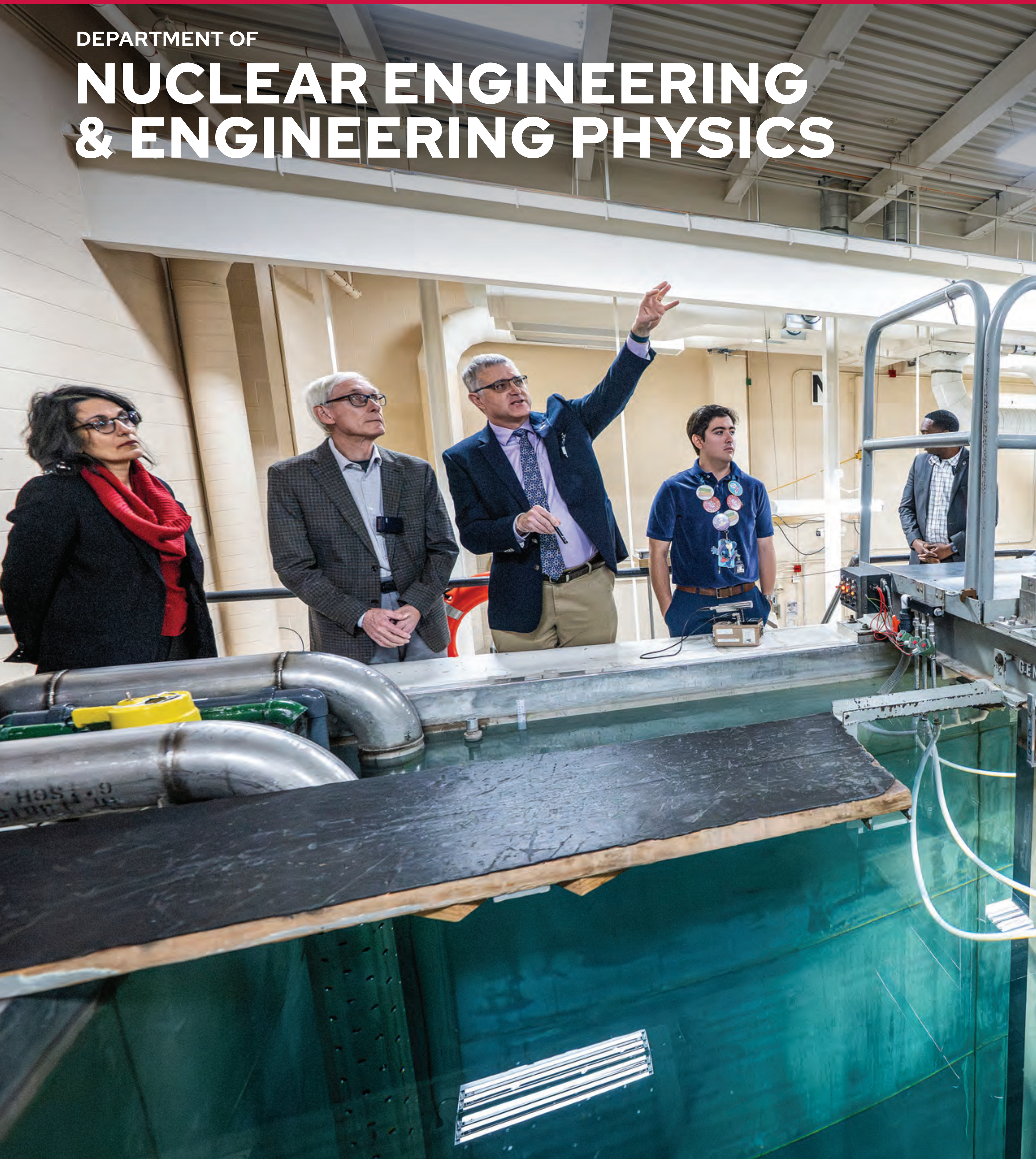
College of Engineering
UNIVERSITY OF WISCONSIN–MADISON

SPRING 2026 **NEWSLETTER**

DEPARTMENT OF

NUCLEAR ENGINEERING & ENGINEERING PHYSICS



Greetings from Madison!

It's been another busy spring for the department! One of the highlights was a visit from Governor Tony Evers to tour the UW Nuclear Reactor. He brought along Representative Renuka Mayadev who represents the part of Madison where the university is located, including many of its students. We also stopped by the Pegasus-III experiment to learn about the progress being made there towards fusion energy. Both visitors were genuinely curious about everything they saw, listening carefully and asking thoughtful questions.

The visit came a week after Governor Evers used his State of the State address to announce a partnership between UW–Madison and the Public Service Commission of Wisconsin to perform a siting study for new nuclear energy in Wisconsin. I will be leading that study with a strong interdisciplinary team from across the UW–Madison campus (NEEP, Life Science Communication, Geography, Law) and collaborators at Pacific Northwest National Laboratory and Oak Ridge National Laboratory. The final report is due at the end of this calendar year, so we've accelerated to full speed quickly!

Another highlight was our first ever NEEP Prom. Organized by our student leaders, the sold-out event gave members of our community a chance to connect away from their classrooms and offices with tasty food, a good dance playlist and an excuse to get dressed up. The crowd took advantage of it all, filling the dance floor and casting their votes for prom royalty. Events like these inspire a culture of collaboration and continued community building through outreach and recruitment events like the successful repeat of "Introduce the Future to Engineering Day" and our card-writing campaign for admitted undergraduate students.

From our NEEP community to communities across the state and beyond, we value our unique opportunity to better the lives of others by educating future leaders, developing the next generation workforce and using our expertise to expand nuclear energy. This newsletter is a sample of stories that demonstrate this commitment to innovation and impact.

This will be my last chair's message. It has been an honor to guide the department through a period of tremendous change and growth over the last seven years. I'm looking forward to spending more time on my research program and with my graduate students. I am also thrilled to be handing over the reins to Katy Huff (PhDNEEP '13), an associate professor of nuclear, plasma and radiological engineering at the University of Illinois, who will take over as the NEEP department chair this summer. Katy is eager to contribute her experiences in academic and federal leadership to elevating the department's people, research, facilities, capabilities and reputation.

On, Wisconsin!

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On the cover: Wisconsin Governor Tony Evers toured the UW Nuclear Reactor in February 2026 as part of his visit to get a firsthand look at the future of nuclear energy at UW-Madison. Photo: Taylor Wolfram.

Sébastien Philippe named MacArthur Fellow

Assistant Professor Sébastien Philippe, a nuclear security specialist, received a 2025 MacArthur Fellowship.

Often referred to as "genius grants," the fellowships are presented by the John D. and Catherine T. MacArthur Foundation to individuals based on their exceptional creativity, dedication to their pursuits and the potential for their work to benefit society—especially with additional support. Fellows receive $800,000 granted with no conditions.

Philippe became an assistant professor in the department in fall 2025 after time as a research scholar at Princeton University and as a nuclear security expert with the French Ministry of Defense. Working at the intersection of science, engineering and public policy, his aim is to reduce the risk associated with nuclear weapons.

The MacArthur Foundation noted the multidisciplinary nature of Philippe's studies of the environmental impact of nuclear weapons tests by France and the United States. The investigations combined declassified documents, historical weather reports and atmospheric modeling to show far more people in French Polynesia and New Mexico and Nevada were exposed to radiation than acknowledged in official records. The results have changed policy and the way people affected are compensated.

Today, he says, his research is more forward-looking, as the number of nuclear weapons in the world is starting to increase again. In August 2025, Philippe was appointed to a United Nations panel charged with producing a report on the consequences of nuclear war at local, regional and global scales. It will be the first such UN report in 40 years.

"I've started applying my modeling tools and bringing together collaborators to better understand the consequences of nuclear weapon use and of nuclear war today."

"I've started applying my modeling tools and bringing together collaborators to better understand the consequences of nuclear weapon use and of nuclear war today," Philippe says. "We want to see how those findings could influence domestic policy on nuclear weapons, strategies, deployments and modernization, and also inform international diplomacy on those issues."

Philippe says he's excited about how the high-profile MacArthur award can advance his work—and the work of others.

"I see this as an investment in the future and support for freedom of inquiry and creativity and collaboration on some sensitive issues," says Philippe. "It gives you freedom to explore avenues that would not otherwise be easy to pursue."

In addition, Philippe recently received $551,000 in new research funding to support the development of open, science-based tools for modeling the humanitarian, environmental and global consequences of nuclear weapon use. Of this total, $491,000 comes through a Carnegie Corporation of New York-led consortium to reduce nuclear dangers, with support from the Corporation, PAX sapiens, and Longview Philanthropy. An additional $60,000 is provided by the Ploughshares Fund.

The awards will support an integrated research program led by Philippe focused on modeling the cascading consequences of nuclear conflict. The work spans immediate effects such as blast, fire and radioactive fallout, as well as longer-term disruptions to climate, food systems, public health, global supply chains and the global economy. A parallel component examines the consequences of nuclear detonations in space and their potential impacts on satellite infrastructure in low Earth orbit.

"Nuclear weapons policy is too often shaped by abstract deterrence theory or models that cannot be independently evaluated," Philippe said. "University-based research can play a critical role by providing technically sound, open analysis that helps decision makers—and the public—grapple with the real consequences of nuclear weapon policies, ensuring that national security choices are made with a full understanding of their implications."

Assistant Professor Sébastien Philippe is developing open, science-based tools for modeling the cascading consequences of nuclear conflict. Photo: Joel Hallberg.

FOCUS ON NEW FACULTY

JungHyun Bae is developing radiation detection technology to enhance safety

As the demand for nuclear energy increases, there are growing challenges for managing the spent nuclear fuel. The United States doesn't yet have a licensed site for permanent storage, so the spent fuel is stored in canisters at multiple interim sites around the country.

However, monitoring the spent fuel in those sealed canisters is challenging because they're specifically designed to shield radiation from the nuclear material inside. That means traditional imaging technologies that use X-rays or gamma rays won't work. Opening the canisters for inspection puts workers at risk for radiation exposure.

"It's very important to manage this spent nuclear fuel, and we really need a licensed and certified technology for safely and securely monitoring it. That technology is something I'm working on in my research," says JungHyun Bae, who joined the department as an assistant professor in January 2026.

Bae's research focuses on developing muon detectors, which allow scientists to peer deep inside matter without damaging samples. His research could significantly enhance the ability to monitor and safeguard nuclear materials. It also promises to help address a critical challenge for quantum computing.

Muons are fundamental subatomic particles produced when cosmic rays hit the Earth's atmosphere. These particles, which travel at nearly the speed of light, constantly hit every inch of the Earth's surface and pass through almost any substance, penetrating far below the surface of the Earth. Bae's muon detector analyzes how muons scatter and lose energy when passing through matter. The system provides detailed images of objects, such as the contents of shielded nuclear fuel canisters.

Bae comes to UW-Madison from Oak Ridge National Lab, where led projects for muon tomography. At ORNL, Bae and his colleagues developed a mobile muon detector with dramatically improved image quality compared to other muon tomography systems. Bae developed the concept for this detector during his doctoral research, which focused on complex computational simulations to validate muon tomography applications.

Bae earned his bachelor's degree in nuclear and quantum engineering from the Korea Advanced Institute of Science and Technology and his master's degree in nuclear engineering from the University of California, Berkeley. He earned his PhD in nuclear engineering from Purdue University in 2022.

With major U.S. investment, UW-Madison leads effort to advance abundant fusion energy for all

UW-Madison is leading a major multi-institution project to develop and test a critical fusion technology—research that will directly benefit commercial fusion power plant developers.

A $19 million Fusion Innovative Research Engine (FIRE) award from the U.S. Department of Energy is supporting the research. Assistant Professor Ben Lindley is leading the project, which brings together leading experts from academia, national laboratories and industry with the goal of bridging the DOE Fusion Energy Sciences program's basic science research and growing fusion industries.

Fusion energy, the process that powers the sun and stars, is a long-sought-after way to produce limitless clean, safe and reliable energy. UW-Madison is one of the world's top-ranked fusion energy research universities and has a strong track record of spinning off fusion companies. In fact, two key industry partners in this project—SHINE Technologies, based in Janesville, Wisconsin, and Madison-based Realta Fusion—are spinoffs from UW-Madison research.

"This research will significantly reduce deployment risks for commercial fusion reactor developers such as Realta Fusion, Type One Energy and Commonwealth Fusion Systems, and others," Lindley says. "Our cutting-edge experimental facilities and capabilities at the university and our close proximity to the Wisconsin-based fusion companies make UW-Madison an ideal place to lead this effort."

The project is focused on advancing a critical fusion technology called a "blanket" to meet the demanding conditions of future fusion power plants. A blanket is a multifunctional layer of material that surrounds a fusion power plant's core. It needs to extract heat efficiently to generate electricity and produce tritium fuel to sustain the fusion reactions. In addition, the blanket must withstand intense heat and radiation, while providing shielding for other reactor components.

Within four years, the team aims to leverage state-of-the-art domestic facilities to conceive, manufacture and comprehensively test fusion blanket components. The team will conduct groundbreaking experiments to validate the performance of two leading blanket materials—lead-lithium and lithium-beryllium fluoride—under intense irradiation and strong magnetic fields. The researchers will conduct tests at the SHINE Fusion Linear Accelerator for Radiation Effects facility, which will enable them to simulate the harsh environment inside a fusion power plant more accurately than ever before.

Why this undergrad chose nuclear engineering to help fight cancer

Motivated by her mother's battle with breast cancer, sophomore Freya Stratte is studying nuclear engineering to help improve radiation treatments and develop better diagnostic tools.

Originally from Whitefish Bay, Wisconsin, Stratte grew up visiting relatives in Madison often, and with a strong family legacy on campus—and an early love for math and science—she knew she wanted to be a Badger engineer. "I've loved math and science since I was a kid. I've always found the way the numbers fit together so satisfying, and I knew I wanted to study engineering," she says.

Her mom's experience with cancer made that decision even more meaningful. "When I was three, my mom was diagnosed with stage one breast cancer, and when I was a junior in high school, it came back," she says.

After discovering the connection between nuclear engineering and the treatments that her mom endured during her second round of cancer, she became interested in nuclear medicine and radiation imaging. With a top nuclear engineering program and on-site research reactor, UW-Madison was the clear choice.

Nuclear engineering students begin working with the reactor as early as the spring semester of their first year when they take the nuclear engineering intro course. Students work in groups to design and fabricate a device that measures power emitted by the reactor during operation.

"That was a very cool course because you get to use your device in the reactor while it's operating," says Stratte. "It was my first time seeing what it might be like to be a real engineer—ordering product and dealing with shipment delays and communications issues. It gave insight into what engineers actually do day-to-day."

She says hands-on group projects have also refined her communication and collaboration skills. "You have to be flexible and adaptable and learn how to compromise in situations where not everyone agrees," she says.

Stratte has found that flexibility is key to her academic success as well. "In high school, I was a very perfectionistic student. I followed a set schedule and receiving any grade below an A was terrifying. Coming here, I've learned to go with the flow. I might not always get perfect scores, but I'm still doing great work."

A strong support system within her major has been essential to that growth. Stratte credits the program's culture—and the intentional leadership of Department Chair Paul Wilson—with helping her feel supported and closely connected. "The community here is incredible," she says. "I don't know if many other majors can say they feel truly known and cared for by their professors and even the department chair. It's an incredible feeling to not just be one more student, but to know that someone actually cares about what I'm contributing."

She has also found community through the STAR Scholars Program, which supports engineering students who demonstrate academic excellence and commitment to their degree.

"It's easy to get lost and feel like what you're doing is not important when so many are also doing great work," she says, "but Carly Andrews, our STAR advisor, does an incredible job of checking in on us and giving students shoutouts when they accomplish something."

Like many people, Stratte once associated nuclear technology with disasters such as Three Mile Island and Chernobyl. But that perception changed as she learned more. "That actually drew me in when I was researching different types of engineering," she says. "It sounded dangerous, but I did some research and found that nuclear energy will be a very useful tool in our future—for sustainable energy, reducing carbon emissions, and it can make a large impact in diagnostic medicine."

Support for nuclear power is growing amongst tech companies, energy suppliers, governments and local communities as its economic and environmental benefits become clearer. Through engaging with industry professionals, Stratte has learned how valuable her education will be. "I hadn't realized how much excitement and potential there was in the industry before coming here," she says. "It's only continuing to grow."

With hundreds of AI data centers under construction around the world, the demand for reliable power is rising rapidly. Meta recently signed a 20-year agreement to purchase nuclear power from Constellation Energy, where Stratte will be interning this summer, working to maximize power efficiency in nuclear fuel systems.

Freya Stratte presents a 2025 Distinguished Achievement Award to NEEP alumnus Kevin Nordt at the College of Engineering's annual Engineers' Day banquet. Submitted photo.

Engineers watch radiation-damaged nuclear reactor materials fix themselves in real time

In nuclear reactors, radiation causes defects to form inside materials, and this process can change those materials' overall properties—usually for the worse.

One approach for mitigating this radiation damage is heating those damaged materials. This process rearranges the materials' atoms and recovers the materials' original properties.

Now, a team of UW-Madison engineers better understands how reactor materials recover from radiation damage when they're heated.

Assistant Professor Charlie Hirst and his collaborators visualized how radiation damage evolves in real time. What they learned could not only inform strategies for heating irradiated reactor materials to recover their properties—but also, importantly, extend the lifetime of current nuclear reactors.

The researchers detailed their advance in a paper published online in September 2025 in the journal *Scripta Materialia*.

To study radiation damage recovery, scientists have typically used transmission electron microscopes to take images of the microstructures of irradiated materials before and after they've been heated.

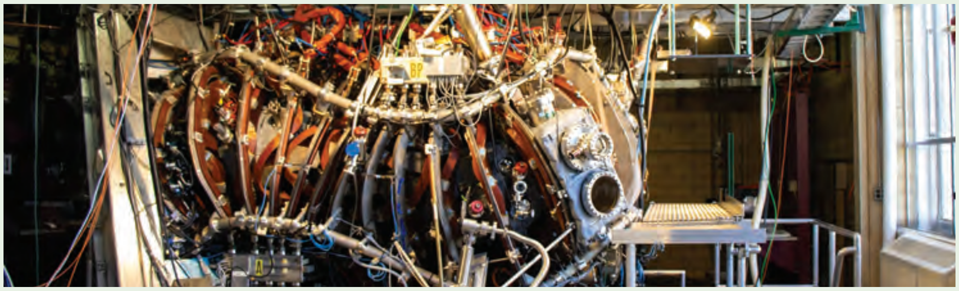
"However, this approach only gives you snapshots of the material before and after," Hirst says. "It's like watching only the first few minutes and the last few minutes of a movie and then trying to figure out what happened during the movie. There's a lot of important information about how the defects are evolving that isn't captured with this approach."

To address this challenge, Hirst and his team used a new approach. In collaboration with Idaho National Lab, the researchers placed a sample of neutron-irradiated titanium on a special chip that can be heated up in a transmission electron microscope. This allowed them to visualize how the titanium's microstructure changed while it heated up.

The researchers discovered that defect clusters moved around during heating—actually leading to recovery of the microstructure. "Crucially, this motion is not described by the existing theory for radiation damage recovery, which assumes defect clusters will shrink or grow—not physically move around," Hirst says. "Our approach gave us really useful data and insight about what's happening in the material."

Assistant Professor Charlie Hirst works on equipment in the UW-Madison Ion Beam Laboratory. Photo: Joel Hallberg.

Unique university experiment empowers the future of fusion



Fusion research at the UW-Madison is bridging industry knowledge gaps to make limitless clean energy a reality.

With a multitude of private companies vying to design and deploy the first fusion pilot plants by 2035, university experiments are more crucial than ever. There is a strong and growing need for technology innovation, workforce development and improvements in the physics understanding necessary to support the development of economically viable fusion energy systems.

The UW-Madison Helically Symmetric eXperiment (HSX) is uniquely positioned to meet those needs. Leveraging its flexibility and distinct magnetic field topology—and supported by a recent renewal of funding from the U.S. Department of Energy—HSX is advancing fusion science and technology through diverse and innovative research initiatives.

HSX is a stellarator, a device that uses 3D magnetic fields to confine high-temperature plasma. It's the only stellarator in the world with quasi-helical symmetry.

Associate Professor Benedikt Geiger has led HSX since 2022 alongside Assistant Professor Adelle Wright, who joined the team in 2024. Geiger leads the experimental plasma physics side, looking at heat and particle transport, diagnostic developments and plasma-wall interaction. Wright focuses on theory exploration and simulation, particularly in the field of magnetohydrodynamics.

In recent years, the HSX team upgraded the system's magnetic coils for greater flexibility, allowing the system to run a diverse range of experiments. Currently, the team is installing a new gyrotron heating system which will improve plasma performance, reaching temperatures up to 60 million degrees Fahrenheit.

DEPARTMENT NEWS

Wright awarded Pivot Fellowship

Assistant Professor Adelle Wright received a Pivot Fellowship from the Simons Foundation.

Aptly named, the fellowship supports researchers pivoting to apply their expertise to a new area of research. Wright is one of eight faculty scholars to join the 2025 class of Pivot Fellows. The leading scholars represent disciplines spanning the natural sciences, mathematics, engineering, data science and computer science.

Wright's research paves the way for the deployment of nuclear fusion technologies as part of a sustainable energy solution by combining cutting-edge numerical simulation with modern applied mathematics to overcome critical macroscopic physics challenges of magnetic confinement.

'Rising Star' prepares to advance nuclear through advocacy-driven leadership

Jessica Wysocki, a second-year PhD student, is leveraging her graduate school experiences to strengthen her leadership skills as she prepares to help drive the nuclear field forward.

Underscoring her natural aptitude for service and leadership, Wysocki was one of just 40 individuals invited to attend the third annual NEA Global Forum Rising Stars Workshop in Stockholm, Sweden. The workshop gathers and trains emerging female leaders, united by a shared motivation to improve the experience of women in nuclear workplaces.

Schmitz elected as APS Fellow

Professor Oliver Schmitz was elected a 2025 American Physical Society Fellow. This prestigious fellowship honors scientists for research excellence and exceptional service to the physics community.

Schmitz specializes in plasma edge physics for fusion energy applications and developing state of the art numerical methods for 3D plasma edge transport and plasma-wall interaction.

APS Fellows are nominated by their professional peers. Each year, no more than one-half percent of the society's members, excluding students, are honored with this distinction. Specifically, he was recognized for "advancing the general understanding of 3D plasma boundary layers towards viable divertor solutions for stellarators, as well as divertor exhaust schemes in tokamaks with applied resonant magnetic perturbation fields."

Graduate student receives NASA space technology research award

PhD student Nicholas Crnkovich received a 2025 NASA Space Technology Graduate Research Opportunity (NSTGRO) Award.

He is a member of the Materials Degradation Under Corrosion and Radiation (MADCOR) group led by Professor Adrien Couet. Crnkovich's research project aims to leverage the group's new high-throughput synthesis, irradiation and characterization system to identify and develop durable materials for nuclear thermal propulsion systems. These systems allow rockets to travel farther and faster while using less fuel.

Navy sailor earns top scholarship

Freshman Lorelai Haase, an active-duty sailor in the U.S. Navy, is pursuing a bachelor's degree in nuclear engineering through the Seaman to Admiral Program.

The scholarship program provides highly qualified enlisted sailors the opportunity to earn a commission as a naval officer while pursuing a degree at a top-tier university. Haase, of Oostburg, Wisconsin, works on nuclear reactors aboard aircraft carriers and submarines as a machinist in the Naval Nuclear Propulsion Program and will maintain her active-duty status while pursuing her degree.

Grad student develops software used by fusion startups to automate stellarator design

PhD student Connor Moreno has developed software tools to help leading fusion companies design the first commercially viable fusion power plants.

Stellarators are challenging to model using traditional methods because of their complex geometry. Recognizing this gap, Moreno developed ParaStell, a software tool designed to automate parametric modeling of stellarators, a type of fusion reactor. As one of the only open-source software packages of its kind, the software has become a valuable resource for private fusion startups that have integrated ParaStell in their design workflows to increase efficiency.

Moreno's work is made possible through funding from a SciDAC partnership called HiFiStell, a multi-institutional research consortium that applies high-fidelity simulations and advanced computing to stellarator design.

ParaStell is currently being used by private fusion companies Gauss Fusion and Type One Energy, a UW-Madison spinoff company co-founded by Professor Chris Hegna.

PhD student Connor Moreno discusses the ParaStell software tool with Professor and NEEP Department Chair Paul Wilson. Photo: Lili Sarajian.

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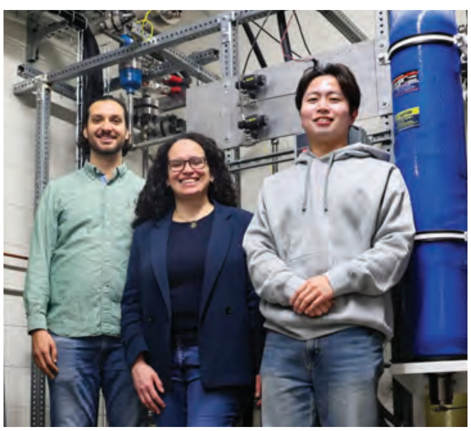

New research facility to support nuclear reactor power uprates

Our new thermal hydraulics research facility is generating crucial data to support safely expanding the operating capacity of current U.S. nuclear power plants

The PHILUS (high-Pressure High-temperature annuLUS) facility began operating in February 2026 under the direction of Associate Professor Juliana Pacheco Duarte. The lab is supported by funding from a U.S. Nuclear Regulatory Commission Faculty Development Grant and a U.S. DOE Distinguished Early Career Program grant awarded to Duarte, who was one of only five faculty in the United States to receive the award in 2023.

PHILUS was designed and built to investigate post-critical heat flux, a heat transfer accident regime of water-cooled nuclear reactors. Critical heat flux represents the maximum amount of heat that the water can safely remove from nuclear fuel rods.

The Nuclear Regulatory Commission has traditionally recognized critical heat flux as the thermal hydraulic limit for U.S. nuclear power plants. Many argue that this limit imposes overly conservative safety margins for most operating conditions, especially with the development of accident tolerant fuels that enhance safety in recent designs.

Now, time-at-temperature criteria have emerged as a realistic alternative. These criteria would relax the traditional safety margins and support growing interest and financial incentives for implementing power uprates across the current fleet of U.S. light-water reactors, allowing plants to increase their operating power.

But more data is needed to define and implement the proposed time-at-temperature criteria. The unique PHILUS facility is designed to provide that essential data, which can be used to develop new models and significantly improve system codes used to predict post-critical heat flux transient cladding temperatures.

Associate Professor Juliana Pacheco Duarte (middle), PhD student Cole Dunbar (left) and postdoctoral researcher Donkoan Hwang (right) in the new PHILUS facility designed and built to investigate post-critical heat flux conditions in light-water reactors. Photo: Lili Sarajian