WELCOME, WORD NERDS!
GRAMMAR LOVE LETTER OF THE MONTH
TODAY’S PLAN

> Translating research for story
  – Welcome Michelle Ma and Hannah Hickey!
Most precise measure of atoms, carbon surfaces interaction

> News and Information, a.k.a. UW news office
> Collaboration with UW Health Sciences, Athletics
An example, start to finish

The dynomak: An advanced spheromak reactor concept with imposed-dynamo current drive and next-generation nuclear power technologies

D.A. Sutherland, T.R. Jarboe, K.D. Morgan, M. Pfaff, E.S. Lavine, Y. Kamikawa, M. Hughes, P. Andrist, G. Marklin, B.A. Nelson

Abstract

A high-$\beta$ spheromak reactor concept has been formulated with an estimated overnight capital cost that is competitive with conventional power sources. This reactor concept utilizes recently discovered imposed-dynamo current drive (IDCD) and a molten salt (FLiBe) blanket system for first wall cooling, neutron moderation and tritium breeding. Currently available materials and ITER-developed cryogenic pumping systems were implemented in this concept from the basis of technological feasibility. A tritium breeding ratio (TBR) of greater than 1.1 has been calculated using a Monte Carlo N-Particle (MCNP5) neutron transport simulation. High temperature superconducting tapes (YBCO) were used for the equilibrium coil set, substantially reducing the recirculating power fraction when compared to previous spheromak reactor studies. Using zirconium hydride for neutron shielding, a limiting equilibrium coil lifetime of at least thirty full-power years has been achieved. The primary FLiBe loop was coupled to a supercritical carbon dioxide Brayton cycle due to attractive economics and high thermal efficiencies. With these advancements, an electrical output of 1000 MW from a thermal output of 2486 MW was achieved, yielding an overall plant efficiency of approximately 40%.
October 8, 2014

**UW fusion reactor concept could be cheaper than coal**

Michelle Ma

News and Information

Fusion energy almost sounds too good to be true – zero greenhouse gas emissions, no long-lived radioactive waste, a nearly unlimited fuel supply.

Perhaps the biggest roadblock to adopting fusion energy is that the economics haven’t penciled out. Fusion power designs aren’t cheap enough to outperform systems that use fossil fuels such as coal and natural gas.

University of Washington scientists hope to change that. They have designed a concept for a fusion reactor that, when scaled up to the size of a large electrical power plant, would rival costs for a new coal-fired plant with similar electrical output.
Resulting coverage
Researchers engage with readers

October 24, 2014

Fusion researchers take a different approach to a heated conversation

When Thomas Jarboe and Derek Sutherland took their concept for an economically feasible fusion reactor into the public sphere two weeks ago, they expected some negative loud mouths and naysayers. After all, this is fusion physics, a field that seems so inaccessible to most people that it carries a certain mystique and inspires an almost religious fervor to see it succeed or fail.

This is a small collection of the interactions UW researcher Derek Sutherland had with various readers in the comments section of a recent news story on UW Today. For the full thread, see the bottom of the original story.
GOODBYE, GREENHOUSE GASES

A groundbreaking concept for a fusion reactor called the “dynomak” could reduce our carbon footprint and change the energy game—all on a budget—courtesy of graduate student Derek Sutherland.
Tackling dense research: Where to start?

> Finding stories
  – Different kinds [research, feature, profiles, Q&A]
  – Research papers [Web of Science, abstracts]
  – Topics in the news
  – Meet people, attending talks, follow your interests
  – Look for a news hook. Is this relevant?

> Navigating a paper
  – Read abstract, conclusions
  – Look for graspable concepts
  – Don’t get bogged down in methods/numbers
  – Ask the researcher and other experts for context
Interview the experts

- Do your homework
- Record and take notes
- Easy intro questions
- Treat like prep for reporters
- Think about big-picture impact and significance
- Lay of the land questions
- Don’t be afraid to ask if you don’t get it
- Leave knowing why it matters
Structuring a research news story

- Lead / teaser opening
- Get to the point: nut graph
- Focus on what's new, exceptional, unusual
- Balance context with specifics
- Choosing quotes: perspective, emotion, opinion
- Connect to things outside the world of science
- Narrative devices: humor, tension, surprise
Isotopic evidence for biological nitrogen fixation by molybdenum-nitrogenase from 3.2 Gyr

Eva E. Stüeken, Roger Buick, Bradley M. Guy & Matthew C. Koehler

Affiliations | Contributions | Corresponding author

Nature 520, 666–669 (30 April 2015) | doi:10.1038/nature14180
Received 27 May 2014 | Accepted 24 December 2014 | Published online 16 February 2015
Ancient rocks show life could have flourished on Earth 3.2 billion years ago

Hannah Hickey
News and Information

February 16, 2015

A spark from a lightning bolt, interstellar dust, or a subsea volcano could have triggered the very first life on Earth.

But what happened next? Life can exist without oxygen, but without plentiful nitrogen to build genes—essential to viruses, bacteria, and all other organisms—life on the early Earth would have been scarce.

The ability to use atmospheric nitrogen to support more widespread life was thought to have appeared roughly 2 billion years ago. Now research from the University of Washington looking at some of the planet's oldest rocks finds evidence that 3.2 billion years ago, life was already pulling nitrogen out of the air and converting it into a form that could support larger communities.

"People always had the idea that the really ancient biosphere was just tenuously clinging on to this inhospitable planet, and it wasn't until the emergence of nitrogen fixation that suddenly the biosphere became large and robust and diverse," said co-author Roger Buick, a UW professor of Earth and space sciences. "Our work shows that there was no nitrogen crisis on the early Earth, and therefore it could have supported a fairly large and diverse biosphere."

The results were published Feb. 16 in Nature.

The authors analyzed 52 samples ranging in age from 2.75 to 3.2 billion years old, collected in South Africa and northwestern Australia. These are some of the oldest and best-preserved rocks on the planet. The rocks were formed from sediment deposited on continental margins, so are free of chemical irregularities that would occur near a subsea volcano. They also formed before the atmosphere gained oxygen, roughly 2.3 to 2.1 billion years ago, and so preserve chemical clues that have disappeared in modern rocks.

Even the oldest samples, 3.2 billion years old—three-quarters of the way back to the birth of the planet—showed chemical evidence that life was pulling nitrogen out of the air. The ratio of heavier to lighter nitrogen atoms fits the pattern of nitrogen-fixing enzymes contained in single-celled organisms, and does not match any chemical reactions that occur in the absence of life.

"Imagining that this really complicated process is so old, and has operated in the same way for 3.2 billion years, I think is fascinating," said lead author Eva Stüeken, who did the work as part of her UW doctoral research. "It suggests that these really complicated enzymes apparently formed really early, so maybe it's not so difficult for these enzymes to evolve."

Genetic analysis of nitrogen-fixing enzymes has placed their origin at between 1.5 and 2.2 billion years ago.

"This is hard evidence that pushes it back a further billion years," Buick said.

Fixing nitrogen means breaking a tenacious triple bond that holds nitrogen atoms in pairs in the atmosphere and joining a single nitrogen to a molecule that is easier for living things to use. The chemical signature of the rocks suggests that nitrogen was being broken by an enzyme based on molybdenum, the most common of the three types of nitrogen-fixing enzymes that exist now. Molybdenum is now abundant because oxygen reacts with rocks to wash it into the ocean, but its sources on the ancient Earth—before the atmosphere contained oxygen to weather rocks—is more mysterious.

The authors hypothesize that this may be further evidence that some early life may have existed in single-celled layers on land, exhaling small amounts of oxygen that reacted with the rock to release molybdenum to the water.

"We'll never find any direct evidence of land was one cell thick, but this might be giving us indirect evidence that the land was inhabited," Buick said. "Microbes could have crawled out of the sap and lived in an aerenchyma layer on the rocks on land, even before 3.2 billion years ago."
A spark from a lightning bolt, interstellar dust, or a subsea volcano could have triggered the very first life on Earth.

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Fixing nitrogen means breaking a tenacious triple bond that holds nitrogen atoms in pairs in the
Life on Earth may have flourished a billion years earlier than originally thought

Scientists had previously thought the earliest ecosystems were clinging on to an essentially uninhabitable planet.

Scientists have found evidence that life on earth may have blossomed 3.2 billion years ago, a challenge to the previous theory that the planet was hostile until 2 billion years ago.

Bacteria Got an Early Fix on Nitrogen

New evidence points to the evolution of the ability for bacteria to grab nitrogen from the atmosphere some 3.2 billion years ago, about 1.2 billion years earlier than thought—with implications for finding extraterrestrial life. Lee Billings reports

By Lee Billings | February 23, 2015

Life on Earth May Have Begun 1 Billion Years Earlier Than Thought, Scientists Say

Life on Earth may have begun 1 billion years earlier than previously thought, scientists say.

UW Research Could Rewrite Timeline Of Life On Earth, And Maybe Mars, Too

The research could rewrite our understanding of how life began on Earth and even on Mars. It could also impact our search for extraterrestrial life.
Wordsmithing for research news

> Avoid jargon
> Avoid acronyms
> Define any unfamiliar terms
> Put numbers, distances into perspective
> Use active voice, strong verbs
> Write simply (reread “Elements of Style” regularly)
> Choose a style – we follow AP Style
Warmer, lower-oxygen oceans will shift marine habitats

Hannah Hickey
News and Information

Modern mountain climbers typically carry tanks of oxygen to help them reach the summit. It's the combination of physical exertion and lack of oxygen at high altitudes that creates one of the biggest challenges for mountaineers.

University of Washington researchers and colleagues have found that the same principle will apply to marine species under global warming. The warmer water temperatures will speed up the animals' metabolic need for oxygen, as also happens during exercise, but the warmer water will hold less of the oxygen needed to fuel their bodies, similar to what happens at high altitudes.

The study, published June 5 in Science, finds that these changes will act together to push marine animals away from the equator. About two-thirds of the respiratory stress due to climate change is caused by warmer temperatures, while the rest is because warmer water holds less dissolved gases.

"If your metabolism goes up, you need more food and you need more oxygen," said lead author Curtis Deutsch, a UW associate professor of oceanography. "This means that aquatic animals could become oxygen-starved in the warmer future, even if oxygen doesn't change. We know that oxygen levels in the ocean are going down now and will decrease more with climate warming."

The study centered on four Atlantic Ocean species whose temperature and oxygen requirements are well known from lab tests: Atlantic cod that live in the open ocean; Atlantic rock crab that live in coastal waters; sharp snout seabream that live in the subtropical Atlantic and Mediterranean; and common eelpout, a bottom-dwelling fish that lives in shallow waters in high northern latitudes.

Deutsch used climate models to see how the projected temperature and oxygen levels by 2100 due to climate change would affect these four species' ability to meet their future energy needs. If current emissions continue, the near-surface ocean is projected to warm by several degrees Celsius by the end of this century. Seawater at that temperature would hold 5-10 percent less oxygen than it does now.

Results show future rock crab habitat would be restricted to shallower water, hugging the more oxygenated surface. For all four species, the equatorward part of the range would become uninhabitable because peak oxygen demand would become greater than the supply. Viable habitats would shift away from the equator, displacing from 14 percent to 26 percent of the current ranges.

The four animals were chosen because the effects of oxygen and temperature on their metabolism are well known, and because they live in diverse habitats. The authors believe the results are relevant for all marine species that rely on aquatic oxygen for an energy source.

"The Atlantic Ocean is relatively well oxygenated," Deutsch said, "If there's oxygen restriction in the Atlantic Ocean marine habitat, then it should be everywhere."

Climate models predict that the northern Pacific Ocean's relatively low oxygen levels will decline even further, making it the most vulnerable part of the ocean to habitat loss.

"For aquatic animals that are breathing water, warming temperatures create a real problem of limited oxygen supply versus elevated demand," said co-author Raymond Huey, a UW professor of biology who has studied metabolism in land animals and in
Modern mountain climbers typically carry tanks of oxygen to help them reach the summit. It’s the combination of physical exertion and lack of oxygen at high altitudes that creates one of the biggest challenges for mountaineers.

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“This simple metabolic index seems to correlate with the current distributions of marine organisms,” he said, “and that means that it gives you the power to predict how range limits are going to shift with warming.”

“We found that oxygen is also a day-to-day restriction on where species will live, outside of those extreme events,” Deutsch said. “Ranges will shift for other reasons, too, but I think the effect we’re describing will be part of the mix of what’s pushing species around in the future.”
Other steps

- Edit, proofing by another writer
- Expert review
  - different for each situation
  - balance accuracy and readability
  - compromise
- Collect images, multimedia
Getting eyeballs on your story

> Know your audience

> Tailor to your platform (digital, social, print)
  - UW Today email for campus stories

> Each story is unique and its play should be, too. Contact News and Info if you think it’ll make a good pitch to reporters. We’re here to help.
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Contact for: Geological sciences, seismology, sun and solar system, Antarctic glaciers, chemistry, physics.
Resources

> National Association of Science Writers (NASW)
> Northwest Science Writers Association (NSWA)
> Associated Press Stylebook
> Book: “A Field Guide for Science Writers”
> Book/Website: “The Science Writers’ Handbook” (focus on freelance science writing)
> Book: “The Elements of Style”
> Blog: “Communication Breakdown: Notes from the trenches on science communication”
> Inspiration: “The Best American Science and Nature Writing”
NEXT NERD MEETING:
Thursday, July 2