to naval operations, the employment of naval forces, na-

val tactics, formulation of operations plans and orders, employment of detection equipment, and meteorology.

N SCI 411 Psychology of Leadership (3) A Introduction of the theory and techniques of naval leadership based on those principles of behavioral science that are pertinent to understanding individual and group behavior of adults. It introduces the student to the management process and the relationship of management functions to leadership. Acceptance of a traditional deep sense of moral responsibility on the part of the aspiring leader is stressed.

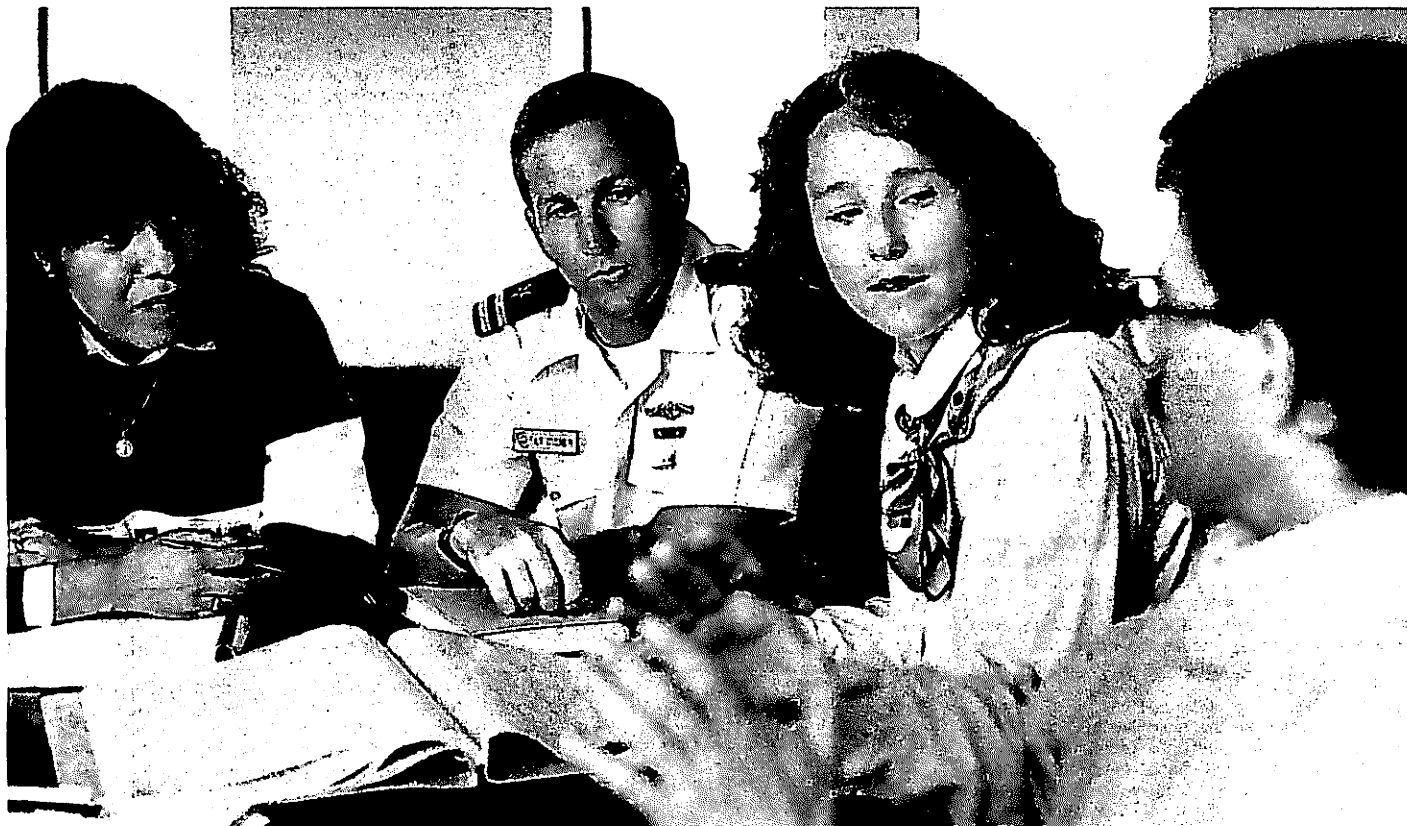
N SCI 412, 413 Naval Organization and Management I, II (3,3) W,Sp Study of organization, systems, and techniques employed in the Navy for management of its human, financial, and material resources. Some of the work relates to the administration of discipline in the Navy under the Uniform Code of Military Justice. Emphasis is placed on the leadership and management role of the junior officer in the fleet.

MARINE CORPS OPTION COURSES

N SCI 321, 322, 323 Evolution of Warfare I, II, III (3,3,3) A,W Introduction to the art of war, the evolution of warfare from the earliest recorded battles to the present day.

N SCI 421, 422 Amphibious Warfare I, II (3,3) A,W Provide basic knowledge of evolution of amphibious warfare from premodern era to present. Strategic and tactical considerations in planning specific operations and amphibious landings.

N SCI 423 USMC Leadership and Administration of Justice (3) Sp Concepts, objectives, characteristic qualities, and practical techniques of leadership as exercised by the Marine Corps officer are studied. Emphasis is placed on the leadership and management role of the junior officer in the fleet marine forces.



School of Social Work

Dean

Nancy R. Hooyman
210 Social Work/Speech and Hearing Sciences

The School of Social Work offers three degree-granting programs, one undergraduate and two graduate. The undergraduate program prepares students to receive a Bachelor of Arts degree with a major in the field of social welfare, while the graduate programs offer the Master of Social Work degree and the Doctor of Philosophy degree in social welfare. All three programs are housed in the Social Work/Speech and Hearing Sciences Building, 4101 Fifteenth Avenue Northeast.

In addition, the school offers a concurrent degree program with the School of Public Health and Community Medicine leading to the M.S.W. and M.P.H. degrees.

Undergraduate Program

The undergraduate program consists primarily of upper-division courses in social welfare, with additional requirements in economics, psychology, and sociology. Students enter the major at the start of their junior year after completing the liberal arts requirements established by the College of Arts and Sciences. Social welfare courses during a student's junior and senior years impart a basic knowledge of the social welfare system, of human behavior and the social environment, of the social work profession, of social research, and of the skills necessary to prepare for beginning social work practice. The program is accredited by the Council on Social Work Education, and graduates of the program may join social work's professional organization, the National Association of Social Workers.

The requirements and curriculum of the social welfare program may be summarized as follows:

Junior year—ECON 100 (5); PSYCH 306 (5); SOC 352 (5); SOC W 419 (3), 300 (3), 320 (3), 390 (3), 310-311 (3-3).

Senior year—SOC W 415 (12), 405 (6); social work electives (15).

Admission

No more than fifty juniors are admitted to the undergraduate program Autumn Quarter of each year. A selective admission procedure is used to determine entrance into the program. Applicants seeking admission should: be admitted or admissible to the University; be eligible, or nearly eligible, for junior class standing (i.e., 65 completed credits of undergraduate work) by the end of the quarter in which application is made; be in good academic standing (i.e., 2.00 minimum grade-point average); and submit a completed application to the program.

Application forms are available at the school's student services and admissions office from January to June for entrance into the program starting the following Autumn Quarter. The school's student services and admissions office is located in 23 Social Work/Speech and Hearing Sciences. Admission application forms also can be mailed upon written or verbal request, telephone 543-5676.

Students accepted for the major at the end of their sophomore year surrender their premajor status by transferring their files and change-of-college forms to the undergraduate social welfare office. Thenceforth, they are advised by the director of student services, located in the student services and admissions office.

Additional Information

The undergraduate program is described in more detail in the undergraduate social welfare program description and in the *School of Social Work Bulletin 1987-89*. These materials may be obtained by telephoning or writing to the student services and admissions office. A student who wishes to discuss the program personally may arrange a private interview by telephoning the director of admissions. Such inquiries are welcome.

Graduate Program

The School of Social Work offers a two-year, full-time program leading to the Master of Social Work degree, as well as an evening program that allows students to take longer than two years to complete the degree requirements.

The program prepares students for professional practice. The curriculum has three major specializations: human services, community and organizational services, and research services. Special emphasis has been placed on women, services to minority persons, child welfare, aging, chemical dependencies, and health care.

Admission Qualifications

Admission to the M.S.W. program requires formal admission to the Graduate School as well as to the School of Social Work. Applicants are required to have an undergraduate degree, a strong academic background, and some practical experience. Applicants must submit transcripts, references, applications, Graduate Record Examination scores, and an admission essay to be considered for entry at the beginning of Autumn Quarter. April 15 is the closing date for receipt of applications and materials.

Financial Aid

A limited number of financial aid opportunities are available to students. Inquiries should be directed to the chairperson, Scholarship and Financial Aid Committee, School of Social Work.

Correspondence and Information

Admissions Office
School of Social Work, JH-30

Master of Social Work/Master of Public Health Concurrent Degree Program with the School of Public Health

The School of Social Work participates with the School of Public Health and Community Medicine in a concurrent degree program leading to the M.P.H. and M.S.W. degrees. The program offers interdisciplinary preparation in the fields of public health and social work. Historically, public health and social work have shared an interest in a preventive approach to health and social problems, a community perspective, and a focus on vulnerable population groups. Both fields recognize the interrelationship of the health, social, and behavioral components of contemporary problems and the need for interventions and research that address all three components. The concurrent degree program prepares professionals who will function at the interface of both fields—in practice, research, planning, administration, and policy development.

Additional information concerning the concurrent degree program may be obtained from the associate dean for curriculum, School of Social Work, 545-1660.

Doctoral Program in Social Welfare

James K. Whittaker, Director and
Graduate Program Coordinator

Anthony H. Ishisaka, Alternate Program Coordinator

The doctoral program in social welfare prepares students to contribute to the field of social welfare and the profession of social work through research, teaching, policy analysis, and program development. The program builds on the premise that scholarship in the field of social welfare must be scientifically based, responsive to service and practice needs, and informed of developments in related fields and disciplines.

Each student's program is individually designed with an emphasis on interdisciplinary study. In the basic core of required courses, as well as in others specially selected, students have an opportunity to pursue their particular interests with faculty members in the School of Social Work and in other schools and departments.

During the first two years, the student is expected to define and develop the specialized area that will be the focus of the subsequent dissertation research. The selected area must have clear significance for the development of practice, programs, or policies in social work and social welfare. Various specialized areas of study are possible within the program, including, but not limited to, studies of child welfare policy, services to the aged, and income-maintenance programs to the effectiveness of social work practice with individuals and families.

The General Examination for advancement to candidacy normally occurs at the end of the second year. After advancement to candidacy, students devote full time to completion of their dissertation research. The last step before award of the degree is the Final Examination, which consists mainly of the defense of the dissertation. Students are strongly encouraged to remain in residence at the University until the dissertation is accepted. The doctoral program takes approximately three years.

Admission

Applicants should have a master's degree in social work or comparable preparation in a closely related field. The applicants selected for admission are those whose scholastic achievements, previous experience, and aptitude for social welfare research and scholarship indicate the greatest promise for achieving the objectives of the program. In addition, an effort is made to maintain a balanced student group reflecting the range of concerns in social work and social welfare as well as the affirmative action goals of the University.

The School of Social Work also offers a combined M.S.W./Ph.D. degree program for a small number of baccalaureate-degree-level applicants wishing to pursue careers in research and teaching, advanced practice, and social policy and administration. The doctoral program director may be contacted for details.

Financial Aid

A limited number of fellowships, teaching assistantships, and research assistantships are available for qualified doctoral students. Tuition waivers are available to some students. However, it is unlikely that the financial assistance provided to any student would be adequate to cover all educational and living expenses. Application forms for financial assistance are submitted after the applicant has been offered admission to the program.

Correspondence and Information

Graduate Program Coordinator
Doctoral Program in Social Welfare, JH-30

Center for Social Welfare Research

In addition to its degree programs, the school maintains the Center for Social Welfare Research, which is the focal point of the school's research activities. The center serves as a resource to the School of Social Work and the social welfare community, both regional and national, for the design, implementation, and evaluation of human services policies and practices. Areas of research include prevention, crime and delinquency,

substance abuse, workplace issues, family violence, child welfare, AIDS, ethnic-minority issues, mental health, women's issues, and services to the elderly. The research projects operated by the center reflect the increased recognition being given to the need for systematic research and evaluation to test the effectiveness of social service programs and policies.

Information about the Center for Social Welfare Research can be obtained from the School of Social Work, JH-30, Center for Social Welfare Research, telephone 543-8345.

Faculty

Professors

Briar, J. Scott,* 1971, M.S.W., 1952, Washington; D.S.W., 1961, Columbia; social work practice, research methodology, family policy and practice, social welfare and social service policy, prevention.

Costner, Herbert L.,* 1959, ‡(Sociology), M.A., 1956, Ph.D., 1960, Indiana; methods, criminology.

Gottlieb, Naomi R.,* 1970, (Women Studies), M.S.W., 1949, D.S.W., 1970, California (Berkeley); women and mental health, research methodology.

Hawkins, J. David,* 1976, M.A., 1969, Ph.D., 1975, Northwestern; family-, school-, and peer-focused delinquency and drug abuse prevention; social networks and social support development, community reintegration and aftercare.

Hunt, Marguerite, 1949, (Emeritus), M.S., 1932, Western Reserve; social work.

Jaffee, Ben Joshua,* 1967, M.S.W., 1953, Michigan; D.S.W., 1972, Columbia; research methodology, program evaluation, needs assessment, evaluation of direct practice.

Levy, Rona L.,* 1975, M.S.W., 1972, Ph.D., 1974, M.P.H., 1975, Michigan; research methodology, single-case evaluation, health care, behavioral medicine, feedback.

Lewin, T. Fred, 1966, (Emeritus), M.A., 1942, Ph.D., 1962, Chicago; social work.

Maler, Henry W.,* 1959, (Emeritus), M.S.S.C., 1949, Case Western Reserve; Ph.D., 1959, Minnesota; child development, group child care, direct practice with individuals, families, and groups.

Marlatt, G. Alan,* 1972, ‡(Psychology), Ph.D., 1968, Indiana; cognitive-behavior therapy and assessment, addictive behaviors, meditation, psychotherapy.

Parsons, Jack R., 1955, (Emeritus), M.A., 1940, Pacific; M.S., 1943, Columbia; Ph.D., 1958, Chicago; social work.

Patti, Rino J.,* 1967, M.S.W., 1960, D.S.W., 1967, Southern California; social services administration, legislative analysis, organizational analysis.

Resnick, Herman,* 1967, M.S.S., 1956, New York; Ph.D., 1970, Bryn Mawr; organizational development, group dynamics, planned change, environmental psychology, social welfare.

Smith, Charles Z.,* 1973, (Emeritus), ‡(Law), LL.B., 1955, Washington; evidence and judicial administration.

Smith, Edmund A., 1957, (Emeritus), M.A., 1954, Ph.D., 1957, Harvard; social work.

Steele, Claude M.,* 1973, ‡(Psychology), M.A., 1969, Ph.D., 1971, Ohio State; social causes and effects of alcoholism, name-calling, attribution, self-esteem therapy.

Stier, Florence R.,* 1964, (Emeritus), M.S.S.A., 1941, Pittsburgh; D.S.W., 1973, Columbia; social welfare planning and program development.

Takagi, Calvin Y.,* 1961, M.S.W., 1952, Ph.D., 1958, Minnesota; mental health services, child development, services to minority population.

Whittaker, James K.,* 1970, M.S.W., 1966, Michigan; Ph.D., 1970, Minnesota; child welfare, in-home, foster family care and residential services, social treatment, social support networks, group treatment.

Woods, Nancy A. F.,* 1978, ‡(Nursing), M.N., 1969, Washington; Ph.D., 1978, North Carolina; women's health.

Associate Professors

Anderson, James R.,* 1968, A.M., 1954, Indiana; social work and health care, interdisciplinary teams in health care, growth and development, particularly in Black Americans.

Berleman, William C.,* 1966, M.S.W., 1960, Washington; undergraduate social welfare, social welfare policy.

Briar, Katharine Hooper,* 1981, M.B.A., 1968, Columbia; D.S.W., 1976, California (Berkeley); social policy, criminal justice, women's issues.

Cox, Gary B.,* 1972, (Research), ‡(Psychiatry and Behavioral Sciences), (Interdepartmental Doctoral Program faculty), Ph.D., 1970, Duke; psychology.

Dear, Ronald B.,* 1970, M.S.W., 1957, Pittsburgh; D.S.W., 1972, Columbia; welfare and income maintenance policy and programs, fiscal impact of social programs, poverty and income inequality, social legislation, social service policy and programs.

Duplica, Moya M.,* 1963, M.S.W., 1956, St. Louis; social welfare policy and history, women and social policy, values and ethics in social work practice, international social welfare.

Ellis, Jack A. N.,* 1966, M.S.W., 1955, British Columbia; social welfare administration and planning, social work and the justice system, health care in custodial settings, social work in school settings.

Gilchrist, Lewayne D.,* 1986, (Research), M.A., 1964, Stanford; M.S.W., 1977, Ph.D., 1981, Washington; adolescents, behavioral medicine, sexuality, drug abuse.

Greenberg, Mark T.,* 1977, (Psychology), M.A., 1976, Ph.D., 1978, Virginia; infant and preschool social and cognitive development of profoundly deaf children.

Hanneman, C. Fred, 1967, M.A., 1951, Indiana; aging, alcoholism, human services practice.

Herrick, James E.,* 1966, M.S.W., 1958, California (Berkeley); D.S.W., 1968, Southern California; social policy, social work and the justice system, research methodology, social and cultural change.

Hooyman, Nancy R.,* 1979, M.S.W., 1970, Ph.D., 1974, Michigan; aging, women's issues, community and organizational development, social networks.

Ishisaka, Anthony H.,* 1971, M.S.W., 1968, California (Berkeley); social work practice, mental health services, services to minority communities, human development, community development.

Kelley, Jerry L.,* 1961, (Emeritus), A.M., 1949, Chicago; social workers in schools, interviewing and counseling in human services.

Klingbell, Karl S., 1964, ‡(Psychiatry and Behavioral Sciences), M.S.W., 1960, Washington; violence in society, particularly with reference to family violence, forensic aspects of criminal justice, health-care planning and administration, gerontology, health-care systems.

Leigh, James W.,* 1967, M.S.W., 1954, Wayne State; social work practice with families, multiethnic and multicultural concerns, family life education.

Miller, Sidney,* 1962, M.S., 1953, Columbia; children, adolescents, and their families, interviewing, crisis intervention, marital counseling.

Mundt, Lenora B., 1961, (Emeritus), M.S.W., 1950, Washington; family treatment.

Plotnick, Robert D.,* 1984, (Public Affairs), ‡ M.A., 1973, Ph.D., 1976, California (Berkeley); poverty and income inequality, income support and income redistribution policies.

Richey, Cheryl A.,* 1973, (Women Studies), M.S.W., 1971, D.S.W., 1974, California (Berkeley); social work practice, women and mental health, clinical research.

Roffman, Roger A.,* 1972, M.S.W., 1965, Michigan; D.S.W., 1983, California (Berkeley); alcoholism and drug abuse, research methodology, program evaluation.

Spain, David H.,* (1968), ‡(Anthropology), M.A., 1962, Ohio State; Ph.D., 1969, Northwestern; psychocultural anthropology, African studies, research methods.

Teather, Edward C.,* 1966, M.S.W., 1962, British Columbia; residential treatment of children, group work, program development.

Weatherley, Richard A.,* 1975, M.S., 1963, Chicago; Ph.D., 1975, Massachusetts Institute of Technology; social welfare policy and administration, social welfare bureaucracies.

Webster-Stratton, Carolyn H.,* 1980, ‡(Nursing), M.S.N., M.P.H., 1972, Yale; Ph.D., 1980, Washington; parent intervention programs for behaviorally disturbed children.

Assistant Professors

Allen, Allethia L.,* 1966, M.S.W., 1950, Boston; social work practice, social policy, interviewing, minority women, minority families, adolescents, human sexuality.

Balassone, Mary Lou, 1986, M.P.A., M.S.W. 1980, Syracuse; D.S.W., 1987, California (Berkeley); maternal and child health, health-care policy, services for adolescents.

Berger, Candace S., 1981, M.S.W., 1973, Washington (St. Louis); Ph.D., 1983, Southern California; micro- and macro-practice in the field of health, organizational and administrative theory, research.

Catalano, Richard,* 1979, (Research), M.A., 1976, Ph.D., 1982, Washington; juvenile delinquency causation and prevention, research methods and statistics.

Ezell, R. Mark, 1986, M.S., 1974, Ph.D., 1985, M.S.W., 1986, Florida State; administration, fiscal management, program evaluation, computer utilization, juvenile justice policies and programs, grant writing, class advocacy.

Gibson, John W., 1987, M.S.W., 1977, Michigan; M.S., 1987, D.S.W., 1987, Columbia; aging, mental health, research methodology, statistics.

Gillmore, Mary L. R.,* 1983, (Research), ‡(Sociology), M.S., 1970, Michigan; M.A., 1977, Ph.D., 1983, Washington; social psychology, adolescents, human sexuality, research methods and statistics.

Hodges, Vanessa G., 1987, M.S.W., 1979, Ph.D., 1985, Illinois (Urbana); intervention research in mental health, practice evaluation, social competency training.

Johnson, Robin S., 1987, M.S.S., 1979, Bryn Mawr; D.S.W., 1987, Pennsylvania; health care policy and management, issues in chronic and terminal illness, death and dying, interdisciplinary issues in health care.

Kopp, Judy,* 1983, M.S.W., 1964, Ph.D., 1982, Washington (St. Louis); interviewing/counseling skills, clinical research, cross-cultural practice, native Americans.

Locklear, Von S., 1985, M.S.W., 1976, Maryland; M.A., 1982, Pembroke State; Ph.D., 1985, Ohio State; Native American mental health.

Morrison, Diane M., 1988, (Research), M.S., 1979, Ph.D., 1982, Washington; adolescent sexuality and contraceptive use, sexual decision making, behavioral medicine, child substance abuse.

Nurius, Paula S.,* 1984, M.S.W., 1980, Hawaii; M.A., 1983, Ph.D., 1984, Michigan; self-concept and self-esteem.

Stephens, Robert S., 1986, (Research), ‡(Psychology), M.S., Ph.D., 1985, Florida State; substance abuse, depression, treatment.

Lecturers

Andersen, Heather A., 1987, M.N., 1983, Washington; hospice/home care, health care.

Averill, Lloyd J., 1984, M.Div., 1950, M.Th., 1966, Colgate Rochester Divinity School; M.A., 1952, Rochester; development and continuing education director.

Day, Pamela J., 1979, M.S.W., 1973, Washington; services to children, youth and families, preventive services, family policy, family-based practice (implementation and evaluation).

Roberts, Elizabeth A., 1986, M.S.W., 1975, Washington; practicum liaison.

Course Descriptions

Courses for Undergraduates

SOC W 200 Introduction to Social Work Practice (5) W Berleman Introduction to the practice of social work, theoretical concepts and institutional framework that guides practice, and the conceptual organization of the discipline of social work. Three weekly lectures and two hours per week in field observation sessions. Lectures supplemented by audiovisual aids and by special guest practitioners.

SOC W 300 Historical Approaches to Social Welfare (3) AW Berleman, Duplica Stresses the origins and development of social welfare policy and programs, starting with the Elizabethan Poor Law (1601) and ending with the Social Security Act of 1935. The issue of poverty and the development of publicly funded income maintenance programs are central concerns. Open to nonmajors and required of social welfare majors.

SOC W 310-311 Social Welfare Practice (3-3) W, Sp Allen, Locklear Provides a conceptual framework for social work practice with individuals, families, small groups, and communities; an introduction to the roles, tasks, and functions of the social welfare practitioner and to theories and methods of intervention; and develops skills in problem assessment, intervention, termination, and evaluation. Open only to social welfare juniors.

SOC W 320 Contemporary Approaches to Social Welfare (3) WSp Berleman, Duplica Policy and program developments in the social welfare field since 1935. Current income maintenance proposals, the emergence of programs to treat specific social dysfunctioning (e.g., mental health services), and the growth of a service-oriented society are typical course concerns. Required of social welfare majors and open to nonmajors. Prerequisite: 300.

SOC W 390 Introduction to Social Welfare Research (3) W Roffman Introduction to the logic of the scientific method as applied to research in social work/social welfare; a beginning understanding of the interrelated steps in the conduct of a research study; and development of skills in the critical consumption of social welfare research and the relationship of this research to social welfare practice. Required of social welfare majors; others by permission of instructor.

SOC W 405 Fieldwork Seminar (2 or 4, max. 6) Anderson, Hanneman, Herrick, Takagi Two-hour seminar meeting weekly. Student integrates social work practicum experiences with prior and concurrent course work in the social sciences, social work, and research. Includes discussion of class presentations and simulations or practice situations that combine knowledge and skill utilization. Student logs provide a basis for individual goal identification and achievement. Required for, and open only to, social welfare seniors. Prerequisites: 310-311; to be taken concurrently with 415.

SOC W 409 Readings in Social Welfare (1-5, max. 15) AWSp Prerequisite: permission of instructor.

SOC W 415 Beginning Field Instruction (4-6, max. 12) AWSp Students are placed in selected social service agencies and accept beginning social service assignments under the supervision of competent agency

personnel. Offered on credit/no credit basis only. Prerequisites: social welfare major standing and 300, 310-311.

SOC W 419 Adult Development and Aging (3) Sp Gottlieb Designed to introduce the student to the field of adult development. Interdisciplinary perspective stressing the interaction of psychological, social, and physiological factors affecting the aging process. Goals are (1) to help the student understand and accept self-aging, and (2) to provide a framework of understanding for working with adult persons. Required for social welfare majors.

SOC W 421 Methods of Child Care and Treatment (3) A Whittaker Major foci include an introduction to the continuum of child welfare services, as well as some practical approaches to working with children and adolescents in a wide variety of practice settings.

SOC W 426 Conceptions of Basic Institutional Change (3) Sp Herrick How basic cultural change may be brought about and specifically how such change may affect the institution of social welfare. Focus on (1) a critical assessment of the dominant cultural values and particularly those values underlying social welfare, (2) prerequisites for a change to occur in these values, and (3) dangers and dilemmas in implementing such a change. Recommended: 300 and ECON 200.

SOC W 430 Child Care Work Practice (3) W Whittaker Specialized practice with emotionally disturbed and delinquent children in group-care settings, with focus on providing child-care staff with specific tools for teaching alternative behavior. Major topics include: etiology and diagnosis, observing and recording children's behavior, special problems of group living, life-space interviewing, token economies, activity programming, group interventions, parental involvement, organizational requisites and community linkages. Prerequisite: 310- or permission of instructor.

Courses for Graduates Only

Social Work

SOC W 501 Problems of Social Welfare in Ethnic Minority Communities (3, max. 6) Locklear, Takagi Examination of selected social welfare problems as related to specific ethnic and racial minority groups. Attention is given to understanding of minority populations and the effective delivery of social work and social welfare services in those communities.

SOC W 502 Social Policy and Economic Security (3) A Berleman, Dear, Herrick, Weatherley Advanced course in policy stemming from the Social Security Act with particular reference to programs of income maintenance and health; social assistance, social insurance, unemployment insurance, and public and private approaches to health care. Emphasis on the development of analytic skills that help to address questions about benefits, comprehensiveness of coverage, financing, gaps in service, and options and alternatives for the future improvement of these programs.

SOC W 503 Social Policy and Social Services (3) W Berleman, Dear, Herrick, Patti Provides in-depth knowledge of social welfare policies and services that meet societal problems, the needs of specific client groups, and analytic tools for evaluating various policies. Understanding of the network of institutions that employ social workers to better serve their clientele is a prerequisite if needed changes and improvements are to be made by professional social workers in these institutions and if feasible options are to be selected to rectify inadequacies at the policy level.

SOC W 504 Social Problems and Social Welfare (3, max. 9) Allen, Balassone, Dear, Duplica, Ellis, Ezell, Herrick, Hooyman, Plotnick, Roberts, Roffman Analysis of major social problems and social welfare service systems providing a systematic approach to

assessing the scope, causes, social cost, and public policy alternatives in the provision of services related to such problems, selected social problems such as poverty and ill health, juvenile delinquency, drug and alcohol addiction, and neglect of the aging are studied and related to the student's field experiences.

SOC W 508 Integrative Seminar (1-3, max. 12) Integrates specialized knowledge with practicum settings. Offered on credit/no credit basis only.

SOC W 509 Readings in Social Work (*) AWSp May be repeated for credit. Offered on credit/no credit basis only. Prerequisite: permission of instructor.

SOC W 515 Field Instruction (1-8, max. 12) AWSp Social work majors only. Offered on credit/no credit basis only.

SOC W 529, 530-531 Introduction to Human Services Practice (3,4-5) Hanneman, Kopp, Nurius, Richey, Teather Topics covering various helping methods used in practice with individuals, families, and small groups.

SOC W 532 Additive Human Service Methods (3, max. 9) AWSp S. Briar, Day, Gottlieb, Hanneman, Hodges, Klingbell, Roffman, Whittaker Focus is either on various methodologies employed in work with clients with specific presenting problems (physical disability, chemical dependency) or on a specific counseling practice stance (behavioral therapy, group treatment). Prerequisites: 529 or 310-311.

SOC W 533 Advanced Human Services Practice (3, max. 9) Kopp, Leigh, Miller, Nurius, Richey, Teather Advanced human services practice in special areas. Intensive study of practice materials with emphasis upon development of appropriate interventive and methodological skills.

SOC W 535 Advanced Field Instruction (2-10, max. 24) AWSp Offered on credit/no credit basis only. Prerequisite: 515.

SOC W 541 Human Behavior and the Social Environment (3) A Duplica, Locklear, Resnick, Takagi Introduction to a social systems perspective on human behavior and social environment. Emphasis upon four social systems (the individual, group, organization, and community), their interactions, and effects upon human behavior across the life span. Required for M.S.W. degree candidates and offered only Autumn Quarter of the first year.

SOC W 543 Problem-Focused Human Development (3, max. 9) AWSp Allen, Anderson, Berger, Gottlieb, Hanneman, Hooyman, Ishisaka, Klingbell, Locklear, Roffman Focus on the social and developmental determinants of specific human problems and their impact on individual development, families, and social institutions. Some time given to examining the nature of organized social responses that are designed to deal with the specified human problem. Prerequisite: graduate standing.

SOC W 560 Introduction to Social Welfare Planning (3) A Dear Methodologically based course providing for the acquisition of professional analytic and interventive skills associated with social work practice in planning and policy analysis.

SOC W 561 Introduction to Social Welfare Administration (3) A Ezell, Patti Methodologically based course considers implications of alternative organizational structures and administrative practices from differing perspectives of client, worker, and administrator. Focus on the ways structure and administrative practices may be manipulated to alter the manner in which clients are served by an agency. Prerequisite: permission of instructor.

SOC W 563 Organizational Analysis (3) Patti Provides conceptual base for analysis and action in human-service organizations. Emphasis on utilization of conceptual tools of organization theory for problem

solving in social welfare organizations. Students learn to describe and analyze selected organizational problems and contribute to their solutions. Prerequisite: permission of instructor.

SOC W 564 Group Process (3) AWSp *Resnick* Provides tools for students to understand dynamics and development of group, to increase awareness of behavior of participants and leaders, and to improve effectiveness as participants and leaders. Prerequisite: permission of instructor.

SOC W 565 Economics of Social Welfare Policy (3) WS *Plotnick* Introduction to economics and its application to social welfare policies. Analysis of markets, performance of the national economy and role of government in the economy. Applications drawn from income maintenance and health policy issues, benefit-cost analysis of social programs and other arenas of social welfare policy.

SOC W 566 Specialized Community and Organizational Services Skills (3, max. 9) AWSp *Allen, Briar, Dear, Ellis, Ezell, Herrick, Patti, Resnick, Teather* Methodologically based course providing graduate social work students with professional analytic and interactional skills associated with administration, planning, and program development in social welfare. Content drawn from research in social work and related social science disciplines. Prerequisites: graduate status and permission of instructor.

SOC W 570 Advanced Planning Seminar (3) W *Herrick, Resnick, Weatherley* Methodologically based course for students in second-year graduate program, providing criteria and methods appropriate for designing, developing, and planning social welfare programs, including such elements as building citizen support, legislative sanction.

SOC W 571 Advanced Seminar in Social Welfare Administration (3) W *Ezell, Patti* Concepts and practice skills necessary for the management of social welfare organization, with emphasis on management practice in those settings offering clinical social services. Includes analysis of treatment settings and auspices, the management of interdisciplinary professional teams, overview of clinical practice technology, and planning, implementing, controlling, and budgeting in a human-services agency context. Builds upon material presented in 561. Prerequisites: 560, 561, and 535 taken concurrently.

SOC W 575 Special Topics in Social Welfare Policy (3, max. 6) *K. Briar, Duplica, Herrick, Weatherley* Analyzes new or expanding areas of social welfare policies and services. Emphasis on developing the student's knowledge of, and ability to assess, social welfare programs. The role of social work is examined in these expanding legislative and program directions.

SOC W 586 Statistics in Social Work (3) W *Levy* Learning to describe and use the fundamental concepts underlying statistical analysis and basic statistical tests.

SOC W 590 Social Welfare Research (3) *Balassone, Berger, Gottlieb, Herrick, Jaffee, Roffman* Three major objectives: (1) to introduce the student to the logic of the scientific method as applied to research in social welfare, (2) to provide the student with a beginning understanding of the interrelated steps in the conduct of research, and (3) to equip students for roles as consumers of, and participants in, social welfare research.

SOC W 591-592 Individual or Group Research Project (3-3) AWSp, AWSp Field practice in a group or individual project in lieu of 594-595 in the community and organizational services track. Includes development of research design, collection of data, tabulation and analysis, and report writing. Prerequisites: 590 or equivalent and permission of research track chairperson.

SOC W 594-595 Advanced Social Work Research (3-3) *Herrick, Jaffee, Kopp, Levy, Nuris, Richey, Roffman* Principles and procedures for the evaluation of direct practice interventions (for human services students). Research methods involved in community-needs assessment, program evaluation, and management-information systems (for community and organizational services students). Separate sections of these courses are available for students in human services and in community and organizational services.

SOC W 600 Independent Study or Research (*) AWSpS

SOC W 700 Master's Thesis (*) AWSp

Social Welfare

SOCWL 552 History of Poverty and Inequality: The Anglo-American Experience (1485-1900) (3) A *Berleman* Examines the roots of modern social welfare policy and program in two historic periods: the reign of the Tudors (1485-1603) and the evolution of welfare policy compatible with the aims of the nation-state; and the significant societal and intellectual developments preceding the English Poor Law Reform of 1834. The English welfare heritage as it subsequently shaped public and private welfare measures in the United States also receives attention, as does the relevance of these early beginnings to today's conceptualization of welfare policy.

developments preceding the English Poor Law Reform of 1834. The English welfare heritage as it subsequently shaped public and private welfare measures in the United States also receives attention, as does the relevance of these early beginnings to today's conceptualization of welfare policy.

SOCWL 553 Seminar in Contemporary Social Welfare Policy (3) Sp *Dear, Plotnick, Weatherley* Major American social welfare programs and some of the policies that guide their development and implementation; contemporary income maintenance policies and their effectiveness in reducing income inequality. This course is closely linked to, and built upon, 552. Selected issues and dilemmas followed in that course, which serve as the focus for policy debate, are examined in the context of current welfare programs.

SOCWL 580 Introduction to Advanced Research Methods and Design (3) A *Gillmore, Hawkins, Levy* Introduction to the broad scientific issues and the specific methodological strategies used in formulating and answering research questions within the field of social welfare. Required of all first-year students in the social welfare Ph.D. program; open to others by permission of instructor.

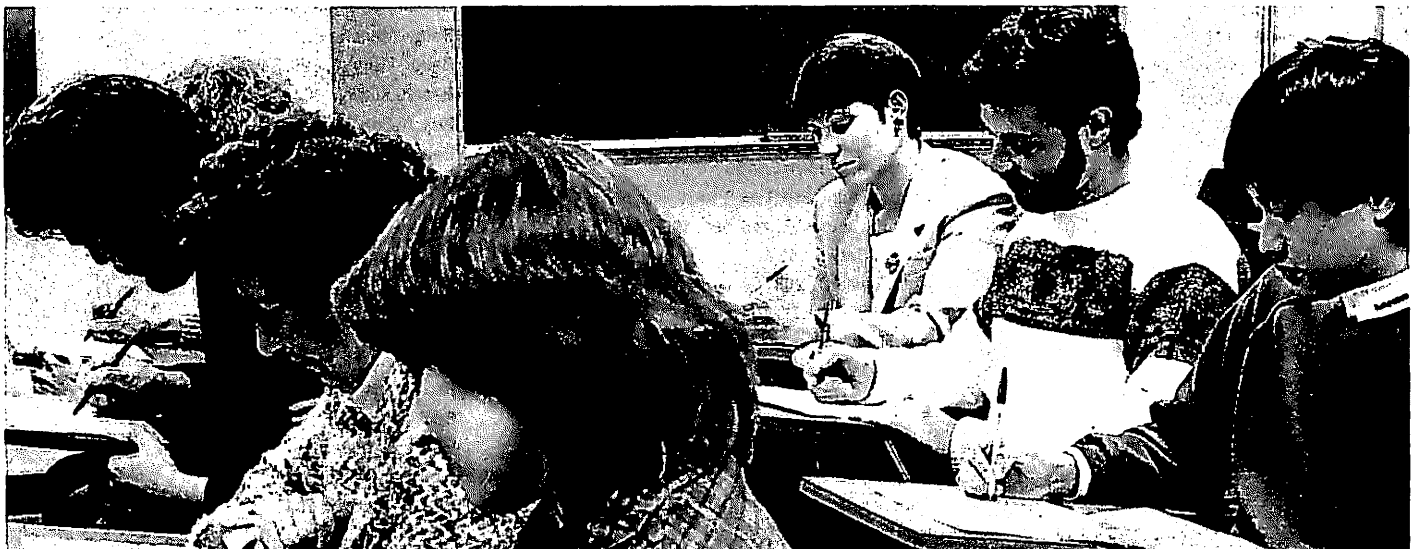
SOCWL 581 Introduction to Advanced Research Method and Design (3) W Continuation of 580. Required of all first-year students in the Social Welfare Ph.D. program; open to others by permission of instructor.

SOCWL 582-583 Research Practicum (1-3, max. 3)-(1-3, max. 3) W, Sp Development of specific methodological skills in social welfare research through participation in an ongoing research project. Offered on credit/no credit basis only.

SOCWL 598-599 Research Problems and Priorities in Social Work and Social Welfare (3-3) W, Sp *S. Briar, Patti, Whittaker* Seminar assesses the current state of knowledge in selected major areas of social work and social welfare, examines analytic and methodological problems in conducting research in these areas, and identifies research priorities. Emphasis on peer learning centered on the identification of central research problems in the areas of social policy, program evaluation, and intervention with individuals, groups, families, and organizations. Prerequisite: admission to social welfare Ph.D. program or permission of instructor.

SOCWL 600 Independent Study or Research (*) AWSpS

SOCWL 800 Doctoral Dissertation (*) AWSpS



Faculty Index

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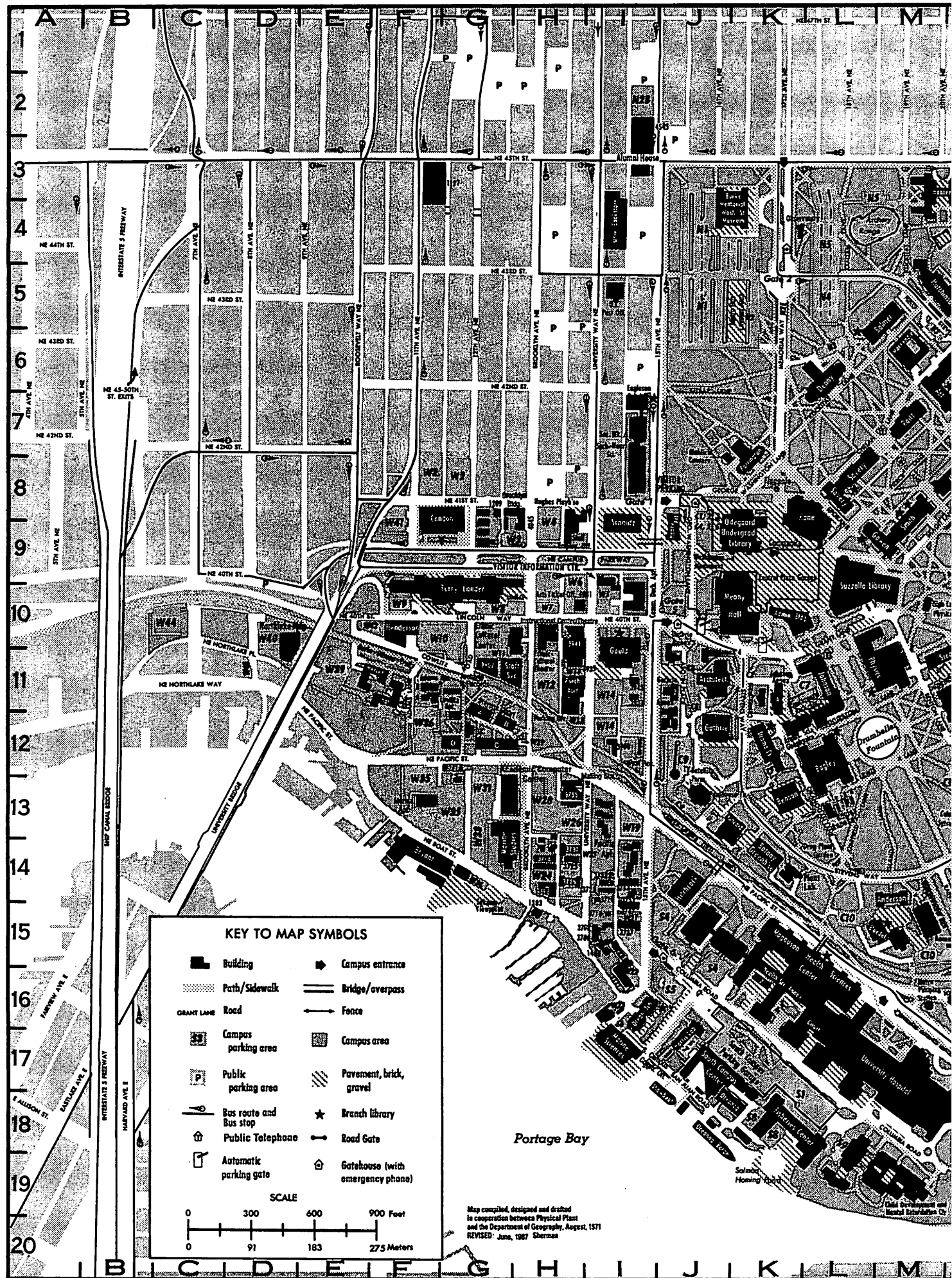
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A A:	Aeronautics and Astronautics (Engineering)	ENV S:	Institute for Environmental Studies (Arts and Sciences)	PCEUT:	Pharmaceutics (Pharmacy)
AAS:	Asian American Studies, American Ethnic Studies (Arts and Sciences)	EPI:	Epidemiology (Public Health and Community Medicine)	PCN:	Parent and Child Nursing (Nursing)
ACCTG:	Accounting (Business Administration)	FAMED:	Family Medicine (Medicine)	PEDO:	Pedodontics (Dentistry)
ADMIN:	Administration (Business Administration)	FD SC:	Food Science (Ocean and Fishery Sciences)	PEDS:	Pediatrics (Medicine)
AES:	American Ethnic Studies (Arts and Sciences)	FIN:	Finance (Business Administration)	PERIO:	Periodontics (Dentistry)
AFRAM:	Afro-American Studies, American Ethnic Studies (Arts and Sciences)	FISH:	Fisheries (Ocean and Fishery Sciences)	PHARM:	Pharmacy Practice (Pharmacy)
AIS:	American Indian Studies (Arts and Sciences)	FPE:	Forest Products and Engineering (Forest Resources)	PHCOL:	Pharmacology (Medicine)
ALTAI:	Altai, Asian Languages and Literature (Arts and Sciences)	FREN:	French, Romance Languages and Literature (Arts and Sciences)	PHIL:	Philosophy, Philosophy (Arts and Sciences)
AMATH:	Applied Mathematics (Arts and Sciences)	FRM:	Forest Resources Management (Forest Resources)	PHY A:	Physical Anthropology, Anthropology (Arts and Sciences)
ANEST:	Anesthesiology (Medicine)	GENET:	Genetics, Genetics (Arts and Sciences)	PHYS:	Physics, Physics (Arts and Sciences)
ANIMED:	Animal Medicine (Medicine)	GEOG:	Geography, Geography (Arts and Sciences)	PN:	Physiological Nursing (Nursing)
ANTH:	Anthropology, Anthropology (Arts and Sciences)	GEOL:	Geological Sciences, Geological Sciences (Arts and Sciences)	POL S:	Political Science, Political Science (Arts and Sciences)
ARAB:	Arabic, Near Eastern Languages and Civilization (Arts and Sciences)	GERM:	Germanics, Germanics (Arts and Sciences)	POLSH:	Polish, Slavic Languages and Literature (Arts and Sciences)
ARCH:	Architecture (Architecture and Urban Planning)	GPHYS:	Geophysics, Geophysics (Arts and Sciences)	PORT:	Portuguese, Romance Languages and Literature (Arts and Sciences)
ARCHY:	Archaeology, Anthropology (Arts and Sciences)	GRK:	Greek, Classics (Arts and Sciences)	PROS:	Prosthodontics (Dentistry)
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ART H:	Art History, Art (Arts and Sciences)	HEBR:	Hebrew, Near Eastern Languages and Civilization (Arts and Sciences)	PRSAN:	Persian, Near Eastern Languages and Civilization (Arts and Sciences)
A S:	Aerospace Studies (Reserve Officers Training Corps Programs)	HINDI:	Hindi, Asian Languages and Literature (Arts and Sciences)	PSN:	Psychosocial Nursing (Nursing)
ASIAN:	Asian, Asian Languages and Literature (Arts and Sciences)	HRMOB:	Human Resources Management and Organizational Behavior (Business Administration)	PSYCH:	Psychology, Psychology (Arts and Sciences)
ASTR:	Astronomy, Astronomy (Arts and Sciences)	HSERV:	Health Services (Public Health and Community Medicine)	QMETH:	Quantitative Methods (Business Administration)
ATM S:	Atmospheric Sciences, Atmospheric Sciences (Arts and Sciences)	HST:	History, General, History (Arts and Sciences)	Q SCI:	Quantitative Science (Interschool or Intercollegiate Programs)
B A:	Business Administration (Business Administration)	HSTAA:	History of the Americas, History (Arts and Sciences)	QUAT:	Quaternary Research Center (Interschool or Intercollegiate Programs)
BA RM:	Research Methods (Business Administration)	HSTAM:	History of Asia, History (Arts and Sciences)	RADGY:	Radiology (Medicine)
B CMU:	Business Communications (Business Administration)	HSTAS:	History of Asia, History (Arts and Sciences)	RAD S:	Radiological Sciences (Interdisciplinary Graduate Degree Programs)
B CON:	Building Construction (Architecture and Urban Planning)	HSTEU:	Modern European History, History (Arts and Sciences)	REHAB:	Rehabilitation Medicine (Medicine)
B ECN:	Business Economics (Business Administration)	HUBIO:	Human Biology (Medicine)	RELIG:	Comparative Religion, International Studies (Arts and Sciences)
BIOC:	Biochemistry (Medicine)	I BUS:	International Business (Business Administration)	RES D:	Restorative Dentistry (Dentistry)
BIOEN:	Bioengineering (Interschool or Intercollegiate Programs)	IMS:	Institute for Marine Studies (Ocean and Fishery Sciences)	RMN:	Romanian, Romance Languages and Literature (Arts and Sciences)
BIOI:	Biology, Biology (Arts and Sciences)	IND E:	Industrial Engineering (Engineering)	ROM:	Romance Linguistics and Literature, Romance Languages and Literature (Arts and Sciences)
BIOST:	Biostatistics (Public Health and Community Medicine)	INDN:	Indian, Asian Languages and Literature (Arts and Sciences)	ROMAN:	Romance Literature, Romance Languages and Literature (Arts and Sciences)
BOT:	Botany, Botany (Arts and Sciences)	I S:	Information Systems (Business Administration)	ROMN:	Romanian, Slavic Languages and Literature (Arts and Sciences)
B POL:	Business Policy (Business Administration)	ITAL:	Italian, Romance Languages and Literature (Arts and Sciences)	R ONC:	Radiation Oncology (Medicine)
B STR:	Biological Structure (Medicine)	JAPAN:	Japanese, Asian Languages and Literature (Arts and Sciences)	RUSS:	Russian, Slavic Languages and Literature (Arts and Sciences)
BULGR:	Bulgarian, Slavic Languages and Literature (Arts and Sciences)	KOR:	Korean, Asian Languages and Literature (Arts and Sciences)	SCAND:	Scandinavian, Scandinavian Languages and Literature (Arts and Sciences)
CAUP:	Preprofessional Courses (Architecture and Urban Planning)	LAB M:	Laboratory Medicine (Medicine)	SER C:	Serbo-Croatian, Slavic Languages and Literature (Arts and Sciences)
CER E:	Ceramic Engineering, Materials Science and Engineering (Engineering)	L ARC:	Landscape Architecture (Architecture and Urban Planning)	SIS:	International Studies, International Studies (Arts and Sciences)
CESM:	Structural and Geotechnical Engineering, and Mechanics, Civil Engineering (Engineering)	LAT:	Latin, Classics (Arts and Sciences)	SISAF:	African Studies, International Studies (Arts and Sciences)
CETS:	Transportation, Surveying, and Construction Engineering, Civil Engineering (Engineering)	LAW:	Law (Law)	SISEA:	Chinese Regional Studies, Japanese Regional Studies, Korean Regional Studies, International Studies (Arts and Sciences)
CEWA:	Environmental Engineering and Science, Civil Engineering (Engineering)	LIBR:	Librarianship (Library and Information Science)	SISJE:	Jewish Studies, International Studies (Arts and Sciences)
CHCS:	Community Health Care Systems (Nursing)	LING:	Linguistics, Linguistics (Arts and Sciences)	SISME:	Middle Eastern Studies, International Studies (Arts and Sciences)
CH E:	Chemical Engineering (Engineering)	MATH:	Mathematics, Mathematics (Arts and Sciences)	SISRE:	Russian and East European Regional Studies, International Studies (Arts and Sciences)
CHEM:	Chemistry, Chemistry (Arts and Sciences)	M E:	Mechanical Engineering (Engineering)	SISSA:	South Asian, International Studies (Arts and Sciences)
CHID:	Comparative History of Ideas (Arts and Sciences)	MED:	Medicine (Medicine)	SLAV:	Slavic, Slavic Languages and Literature (Arts and Sciences)
CHIN:	Chinese, Asian Languages and Literature (Arts and Sciences)	MEDCH:	Medicinal Chemistry (Pharmacy)	SLAVC:	Slavic Languages and Literature, Slavic Languages and Literature (Arts and Sciences)
CHSTU:	Chicano Studies, American Ethnic Studies (Arts and Sciences)	MEDED:	Medical Education (Medicine)	SNKRT:	Sanskrit, Asian Languages and Literature (Arts and Sciences)
CIVE:	Core Courses, Civil Engineering (Engineering)	MEIE:	Industrial Engineering, Mechanical Engineering (Engineering)	SOC:	Sociology, Sociology (Arts and Sciences)
CL AR:	Classical Archaeology, Classics (Arts and Sciences)	MET E:	Metallurgical Engineering, Materials Science and Engineering (Engineering)	SOC W:	Social Work (Social Work)
CLAS:	Classics, Classics (Arts and Sciences)	MHE:	Medical History and Ethics (Medicine)	SOCWL:	Social Welfare (Social Work)
CLIT:	Comparative Literature, Comparative Literature (Arts and Sciences)	MICRO:	Microbiology (Medicine)	SO JU:	Society and Justice, Society and Justice (Arts and Sciences)
CL LI:	Classical Linguistics, Classics (Arts and Sciences)	MKTG:	Marketing (Business Administration)	SPAN:	Spanish, Romance Languages and Literature (Arts and Sciences)
CMU:	Communications, Communications (Arts and Sciences)	M SCI:	Military Science (Reserve Officer Training Corps Programs)	SPCH:	Speech Communication, Speech Communication (Arts and Sciences)
CONJ:	Conjoint (Medicine)	MSE:	Materials Engineering, Materials Science and Engineering (Engineering)	SPHSC:	Speech and Hearing Sciences, Speech and Hearing Sciences (Arts and Sciences)
COPTC:	Coptic, Near Eastern Languages and Civilization (Arts and Sciences)	MUSAP:	Music Applied, Music (Arts and Sciences)	STAT:	Statistics, Statistics (Arts and Sciences)
C SCI:	Computer Science (Arts and Sciences)	MUSEN:	Music Ensemble, Music (Arts and Sciences)	STC:	Scientific and Technical Communication (Engineering)
CZCH:	Czech, Slavic Languages and Literature (Arts and Sciences)	MUSIC:	Music, Music (Arts and Sciences)	SURG:	Surgery (Medicine)
DAN:	Danish, Scandinavian Languages and Literature (Arts and Sciences)	N E:	Near Eastern Languages and Civilization, Near Eastern Languages and Civilization (Arts and Sciences)	SWED:	Swedish, Scandinavian Languages and Literature (Arts and Sciences)
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DENT:	Dentistry (Dentistry)	NR:	Neurological Surgery (Medicine)	THAI:	Thai, Asian Languages and Literature (Arts and Sciences)
D HYG:	Dental Hygiene (Dentistry)	N SCI:	Naval Science (Reserve Officer Training Corps Programs)	TIB:	Tibetan, Asian Languages and Literature (Arts and Sciences)
DPHS:	Dental Public Health Sciences (Dentistry)	NUC E:	Nuclear Engineering (Engineering)	TKIC:	Turkic, Asian Languages and Literature (Arts and Sciences)
DRAMA:	Drama, Drama (Arts and Sciences)	NURS:	Nursing (Nursing)	TKISH:	Turkish, Near Eastern Languages and Civilization (Arts and Sciences)
ECON:	Economics, Economics (Arts and Sciences)	NUTR:	Nutritional Sciences (Interdisciplinary Graduate Degree Programs)	UCONJ:	University Conjoint (Interschool or Intercollegiate Programs)
EDC&I:	Educational Curriculum and Instruction (Education)	OB GY:	Obstetrics and Gynecology (Medicine)	UKR:	Ukrainian, Slavic Languages and Literature (Arts and Sciences)
EDPGA:	Policy, Governance, and Administration (Education)	OCEAN:	Oceanography, (Ocean and Fishery Sciences)	URBDP:	Urban Design and Planning (Architecture and Urban Planning)
EDPSY:	Educational Psychology (Education)	O E:	Organization and Environment (Business Administration)	UROL:	Urology (Medicine)
EDSPE:	Special Education (Education)	O ENG:	Ocean Engineering (Engineering)	WOMEN:	Women Studies, Women Studies (Arts and Sciences)
EDUC:	Independent Study, Research, and Field Experiences (Teaching Practicum) (Education)	OPHTH:	Ophthalmology (Medicine)	ZOOL:	Zoology, Zoology (Arts and Sciences)
E E:	Electrical Engineering (Engineering)	OPMGT:	Operations Management (Business Administration)		
ENDO:	Endodontics (Dentistry)	ORALB:	Oral Biology (Dentistry)		
ENGL:	English, English (Arts and Sciences)	ORALM:	Oral Medicine (Dentistry)		
ENGR:	Engineering, College Courses (Engineering)	ORTHOD:	Orthodontics (Dentistry)		
ENVH:	Environmental Health (Public Health and Community Medicine)	ORTHOP:	Orthopaedics (Medicine)		
		O S:	Oral and Maxillofacial Surgery (Dentistry)		
		OTOL:	Otolaryngology—Head and Neck Surgery (Medicine)		
		PABIO:	Pathobiology (Public Health and Community Medicine)		
		PATH:	Pathology (Medicine)		
		PB AF:	Public Affairs (Public Affairs)		
		P BIO:	Physiology and Biophysics (Medicine)		
		PBSCI:	Psychiatry and Behavioral Sciences (Medicine)		

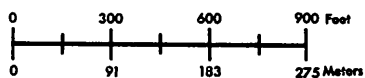
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KEY TO MAP SYMBOLS

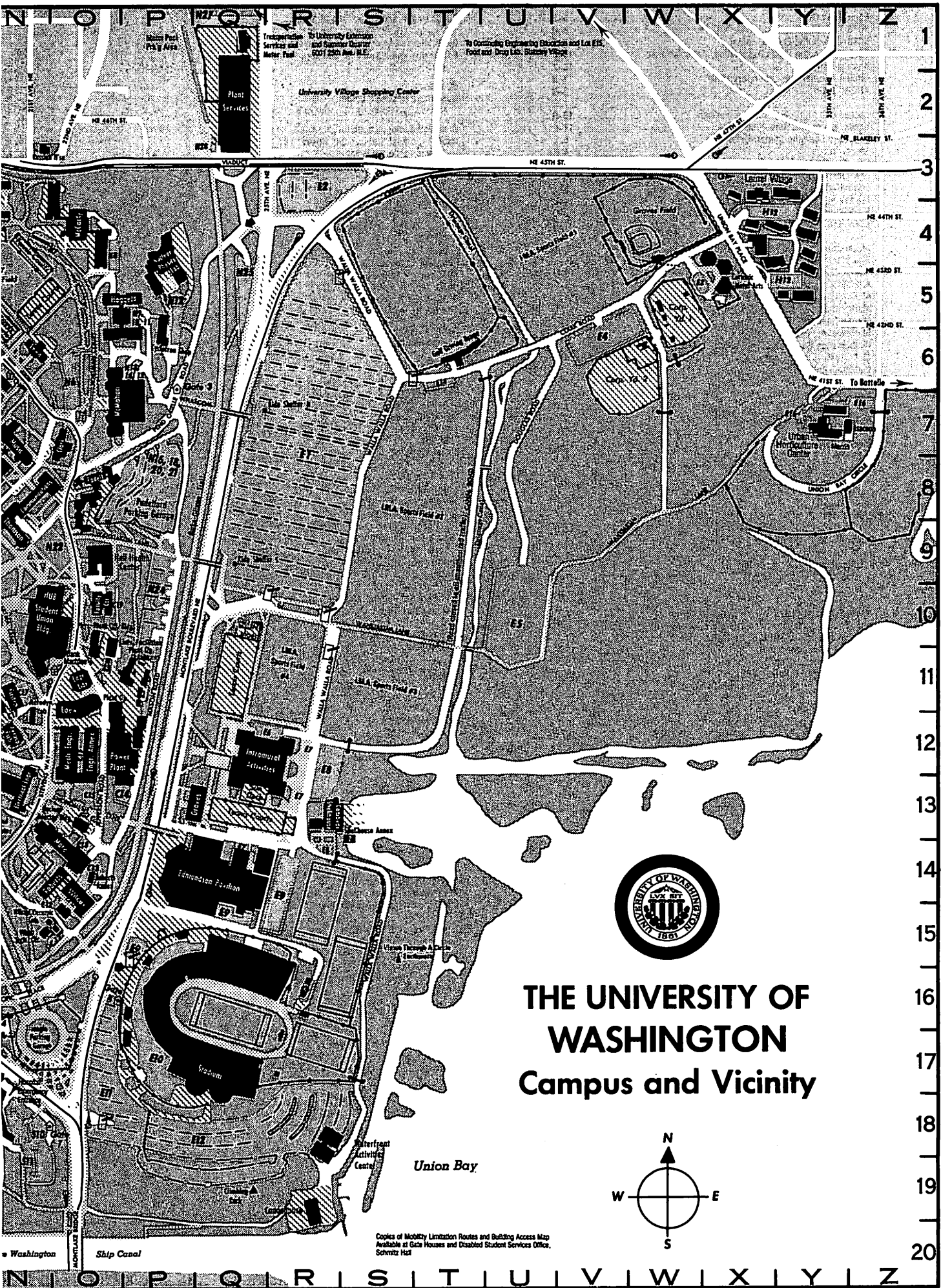
- | | | | |
|---|------------------------|---|----------------------------------|
|  | Building |  | Campus entrance |
|  | Path/Sidewalk |  | Bridge/overpass |
|  | Road |  | Fence |
|  | Campus parking area |  | Campus area |
|  | Public parking area |  | Pavement, brick, gravel |
|  | Bus route and bus stop |  | Branch library |
|  | Public Telephone |  | Road Gate |
|  | Automatic parking gate |  | Gatehouse (with emergency phone) |

SCALE



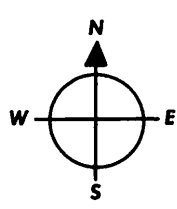
Portage Bay

Map compiled, designed and drafted in cooperation between Physical Plant and the Department of Geography, August 1971
REVISED: June, 1987 Sherman



THE UNIVERSITY OF WASHINGTON

Campus and Vicinity



Copies of Mobility Limitation Routes and Building Access Map Available at Gate Houses and Disabled Student Services Office, Schmitz Hall

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Political Science Library, Smith Hall	9-M
Post Office, U.S., 4244 University Way N.E.	5-J
Postal Center, Self-Service, Student Union Building (HUB)	10-N
Power Plant	12-O
Practice Field	14-R
President's Office, Administration Building	10-K
Printing, Communications Building	8-N
Psychology, Guthrie Hall	12-J
Public Affairs, Smith Hall	9-M

Public Health and Community Medicine, Magnuson Health Sciences Center	15-K
Publications, Communications Building	8-N
Purchasing and Accounting Building, 3917 University Way N.E.	11-H
Quadrangle	8-M
Quaternary Research Center, Atmospheric Sciences-Geophysics Building	11-K
Radiation Ecology Laboratory, Fisheries Center	18-K
Radio Broadcast Services and KUOW, Communications Building	8-N
Rainier Vista	15-N
Raiff Hall (RAI)	7-M
Real Estate Office, University Facilities Building	10-O
Regents, Board of, Administration Building	10-K
Registrar, Schmitz Hall	9-J
Retirement and Insurance Office, Staff Services Building	11-G
Roberts Annex	14-O
Roberts Hall (ROB)	14-O
Romance Languages and Literature, Padelford Hall	8-O
ROTC, Aerospace Studies, Clark Hall	7-O
ROTC, Military Science, Clark Hall	7-O
ROTC, Naval Sciences, Clark Hall	7-O
Russian House, 2104 N.E. 45th Street	3-N
Sakuma Viewpoint	14-G
Salmon Homing Pond	19-K
Savery Hall (SAV)	8-L
Scandinavian Languages and Literature, Padelford Hall	8-O
Schmitz Hall, 1410 N.E. Campus Parkway	9-J
Shellhouse Annex 2	13-S
Showboat Theater (SHB)	18-J
Sieg Hall (SIG)	11-M
Slavic Languages and Literature, Thomson Hall	9-N
Smith Hall (SMI)	9-M
Social Work, Social Work/Speech and Hearing Sciences Building (SWS)	7-J
Social Work Library, Social Work/Speech and Hearing Sciences Building	7-J
Sociology, Savery Hall	8-L
South Campus Center	17-J
South Campus Parking Garage	17-K
Speech Communication, Parrington Hall	7-M
Speech and Hearing Clinic, Social Work/Speech and Hearing Sciences Building	7-J
Stadium	16-O
Staff Employment Office, 1320 N.E. Campus Parkway	9-H
Staff Services Building, 3903 Brooklyn Avenue N.E.	11-G
Stevens Court	12-G
Student Affairs, Schmitz Hall	9-J
Student Employment, Schmitz Hall	9-J
Student Financial Aid, Schmitz Hall	9-J
Student Health Center, Hall Health Center	9-O
Student Housing, Schmitz Hall	9-J
Student Union Building (HUB)	10-N
Summer Quarter Office, (See University Extension)	off map
Suzzallo Library (SUZ)	10-L
Swimming Pools:	
Edmundson Pavilion	14-Q
Hutchinson Hall	5-M
Intramural Activities Building	12-Q
Telephones	11-L, 7-M, 6-N, 11-O
Television KCTS-TV, 4045 Brooklyn Avenue N.E.	8-H
Television Satellite Earth Terminal	12-J
Tennis Courts	5-N, 11-Q
Terry Hall, 1101 N.E. Campus Parkway	10-G
Thomson Hall (THO)	9-N
Transportation Services	1-Q
Triangle Parking Garage	17-N
Undergraduate Studies, Padelford Hall	8-O
University Architect's Office, University Facilities Building	10-O
University Extension and Summer Quarter, 5001 25th	off map
University Facilities Building	10-O
University Hospital (UWH)	17-M
University Police, Bryant Building	14-F
University Press, 4045 Brooklyn Avenue N.E.	8-H
University Relations and Development, Administration Building	10-K
Urban Horticulture Center	7-Y
Urban Planning, Gould Hall	11-I
Veterans Affairs and Special Services, Schmitz Hall	9-J
Views Through a Circle Earthwork	15-S
Visitor Entrance	8-J
Visitors Information Center, 4014 University Way N.E.	10-J
Washington Monument (Statue)	9-J
Washington Technology Center	15-N
Waterfront Activities Center	19-R
Wilcox Hall	14-O
Wilson Ceramic Laboratory (WCL)	15-O
Winkenwerder Forest Sciences Laboratory (WFS)	15-M
Zoology, Kincaid Hall	13-J

Additional copies of this map are available from Central Stores. Contact the University of Washington Office of Publications for information concerning the production of this map or the Department of Geography for information concerning its contents.

(ADM) indicates building abbreviation used on official programs.

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