NUCLEAR, PLASMA & RADIOLOGICAL Engineering

NPRE NEWS

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

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NEWSLETTER FOR ALUMNI & FRIENDS

A New Generation of Innovators:

NPRE welcomes its largest freshman class in years

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DEPARTMENT OF **N**UCLEAR, **P**LASMA & **R**ADIOLOGICAL **E**NGINEERING

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Daniel Andruczyk | research associate professor
Caleb Brooks | professor
Davide Curreli | professor
Angela Di Fulvio | associate professor
Kathryn Huff | associate professor
Tomasz Kozlowski | associate head, undergraduate programs | professor
Leon Liebenberg | teaching professor
Ling-Jian Meng | professor
Zahra Mohaghegh | professor
April Novak | assistant professor
Dren Qerimi | research assistant professor
Magdi Ragheb | associate professor
R. Mohan Sankaran | associate head, graduate programs | professor
James Stubbins | professor
Lorenzo Vergari | assistant professor
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Dear NPRE Family,

As we enter a new academic year, I'm pleased to share that NPRE is welcoming its largest freshman class in many years—a testament to the growing interest in our field and the strength of our programs. It's energizing to see so many new faces eager to explore nuclear, plasma, and radiological engineering at a time when these disciplines are more vital than ever to society's future.

This growth comes at a challenging moment for higher education in the United States. Institutions across the country are navigating shifting demographics, increasing financial pressures, and rapid technological change that is reshaping how—and why—students learn. At NPRE, we're meeting these challenges head-on by focusing on what has always set us apart: a commitment to world-class education, groundbreaking research, and close mentorship that empowers students to think critically, innovate boldly, and adapt to whatever the future brings. In that vein, applicants to NPRE can now choose to major in NPRE + Data Science, in addition to our three main concentration areas.

"It's energizing to see so many new faces eager to explore nuclear, plasma, and radiological engineering at a time when these disciplines are more vital than ever to society's future."

Our students continue to inspire us through their drive and accomplishments, both in the classroom and beyond. Our faculty remain dedicated to advancing the frontiers of nuclear science and engineering while preparing the next generation of problem-solvers and leaders. Together, we are building a learning environment that values curiosity, collaboration, and community.

Rizwan Uddin

As always, the continued success of NPRE depends on the strength of our extended family—our alumni, friends, and partners who support our mission and our students. Your engagement helps us provide the resources and opportunities that make a real difference in their lives.

Thank you for being part of this thriving and resilient community. I invite you to explore the stories that follow and stay connected with us as we continue to educate, innovate, and lead in the years ahead.

Warm regards,

Rizwan Uddin
Professor and Department Head

Student organizations shine for another year

The University of Illinois chapter of the American Nuclear Society was once again named the country's best section by winning the Samuel Glasstone Award this year. Our ANS chapter has been among the top three finishers for the award every year since 2019, winning it twice.

Our chapter of Women in Nuclear was honored with the Chapter Excellence award at their national conference this summer. This is the second year in a row that the UIUC chapter has received a national award.

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About the Cover

This year's cover features students in our **NPRE 100** class, the quintessential first-semester course for new students. This fall, there are **72 new students** in NPRE (64 freshmen and eight transfers). This class marks the largest cohort of new students in at least five years, the second-highest being 46 in Fall 2023.

This milestone—combined with the department's continued place in the top 10 of U.S. News and World Report's annual rankings of graduate nuclear engineering programs—reflects both the growing excitement surrounding nuclear technology and the strength of Illinois' reputation as a leader in energy innovation. Across the country, interest in clean, reliable, and carbon-free power is driving a renewed focus on nuclear engineering, advanced reactors, and fusion research. At the same time, expanding opportunities in radiation science, plasma applications, and medical technologies are attracting students eager to make an impact across multiple industries.

At Illinois, NPRE's nationally recognized faculty, hands-on research opportunities, and strong connections to national laboratories and industry partners have made the department a destination for students ready to help solve some of the world's most pressing energy challenges. This rise in enrollment signals a bright future—not only for the department, but for the next generation of engineers who will power the innovations of tomorrow.

Bridging Atoms and Algorithms: Illinois launches innovative NPRE + Data Science Degree

As industries around the world accelerate toward advanced computing, clean energy, and smart technologies, the University of Illinois Urbana-Champaign is once again stepping forward with a visionary program designed to meet the moment. This fall, Grainger Engineering's Department of Nuclear, Plasma & Radiological Engineering (NPRE) introduced its newest offering: the **Bachelor of Science in Nuclear, Plasma, & Radiological Engineering + Data Science (NPRE + DS)**.

A response to a changing world

Nuclear engineering has always relied on complex modeling, precision measurement, and large-scale simulation. Today, as data becomes one of the world's most valuable resources, the tools used by the next generation of engineers are changing. Machine learning, high-performance computing, and advanced analytics now drive discovery in everything from fusion research to radiation medicine to national security.

The NPRE + DS degree was designed with this reality in mind. The curriculum blends the foundational physics and engineering of NPRE with a strong core in computational and data science. Students gain the ability not only to understand nuclear systems, but also to model them, analyze their performance, and extract insights from vast and complex datasets.

A campus-wide collaboration

In true Illinois fashion, the program is the result of deep collaboration across campus. Students work with faculty from NPRE, the Siebel School of Computing and Data Science, the School of Information Sciences, and experts in mathematics and statistics. This cross-disciplinary structure ensures that graduates leave with a uniquely comprehensive skill set—one that positions them to tackle global problems from multiple angles.

During their first two years, students build the mathematical, physical, and computational foundations needed in both fields. Their later coursework bridges advanced NPRE topics with hands-on data science work, culminating in a capstone experience that challenges seniors to apply analytics to real engineering challenges. For many, these projects can serve as launchpads for industry careers, research positions, or graduate studies.

Meeting demand—and anticipating the future

The addition of data science comes at a time when the need for technically fluent analysts is skyrocketing. National labor projections show remarkable growth in data-focused careers, and the clean energy sector—particularly nuclear—is rapidly adopting data-driven tools to enhance efficiency, reliability, and safety.

NPRE graduates are already known for their adaptability and strong analytical grounding. The new joint degree builds upon that legacy, preparing students for roles in federal laboratories, advanced reactor design, fusion startups, medical imaging, plasma technologies, risk analysis, regulatory agencies, and beyond.

Continuing a tradition of leadership

For alumni who remember learning on analog machines or running early computational models in Talbot Lab, this new program may feel like a glimpse into engineering's next era. But at its heart, the NPRE + DS degree reflects the same core values that have guided the department since its founding: rigorous science, hands-on learning, ingenuity, and a commitment to using engineering for the public good.

And as always, the department's alumni and friends play an important role in that future, helping ensure that Illinois remains a place where new ideas take shape and new leaders emerge.

A Q&A with new graduate programs coordinator Jenna Russell

NPRE is proud to introduce the newest member of its administrative team. We sat down with Jenna Russell, our new Graduate Programs Coordinator and Academic Advisor, to talk about her path to Illinois, what excites her most about supporting our students, and how she plans to strengthen the graduate experience in the years ahead. Read on for insights, goals, and a closer look at the person behind this important role.

Can you tell us a little about your background and what brought you to NPRE?

I worked previously as a Graduate Programs Coordinator in Aerospace Engineering, just upstairs in Talbot, so when my family moved back to Illinois, I was eager to return to a similar role at the University. I was familiar with staff in NPRE and knew it'd be a comfortable fit.

What excites you most about your new role as Graduate Programs Coordinator?

Learning a new program and meeting new people. Our faculty and students are doing some pretty incredible work at the university and beyond. I don't always understand the work, but given our reputation and status on a national and international stage, I know it's extraordinary. It's rewarding to be a small part of that.

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Russell

Shaping the future of NPRE: Mohaghegh and Brooks reach full professor milestone

How does it feel to reach this point of your career?

Brooks

Mohaghegh

Brooks: I feel thankful to the department for supporting my promotion and helping to enable the success of my research group. I also feel like it has gone too fast. Long days, but the years have gone by quickly.

Mohaghegh: I'm honored to be promoted to the rank of full professor. I'm profoundly grateful to my students, mentors, collaborators, colleagues, and my incredibly supportive family for their encouragement, guidance, and collaboration over the years. A heartfelt thank you to the members of my research team—past and present—whose dedication and hard work have been at the core of every project. None of this would have been possible without them. I also sincerely appreciate the continued support from leadership at the department, college, and campus levels. Thank you all for being such an essential part of this journey.

What have been some of the most rewarding parts of this journey so far?

Brooks: The reward of this job is in the graduate and undergraduate students we get to teach and learn from. I have been exceedingly fortunate to have excellent students and will continue to enjoy watching their many successes as they continue their careers.

Mohaghegh: The most rewarding moments in my journey are those when I feel I'm truly making an impact.

A particular highlight has been serving on committees of the U.S. National Academies of Sciences, Engineering, and Medicine, where I've had the opportunity to apply my expertise in nuclear energy risk analysis to a wide range of technological challenges. Helping shape policies and regulations that make our world safer, more secure, and more resilient has been deeply fulfilling. Contributing to efforts that help prevent accidents and save lives is a responsibility I hold close to my heart.

On a day-to-day basis, my greatest joy comes from mentoring students of diverse nationalities, races, and religions—supporting them as they navigate their academic and professional paths. I especially cherish the moments when they overcome challenges, complete their degrees, and step confidently into meaningful careers beyond graduation.

Becoming the first female full professor in our department is a profound honor. I hope that my journey inspires others to believe in themselves and pursue their goals with confidence—regardless of the obstacles they may face.

What current projects are you most excited about?

Brooks: It is a great time to be a nuclear engineer. New nuclear technologies are in great position to address the surging demand for clean, reliable power. I am excited by the opportunities in my group to support the significant need in education, research, and at-scale demonstration of new nuclear power technologies and end-use applications.

Mohaghegh: I'm especially excited about our research efforts focused on enhancing the safety and economic viability of nuclear energy.

One of my ongoing initiatives is a collaboration with Professor Arden Rowell from the University of Illinois College of Law, where we're addressing the complex regulatory challenges associated with advanced nuclear reactors. This interdisciplinary effort bridges both technological and legal uncertainties, and it has been incredibly rewarding to integrate expertise from engineering and law to tackle such a timely and critical issue.

I'm also leading several high-impact projects in collaboration with national laboratories and industry partners to improve risk assessment methodologies for both aging nuclear plants and next-generation reactors. In the case of aging plants, evolving maintenance policies and the adoption of modern technologies—such as AI-driven predictive maintenance—have reduced the reliability of historical data. For advanced reactors, the primary challenge is the limited availability of operational experience and empirical data.

To address these gaps, we are developing innovative methods that incorporate advanced uncertainty analysis, expanded use of modeling and simulation, and AI-based techniques to improve risk assessment. These efforts are essential for enabling more informed, cost-effective, and benefit-justified safety evaluations and decision-making—ultimately reinforcing the safety and economic viability of nuclear energy.

What do you hope to accomplish now that you have become a full professor?

Brooks: I would like to continue to help develop students who are well-positioned to have impactful, fulfilling careers.

Mohaghegh: As a full professor, I remain deeply committed to continuous learning, mentoring junior colleagues and students, and fostering a more inclusive and collaborative academic community. I look forward to advancing my scientific contributions, guiding the next generation of successful

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New named professorship carries on legacy of Ruzic family

The Department of Nuclear, Plasma & Radiological Engineering at The Grainger College of Engineering, University of Illinois Urbana-Champaign is taking another step forward in its educational mission, and it has the family of one of its most prominent faculty to thank for it.

The Neil and Carol Ruzic Professorship, the first named professorship originating specifically from this department, is being established to honor the parents of professor emeritus David Ruzic.

Neil Ruzic passed away in 2004 at age 74 having written 12 books, founding four magazines, [and] developing an island in the Bahamas.

"We can direct this towards a plasma-related faculty in our department, the very thing that I've helped initiate and build," David Ruzic said. "This is a way to have it continue going strong.

David and his wife, Marilyn, were on hand recently to sign paperwork with the University of Illinois Foundation, along with UIF President/CEO James Moore, Jr., Illinois Grainger Engineering Associate Dean Philippe Geubelle, and Rizwan Uddin, professor and head of the Department of Nuclear, Plasma & Radiological Engineering at Illinois Grainger Engineering.

"The Neil and Carol Ruzic Professorship will support excellence in scholarship, enhance the department's visibility, and further our mission to lead in plasma engineering education and innovation," said Uddin.

"We are deeply grateful to David and his family for this opportunity to honor the Ruzics' legacy in a way that will benefit generations of students and researchers."

Neil Ruzic passed away in 2004 at age 74 having written 12 books, founding four magazines, developing an island in the Bahamas now known as "Coco Cay" and doing many other amazing things. His last book, *Racing to a Cure*, was a memoir detailing the search for new biotherapies in cancer treatment while encouraging others to research, question, and become self-advocates for their own treatments.

After being diagnosed with one of the most aggressive forms of cancer in mantle cell lymphoma and given only about six months to live, his doctors wanted to put him into chemotherapy, but Neil resisted because while it might give him a few more months of life, it had no chance of a cure.

"Being a scientific journalist, he figured there had to be people working on this across the country or world," David Ruzic said in an interview with Carle Illinois College of Medicine. "So he threw himself into the research, being his own patient advocate and did discover people working on this and got into trials and other things, and while I'd love to say he became cancer free, he was certainly able to do some of these modern therapies and live another six years in really good quality of life."

Before Carol's death earlier this year, she and David worked to create the Neil and Carol Ruzic Carle Illinois College of Medicine Fund. Carol earned degrees in journalism and education and worked as a teacher before devoting her life to civic and conservation efforts in the couple's longtime hometown of Beverly Shores, IN.

David, an Abel Bliss Professor of Engineering himself, has spent over four decades teaching, researching, and growing the study of plasma physics and engineering at Illinois. While this named professorship is emanating from his parents' estate, he said he hopes that it will establish and extend his own heritage at the university and in this department.

"In helping build the plasma area in our department, I was the one that really pushed to get the word 'plasma' into our department's name," David said. "I've designed many of the plasma courses that we now teach and I've taught most of them myself at some point. Recently we've established this new Masters of Engineering in Plasma Engineering program. I think I've had a big hand in creating and helping build our plasma efforts at this university, and this is a way for that legacy to continue even if I'm not here."

Alam Recognized as National AI Leader in the University of Illinois's Official Response to White House AI Action Plan

Dr. Syed Bahauddin Alam, Assistant Professor in the Department of Nuclear, Plasma, and Radiological Engineering (NPRE), has been named a National AI leader and expert in the University of Illinois Urbana-Champaign's official response to the White House's Request for Information on the U.S. National Artificial Intelligence (AI) Action Plan (2025).

Alam

The university's institutional response, submitted to the Office of Science and Technology Policy by Vice Chancellor for Research and Innovation Susan Martinis, highlighted UIUC's long-standing role in shaping the national AI landscape. In the report, Dr. Alam was cited among faculty "already engaged in helping shape future policies and directions for the AI landscape." This recognition places him alongside a select group of UIUC experts contributing to the broader U.S. AI strategy, including Nancy Amato, Bill Gropp, Klara Nahrstedt, and Anita Nikolich.

Dr. Alam was specifically recognized for his service on the National Academies of Sciences, Engineering, and Medicine (NASEM) committee on AI foundation models and their impact on scientific discovery and innovation. His appointment reflects his growing influence in aligning advanced AI research with high-impact applications in energy, cybersecurity, and critical infrastructure.

"Being named in UIUC's official response to the White House is both an honor and a responsibility," said Dr. Alam. "It underscores how our research at NPRE and Illinois, integrating AI, nuclear engineering, and cybersecurity, directly contributes to national priorities in science, technology, and security."

Dr. Alam joins a distinguished list of UIUC faculty cited for national leadership roles, including:

- **Nancy Amato,** Chair of the Computing Research Association and President of the IEEE Robotics and Automation Society,
- **Bill Gropp,** Council Member of the American Association for the Advancement of Science (AAAS),
- **Klara Nahrstedt,** Advisory Board Member for NSF's Computer and Information Science and Engineering (CISE) Directorate, and
- **Anita Nikolich,** member of the NSF Advisory Committee for Cyberinfrastructure.

UIUC's recognition of Dr. Alam in its response to the White House RFI reflects the university's commitment to advancing trustworthy, energy-efficient, and scientifically grounded AI for societal impact.

Shaping the future of NPRE, *continued from page 6*

graduates, and developing engineering solutions that have a meaningful impact on society worldwide.

In particular, I aim to broaden the reach and influence of my work in nuclear energy risk analysis and to further advance the field of socio-technical risk engineering across high-consequence industries. I plan to deepen my engagement with national organizations such as the U.S. National Academies and take on leadership roles in research initiatives that shape risk-informed policymaking and best practices. These efforts will be closely integrated into the education and training of students.

One of my long-term goals is to establish an international think tank focused on safety and security, grounded in rigorous scientific education. This initiative will create a global platform for educating future analysts on the root causes of socio-technical failures and for equipping decision-makers with effective tools for risk assessment and communication.

QERIMI WINS AVS AWARD

NPRE research assistant professor Dren Qerimi was named this year's winner of the AVS Plasma Science and Technology Division's Young Investigator Award. This award recognizes outstanding basic and applied contributions in areas of importance to the Division.

Qerimi (BS '16, MS '19, PhD '21), who came back to his alma mater in March 2024, also serves as the associate director of the Illinois Plasma Institute.

Qerimi said, "I am deeply honored and grateful to receive the AVS Plasma Science and Technology Division's Young Investigator Award. This recognition in the field of plasma physics is a reflection not only of my efforts, but also of the support, collaboration, and inspiration I have received from my colleagues, mentors, and students."

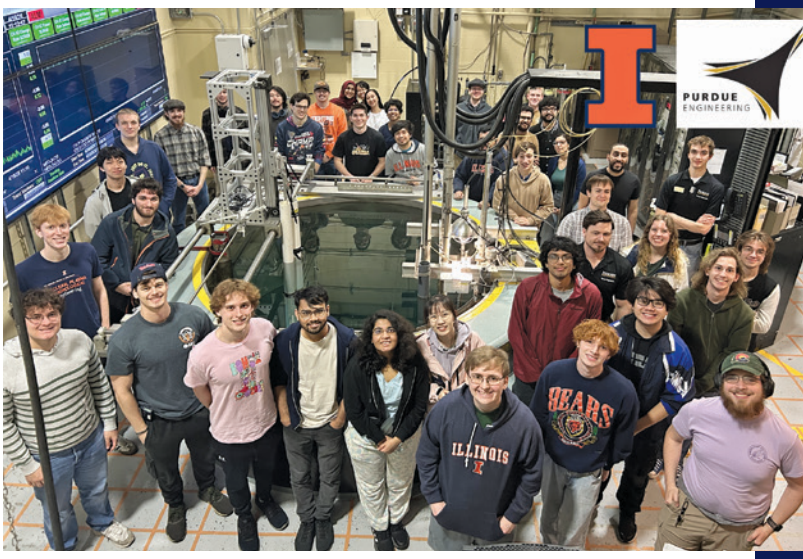
NPRE students visit Purdue research reactor through DOE Outreach Program

As part of the U.S. Department of Energy's University Reactor Sharing and Outreach Program, 38 students from the Department of Nuclear, Plasma, and Radiological Engineering at The Grainger College of Engineering, University of Illinois Urbana-Champaign visited Purdue University's Research Reactor, PUR-1, on April 19. The trip was organized by Illinois Grainger Engineering professor April Novak and Purdue professor Stylianos Chatzidakis.

During the visit, students toured the PUR-1 facility and participated in three hands-on experiments using the reactor and other instructional labs at Purdue. A highlight of the experience was witnessing Cherenkov radiation firsthand—a striking phenomenon seen for the first time by many of the students. "Seeing the Cherenkov radiation with my own eyes was an amazing experience," said NPRE undergraduate Arnav Goyal.

Students also conducted neutron flux mapping with indium foils in a subcritical pile reminiscent of the historic Chicago Pile-1, the world's first human-made nuclear chain reaction. For all attendees, this was their first direct experience with a subcritical assembly.

Another experiment focused on predicting the approach to criticality by incrementally loading uranium fuel into a water-moderated tank. "Everyone on the Purdue side was wonderful and very excited to help," said NPRE senior Joseph Specht. "My favorite experiment was the approach to criticality. It definitely strengthened my intuition about reactors in light water."



NPRE undergraduate Jake Lehman reflected on the broader value of the trip: "It's always a valuable experience traveling to other schools to learn about nuclear technology that we may not have here at Illinois."

Professors Novak and Chatzidakis plan to organize another visit next year for students in NPRE 455 and are exploring the development of a dedicated reactor lab course for UIUC students in the future.

NPRE leading the way in advanced nuclear reactor deployment

The Illinois Microreactor Demonstration Project (IMDP) is currently pursuing the deployment of a next generation research nuclear reactor on campus. Research reactors are nothing new. In fact, there have been as many 50 in operation in United States during the peak of the rollout of the currently operating fleet of large light water reactors. However IMDP's mission is distinct in its focus on developing and optimizing industrial applications of nuclear energy.

Many reactors are currently being developed in the vibrant nuclear industry, with new startups routinely coming onto the scene. Particularly unique about these technologies is that their sizes are often much smaller than the currently operating fleet –100+ times smaller in some cases. The intent is to address one of the largest barriers to plant construction over the past few decades: project-side risk associated with high financing costs and long duration deployments. Smaller reactors will require far less financing and should be deployable is significantly shorter timeframes. A promising future indeed!

However, a close look at proposed operational approaches show that rather than being completely eliminated, project-level risk is being shifted from capital expenditure to Operations and

Maintenance (O&M) expenditure. This truly is a paradigm shift in thinking about how nuclear plants are operated and how their energy is used. IMDP is targeted

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Illinois researchers part of $40 million ARPA-E project to reduce impact of used nuclear fuel

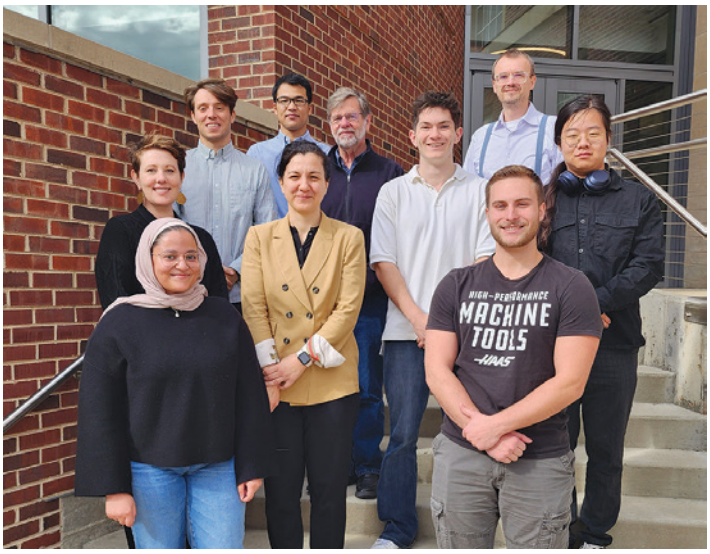
Earlier this year, the U.S. Department of Energy (DOE) Advanced Research Projects Agency-Energy (ARPA-E) announced $40 million for 11 projects to pursue transmutation technologies that would reduce the impact of used nuclear fuel (UNF) in permanent storage facilities. Transmutation is a process in which an isotope is converted to a different isotope or element through a nuclear reaction. ARPA-E's Nuclear Energy Waste Transmutation Optimized Now (NEWTON) program will pursue transmutation technologies to significantly reduce the mass, volume, activity, and effective half-life of the existing stockpile of commercial UNF, which would shift UNF disposal from an intergenerational issue to an intragenerational one.

NPRE associate professor Angela Di Fulvio had this to say about the research:

"A major challenge in the nuclear energy landscape is the long-term management of used nuclear fuel, which contains long-lived actinides that remain hazardous for hundreds of thousands of years.

"Our project, Enhanced Integrated Nuclear Systems for Transmutation and Efficient Isolation of Nuclides (EINSTEIN), funded by the U.S. Department of Energy's ARPA-E under the Nuclear Energy Waste Transmutation Optimization (NEWTON) program, plans to tackle this challenge by developing and evaluating technologies that enable the transmutation of used nuclear fuel and reduce the size of systems for long-term storage in permanent disposal facilities.

"As the only single-institution project within the EINSTEIN portfolio, our team at the University of Illinois Urbana-Champaign is integrating advanced nuclear and materials measurement capabilities with modeling to determine the



designs that would be most effective for reducing waste radiotoxicity and improving fuel-cycle sustainability.

The project is led entirely at Illinois, with my group supporting transmutation design and validation with experimental nuclear data. Professor Kathryn Huff will advance system analysis and fuel-cycle integration, Professor Tomasz Kozlowski will lead reactor physics and transmutation modeling, and Professors James Stubbins and Lorenzo Vergari will oversee nuclear materials characterization and chemical compatibility with transmutation systems. We will work closely with collaborators at national laboratories and in industry, with Dr. Ming Fang serving as liaison to coordinate technical evaluations, data sharing, and benchmarking activities."

NPRE leading the way in advanced nuclear reactor deployment, *continued*

at mitigating just this risk. The team is partnering with NANO Nuclear Energy, Inc. to deploy a KRONOS Micro Modular Reactor™ (MMR) to perform research to ensure that, once constructed, advanced reactors can be operated and utilized in economically favorable configurations. This research will encompass training approaches, instrumentation, enabling technologies like cybersecurity, and development of beyond-electricity applications like district heating.

The KRONOS MMR is a High Temperature Gas-Cooled Reactor (HTGR) fueled by TRI-structural ISOtropic (TRISO) fuel.

This technology configuration creates a remarkable safe operational envelope appropriate for deployment on a campus. The IMDP team has been engaged with the NRC for several years and has achieved key regulatory outcomes, such as 5 approved Topical Reports. Following a Part 50 application process, a Construction Permit Application (CPA) is planned for submission next year. That will be followed by an Operating License Application (OLA). Based on current regulatory timelines, deployment before 2030 is feasible.

Closing a star in a bottle: NPRE researchers play a central role in $220M grants from the U.S. Department of Energy to accelerate the commercial use of fusion energy

by Bruce Adams, Grainger College of Engineering

"If you're going to take a star and close that star inside a bottle, you have to make sure that you do a good job in designing the walls of the bottle," says Davide Curreli, Professor and Donald Biggar Willett Faculty Scholar of Nuclear, Plasma & Radiological Engineering (NPRE) in The Grainger College of Engineering at the University of Illinois Urbana-Champaign.

Curreli and other NPRE Illinois researchers are designing such packaging for nuclear fusion—the same energy that powers stars' cores—as part of several collaborations to accelerate the viability of commercial fusion energy funded by the U.S. Department of Energy.

"A significant step forward in advancing fusion energy research"

The DOE announced an anticipated investment of up to $235M in thirteen Fusion Innovative Research Engine (FIRE) "centrally managed teams called 'Collaboratives' that have a collective goal of bridging basic science research programs with the needs of the growing fusion industry." Phase 1 launched in January 2025, while Phase 2 was announced last month. Each team is comprised of researchers from universities, national laboratories and private enterprises. Each collaborative's work will span four years.

NPRE faculty will play a vital role in a number of these projects, developing new materials for fusion energy.

"Plasma Material Interactions (PMI) has been recognized as one of the major problems to tackle and solve in fusion energy by the National Academy of Engineering," Curreli said. "And the expertise at Illinois—and I think this is recognized across the entire fusion community—is specifically in PMI. We have demonstrated a capability over the past ten-plus years. Our contribution on multiple fronts will be on the plasma material interactions."

NPRE researchers lead the way in fusion energy materials

Describing his departmental colleagues, Curreli mentions that assistant professor April Novak is working "on liquid-metal blankets and fluid dynamics simulations which might be useful for both fusion and fission." He also namechecks NPRE Assistant Professor Lorenzo Vergari and his work on advanced blankets and coolants, and Associate Head for Graduate Programs and Donald Biggar Willett Professor R. Mohan Sankaran and his research on low-temperature plasma. John Paul Allain, Associate Director of the DOE Office of Fusion Energy Sciences, received M.S. and Ph.D. degrees from Illinois Grainger Engineering and taught at NPRE for ten years. Professor Emeritus David Ruzic notes that Allain wrote his thesis under Ruzic and co-authored papers on

Curreli

Andruczyk

Novak

lithium for fusion. "I'm really happy to see that the Department of Energy has recognized that by providing funding in this area, which I think can make all the difference in the world to making commercial fusion energy possible."

Illinois researchers are contributing to research collaboratives.

As part of the first round of DOE FIRE grants, totaling $107M, Curreli was awarded a FIRE grant in collaboration with Darin Ernst from MIT for the creation of an advanced simulation center focused on profile prediction in fusion pilot plants. The project was titled "FIRE Collaborative: Advanced Profile Prediction for Fusion Pilot Plant Design" (APP-FPP).

Curreli writes that "the urgently needed capability provided by APP-FPP helps bridge the gap between decades of federally funded research, which has aimed to develop validated predictive scientific understanding of turbulence and transport in fusion plasmas, and the Bold Decadal Vision for fusion, which will support industry in designing and building the next generation of fusion devices through public-private partnerships. AFP-FPP is delivering this new predictive capability in a highly accelerated simulation framework, making whole device profile prediction accessible and practical for end users in the fusion industry to optimize fusion pilot plant designs."

On September 10, 2025, DOE announced an additional $128 million in funding for FIRE collaboratives. Of the seven teams selected, NPRE researchers are involved in three of them.

Benjamin Lindley, from the University of Wisconsin-Madison and Argonne National Laboratory, is leading the FIRE Collaborative: Fusion Neutrons for Integrated Blanket Technology Development Through Advanced Testing and Design.

Assistant Professor April Novak at Illinois will lead the validation of liquid-metal magnetohydrodynamic (MHD) tools for modeling breeder blankets, in tandem with new high-magnetic-field experiments at the Wisconsin HTS Axisymmetric Mirror (WHAM) facility. The team will also generate a pressure drop library for common fusion flow

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Closing a star in a bottle, *continued*

components compatible with fast-running design tools. The overall goal is to improve the maturity of simulation and design tools for breeder blankets.

Nathaniel Ferraro from Princeton Plasma Physics Lab (PPPL) is leading the FIRE Collaborative: Mitigating Risks from Abrupt Confinement Loss (MiRACL), to study what happens when the plasma's energy suddenly escapes the confining magnetic field that keeps it away from the walls of the fusion system. MiRACL will partner with the industry to identify and manage associated risks. Curreli is contributing to the collaborative project on the determination of material limits due to cumulative PMI.

"We have developed ion surface interaction codes," Curreli says, "these are sophisticated kinetic tools that handle the PMI problem using advanced computing. Now we are integrating these tools into larger frameworks by using machine learning. Thanks to machine learning, you can retain kinetic accuracy, which would normally require high-performance computing, within larger computational framework, and get results in the blink of an eye in terms of performance."

> "There are nine of us overall in this collaborative, pulling a lot of experience that we've developed together to push not just liquid metals, but liquid lithium as a solution for fusion reactors."
>
> — Daniel Andruczyk

The project, entitled "FIRE Collaborative: Advancing the maturity of liquid metal (LM) plasma facing materials and first wall concepts", led by Rajesh Maingi from PPPL, aims to address key technical challenges associated with liquid metal plasma-facing materials and wall concepts, thereby enabling the consideration of liquid metals for fusion pilot plant designs. Research will encompass four main challenges: testing protective materials, understanding material properties, investigating the behavior of liquid metals in magnetic fields, and developing new metal alloys.

NPRE expertise in liquid metal technology

Daniel Andruczyk, NPRE Research Associate Professor, is heading up the University of Illinois portion of this FIRE collaboration. The co-PIs on this collaboration from NPRE are Curreli and Ruzic. Aside from PPPL, the Illinois team is receiving the next-largest share of the budget, totaling $4.24M over the next four years.

"We are the premier laboratory, I'd say in the world, that works on molten lithium or molten metals," says Ruzic. "We have demonstrated the safety of this to the university, we've developed the right types of procedures that keep things safe and working, and we do more liquid metal experimental research than anywhere. So, a lot of times we are included in other teams because of our development of the liquid metal technology."

As Andruczyk describes it, "The FIRE collaborative looks to advance the maturity of liquid metal (LM) plasma-facing materials (PFM) and first wall component (PFC) concepts." He says the collaborative role of Illinois researchers will be to drive much of the experimental work with lithium. "There are nine of us overall in this collaborative, pulling a lot of experience that we've developed together to push not just liquid metals, but liquid lithium as a solution for fusion reactors."

Curreli defines his contributions as "the computational modeling of liquid metals and what happens to the surface of a liquid when it's exposed to a plasma."

As Ruzic and his collaborators wrote in the 2021 paper "Lithium, a path to make fusion energy affordable," a "lithium-driven low recycling regime could accelerate fusion's commercial viability since such a device would be smaller, dramatically decreasing plant and electricity costs if all technological complexities are solved."

Andruczyk elaborates that "through many discussions with the public and private sector, 60 gaps were identified, with about ten that were highlighted by many end users. Thus, there are four interconnected areas that will be focused on by the Collaborative: Integrated PFC analysis and testing of liquid lithium, Material properties and lithium compatibility, Liquid lithium flow in magnetic fields, and Development of novel liquid metal alloys. Illinois will be heavily involved in several of the areas, as our unique facilities, including our own steady-state magnetic toroidal fusion device, HIDRA, will be used to advance novel PFC technology solutions."

The Center for Plasma Material Interactions (CPMI), located in NPRE, is one of the world's leading laboratories for liquid lithium and metals and has advanced much of the knowledge and technology related to flowing lithium and its interactions with plasmas.

Partnerships to commercialize fusion energy

A key component of the FIRE collaboratives is a public-private partnership with firms working to commercialize fusion energy. Curreli calls fusion energy generation "a high-risk, high-reward type of investment. There are a few companies that are doing excellent work," he says, mentioning Commonwealth Fusion Systems, a MIT spinoff. Illinois Grainger Engineering has partnered with Tokamak Energy, a British company serving as a technical advisor on eight FIRE projects. In 2024, Tokamak began working with Grainger engineers to design an upgrade to the HIDRA and to apply research findings to its prototype power plant designs.

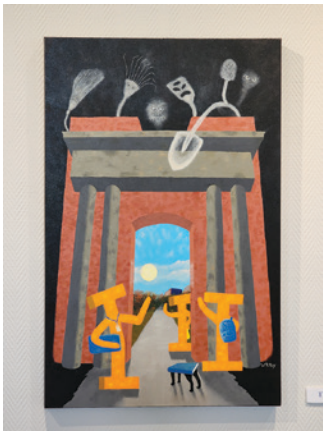
As Ruzic puts it, "we're very well placed to do this kind of research."

Roy takes ‘surrealist view’ with paintings

Professor William Roy has been a fixture in NPRE classrooms for decades. What he does outside of the classroom, at least with some of his time, has proven to be surreal.

This past summer, 18 of Roy’s paintings were featured at the Illini Union gallery in an exhibit entitled “Surrealist Views of Life,” with subject matter relating to his professional and professional lives.

Here are some of the pieces, described by Roy himself:



The Last Daze

“The title of this composition refers to the days of classes at the University of Illinois, as the I-Students strive to complete all their assignments, research papers, and projects for grading on time. I wanted to create a surrealistic interpretation of how students feel as the semester comes to an end. I used some feedback from my students! I tried to emulate the excitement, trepidation, frustration, stress, angst and determination of students as they strive to reach graduation—as personified by the Alma Mater. Note the mythical grading dice, a clock that always says ‘late,’ the ever-present eye…and in the sky—a tunnel at the end of the darkness that leads to…what?”

Office Wars

“Have you ever noticed that the closet where office supplies are stored often seems to be a mess? It could be that incompatible office supplies were stored together! As shown in the painting, there could be battles between opposing forces at night. In this violent scene, White Out confronts the pencils for dominance. It could happen.”

Lost and Late

“This painting was based on a recurring nightmare—becoming lost in a city, making me late for some class or meeting. With every step, the landscape becomes less familiar and more threatening. Any hope of finding my way becomes replaced with despair. I had hoped that creating this painting would end my nightmares—but they continue to this day.”

Escape to Sweden

“It was a black day when the State Department decided at the last minute that I could not go to Sweden to teach because my passport would expire ‘too soon’ after I returned. Hence, in this surrealistic dream, I have broken free from the State Department, and I am flying across the Atlantic on my passport to Sweden. There, in Sweden, was Professor Gudowski, the classrooms and the Äspö Hard Rock Laboratory. Sadly, such a voyage remained a dream.”

From Chicago to Taipei: Owen Strong expands his nuclear horizons

Any student in the Department of Nuclear, Plasma & Radiological Engineering can be taken to special places, both literally and figuratively.

For NPRE junior Owen Strong, the desire to apply the knowledge learned in the classroom and learn even more led him to Taiwan, where he spent last spring studying abroad at National Taiwan University in Taipei.

Owen Strong

Born and raised in Chicago, Strong said he was interested in studying in Taiwan to "get more perspective on how and how nuclear power is perceived in different communities and in different ways" because of the country's complicated history with nuclear power.

"For me, a lot of the reason why I wanted to study nuclear engineering, and especially going to the power track, was because I thought it was something that I thought, not just, 'Oh, this is cool science,'" Strong said. "I thought I could help my community with it...thinking about how abstract engineering or scientific concepts...not just how they literally affect people, but how they are perceived by people."

During his time in Taiwan, Strong was able to visit the country's Low Level Nuclear Waste Repository on outlying Lanyu Island.

"This island has a decent amount of history that I wouldn't be able to explain in a class, let alone an email, but it's part of why nuclear energy has been controversial in Taiwan," he said. "The nationalist government (pre-democracy) established this low-level nuclear waste repository there...and the island's inhabitants (primarily the indigenous, Polynesian, Tao People as opposed to the Han Mandarin-speaking martial government) themselves were not initially informed or asked for consent on the site during this martial law period.

"Management of the site is part of why the resistance and eventual opposition to the party once elections were held crystallized around opposition to nuclear energy...With a substantial amount of luck, I was able to take a ferry and visit the outlying island and visit the waste site. I gave a driver's license as collateral, and they had an informational room to visit before actually looking at or taking pictures of the site."

Strong was also able to visit the research reactor at National Tsing Hua University in Hsinchu, Taiwan. The facility there has a TRIGA reactor that began operations around the same time as UIUC's now-decommissioned reactor. It is currently still used for education/research, including Boron Neutron Capture Therapy.

"I was really impressed with Owen's independent drive to go and visit Taiwan all by himself on a foreign exchange semester this spring," NPRE associate professor Katy Huff said. Strong is part of Professor Huff's Advanced Reactors and Fuel Cycles research group.

"He took the opportunity to visit corners of the world and other nuclear engineers will likely never see, myself included," Huff said. "He really embedded himself into the nation was proactive and shared photos of his nuclear-themed bicycle touring adventures with us. He even took a bike ride just to see a nuclear power plant there in Taiwan. This kind of world experience reflects how Owen intentionally builds his understanding of the connection between his work as a nuclear engineer and the broader nation-transforming impacts that nuclear energy can have."

As for future aspirations, Strong is focused on finishing his undergraduate studies in NPRE and eventually earning his PhD.

"Owen's work with Oak Ridge (National Laboratory) this past summer so impressed his laboratory mentors that they requested that he be supported to continue working on the project for the remainder of the school year," Huff said. "We've set for some milestones for his work and are already preparing a conference publication. His work is focused on improvements to a real national laboratory production code for neutron transport. This kind of work as well beyond the level of physics and mathematics that a student would be expected to be perform at his stage in his curriculum, but he has had no trouble contributing to this effort."

Strong said he also hopes to travel to other countries with interesting histories surrounding nuclear and spending time learning about those complicated chronicles.

"No two people's experiences are the same, let alone entire groups and cultures," he said. "I think, were I to have the opportunity to spend more time internationally, I think I would probably be interested in, getting to know more of those sorts of stories."

Mohaghegh awarded NSF Mid-Career Achievement Grant for work in risk analysis

Professor Zahra Mohaghegh of the Department of Nuclear, Plasma & Radiological Engineering at The Grainger College of Engineering, University of Illinois Urbana-Champaign, has been honored with the Mid-Career Achievement (MCA) grant award from the National Science Foundation (NSF). This prestigious grant recognizes mid-career scientists, providing them with the opportunity to expand and advance their research initiatives.

Professor Mohaghegh's NSF-funded research project is titled "Interactions of Human Performance, Physical Failure Mechanisms, and Organizational Phenomena in Socio-Technical Risk Analysis of Complex Technological Systems."

"Socio-technical risk analysis explores how technical risk factors—such as material degradation—interact with human behavior, organizational dynamics, and policy influences, potentially leading to complex technological accidents," Mohaghegh said. "With emerging reactor technologies and evolving regulatory landscapes, socio-technical risk analysis in nuclear energy has never been more critical. It is essential to navigate the uncertainties posed by these cross-disciplinary changes and turn them into opportunities for safer, more efficient energy generation."

Although the project primarily focuses on nuclear energy systems, its findings will have broad implications for deploying new technologies across various industries. The project aims to enhance the modeling of potential risks in technological systems, apply new methods across different industries and regulatory settings, and create an educational platform for socio-technical risk analysis.

Mohaghegh, a Donald Biggar Willett Faculty Scholar in the Department of Nuclear, Plasma, and Radiological Engineering at Illinois Grainger Engineering, also serves as the Director of the Socio-Technical Risk Analysis (SoTeRiA) Research Laboratory, where her work focuses on advancing risk science and its applications to ensure the safety and economic viability of complex technological systems, including commercial nuclear power plants, advanced reactors, civil aviation, and the oil industry. Her research includes probabilistic risk assessment, probabilistic physics of failure analysis, human-system reliability modeling, risk-informed decision-making, and uncertainty analysis.

Throughout her career, Professor Mohaghegh has applied her expertise in nuclear risk analysis to a wide range of technological challenges, contributing to improved policymaking and regulation across multiple sectors. She has served on the Committee on "Transport Airplane Risk Assessment Methodology" for the U.S. National Academies of Sciences, Engineering, and Medicine, and is currently a member of the U.S. National Academies' Committee on "Improving the Efficiency and Effectiveness of the Coast Guard Certificate of Compliance Examination Program for Gas Carriers."

Fueling change, one reaction at a time: Huff continues clean energy mission

BY ABIGAIL BOBROW

The offer came out of the blue. In 2021, Katy Huff was just 34 and only five years into her faculty career at the University of Illinois when she received what looked like a standard government email. She assumed its senders wanted recommendations of more experienced scientists for a vacant post. Instead, they asked her to lead the U.S. Department of Energy's Office of Nuclear Energy.

Katy Huff

Huff took a leave from Illinois to take on the highstakes role—one that managed billions of dollars in national research programs to keep aging nuclear plants operational, push new reactors toward launch, and accelerate innovations from the lab to reality. Just as essential was communicating the mission to the public.

The perception of nuclear energy has shifted over the decades. In 2024, the Pew Research Center found that 56% of American adults support building more nuclear power plants to generate electricity. They now see nuclear power not as a threat but as a clean, safe solution in the fight against climate change.

"We are facing this incredible existential challenge of the climate crisis," she said. "The need to build clean energy is so urgent that people who may have previously been wary about nuclear energy have begun to embrace it as a needed source of carbon-free electricity."

continued on next page

Fueling change, one reaction at a time, *continued*

Powered by Questions

It's a puzzle Huff has been wrestling with since childhood, growing up in a highly intellectual and curious environment where energy topics—like solar and nuclear power—were regular dinner table conversations. Huff and her identical twin sister, Allison Gouch, remember their home in rural Cat Spring, Texas—about an hour from Houston—as being filled with books that opened the world to them.

Their parents, both engineers in Texas' flourishing energy industry, were always working on mechanical, electrical, and construction projects, often involving the girls from a young age. The family's 11-acre property was a playground, where they fished, shot clay targets, and encountered wildlife.

"They didn't shy away from teaching us about solar power, nuclear fusion, or how to fix things with our hands," Gouch recalled. "There was always something going on—fixing cars, building things, tinkering. Katy had a real aptitude for it." When Huff and Gouch exhausted the math curriculum at their local high school, they transferred together to the Texas Academy of Mathematics and Science for their junior and senior years. There, Huff finally found her intellectual home, surrounded by like-minded peers.

That's also when she picked up "The Making of the Atomic Bomb" by Richard Rhodes—a sweeping history of nuclear science and its devastating transformation into a weapon of war. She was hooked. That fascination led to an internship at Los Alamos National Laboratory, birthplace of the Manhattan Project. But rather than dwell on its destructive legacy, Huff saw something else: the potential for nuclear science to build a cleaner, more sustainable world. She began envisioning a future where she could be part of the solution. For college, she chose the University of Chicago—a legendary hub for nuclear research and a universe away from Cat Spring.

Second Life

By the time Washington called, Huff, her husband, Strom Borman, and their black mutt, Nyx, were settling into the strange new rhythms of pandemic life. After completing her Ph.D. at Wisconsin and a postdoc at Berkeley, she had put down roots at Illinois and was deep into her research, writing software to model and simulate advanced nuclear reactor multiphysics and their fuel cycles. One area of research in her group addresses recycling spent fuel in new nuclear reactors.

"France has done this for almost 40 years now. I stood on top of some of their vitrified waste, which is currently stored in a pristine room the size of a basketball court," Huff said. "Unfortunately, we don't do it in the United States both because of cost and due to policy concerns about proliferation, meaning the potential for the material to be used in weapons. But I believe those concerns can be addressed."

Nuclear waste recycling—or reprocessing—is exactly what it sounds like: turning what is considered waste into additional power. Even after fuel rods are deemed "spent," they still hold valuable energy. Instead of locking that potential away in long-term storage, scientists are working on separating usable materials like uranium from the used rods. These recovered elements can be recycled and reused in next-generation reactors, extracting more energy from the same source.

> "The need to build clean energy is so urgent that people who may have previously been wary about nuclear energy have begun to embrace it as a needed source of carbon-free electricity."
>
> **— Katy Huff**

The benefits are twofold. Recycling reduces the volume and timeline on which the spent fuel rods remain radiotoxic and lessens the demand for freshly mined uranium—a win for sustainability and security in the energy landscape. While in Washington, Huff helped revive a "consent-based" approach to managing spent nuclear fuel, inviting communities into the decision-making process and laying the groundwork for trust and transparency.

The Work Comes Home

Huff, an optimistic nuclear energy advocate, conveyed these ideas throughout her three years in D.C. Her easygoing, clear communication style made her a relatable messenger. "I think you have to meet people where they are, and the communication strategy leveraged by a lot of the industry in the past missed the mark," Huff said.

"If the public comes to officials for answers and explanations, they deserve a public official who will answer those questions." The U.S. Senate had confirmed her with the distinguished title of "The Honorable," but reclaiming the title of professor, Huff returned to campus without missing a beat. A year after stepping back into academia, she remains fiercely committed to using and expanding nuclear energy and bringing others along with her.

Originally published in STORIED, a publication of the Office of the Vice Chancellor of Institutional Advancement at Illinois.

Students take part in national delegation

Earlier this year, graduate student Jacob Fritchie and undergraduate student Piper Fernau were chosen to take part in the Nuclear Engineering Student Delegation. Each year since 1994, the NESD has sent students from all over the country to Washington, D.C. to express the views and policies of the nuclear science and engineering student population. 2025 marks the sixth year in a row that the NESD included either current students or alumni of NPRE.

Here's what Fernau had to say about her time:

"Participating in the Nuclear Engineering Student Delegation was an extremely rewarding experience. I had the opportunity to collaborate with 17 other undergraduate and graduate students from across the nation, learning from them throughout the week. During the week we worked together to create and polish a policy statement advocating for current and future legislation that will help keep the nuclear industry moving forward. When writing the policy statement, I focused on the nuclear workforce development, education, and training section. In my section, I emphasized the current needs within academia and highlighted pathways to industry that have gone unseen.

Throughout the week we had the honor of meeting with several NGOs, think-tanks, and startups in D.C. We also met with governmental organizations such as the Office of Nuclear Energy within the Department of Energy, the Office of Science and Technology Policy at the White House, and the Nuclear Regulatory Commission, where we met with Commissioner Marzano. These meetings allowed me to hear from current industry and policy-based professionals who provided valuable insight into critical issues facing the nuclear industry.

Overall, being a part of the Nuclear Engineering Student Delegation has been a major highlight of my undergraduate career. My understanding of nuclear policy was widened immensely. I learned about the research behind proposals, how to get nuclear proposals introduced in Congress, how to incorporate feedback from the nuclear industry at large, and more. I am beyond grateful to the NPRE department for their support of my involvement, allowing me to have such an incredible experience."

Fritchie added this about his encounter:

"Participating in the Nuclear Engineering Student Delegation was one of the most meaningful professional experiences I've had so far. Over the course of the week, I joined a group of 18 students from across the country to learn about how federal policy is shaped and how technical voices can help inform that process. Together, we drafted a policy statement addressing several key topics including nuclear workforce development, advanced reactor deployment, waste management, and global nonproliferation. My primary contributions focused on nonproliferation, safeguards, and international nuclear cooperation, connecting my research background to the broader policy landscape.

Throughout the week, we met with representatives from government agencies, NGOs, and private industry—each offering a unique perspective on the challenges and opportunities facing nuclear energy. These discussions gave me a much deeper appreciation for how technical research intersects with policymaking. The week concluded with meetings on Capitol Hill, where Piper and I met with several Illinois congressional offices to advocate for continued investment in nuclear science, education, and infrastructure. It was an incredible opportunity to represent both UIUC and the next generation of nuclear professionals. I'm deeply grateful to the NPRE department for supporting my participation in the delegation and for encouraging students to engage in policy and advocacy efforts that strengthen the future of our field."

ALUMNUS HERTEL HONORED WITH PRESTIGIOUS EVANS MEDAL

Dr. Nolan Hertel (NPRE PhD '79), currently a professor emeritus at Georgia Tech, has been awarded the Robley D. Evans Commemorative Medal by the Health Physics Society, one of the highest honors in the field of radiation safety.

The medal honors Robley D. Evans, a pioneering physics educator, scientist, author, and humanitarian whose more than 50-year career advanced the field of radiation protection and health physics. Since its inception in 1997, the Evans Medal has been awarded only 13 times, highlighting the exceptional distinction of this recognition.

Hertel exemplifies the qualities celebrated by the Evans Medal, including excellence in scientific achievement, interdisciplinary capabilities, insight into simple solutions for difficult problems, and a deep commitment to applying science to real-world radiation safety needs.

Ruzic wins IUVSTA Prize for Technology, recognized for 'pioneering work'

Sometimes, when you are ahead of the curve, it takes time for the world to catch up. For David Ruzic, that recognition is happening more and more.

Ruzic—a professor emeritus in the Department of Nuclear, Plasma & Radiological Engineering at The Grainger College of Engineering, University of Illinois Urbana-Champaign—was recently named the winner of the IUVSTA Prize for Technology.

The worldwide prize is awarded every three years to recognize and encourage outstanding internationally-acclaimed achievements in technology and instrumentation in the fields of interest to the International Union for Vacuum Science, Technique and Applications (IUVSTA).

"Basically, it's all of the types of science you would do generally when you have to have it inside a vacuum system," Ruzic said of IUVSTA's purview. "Making computer chips is all done inside a vacuum system. Fusion is done inside a vacuum system. You have to get rid of the air before you can do stuff."

As part of the nomination process, Ruzic had to receive supporting letters from colleagues from at least three different countries and have the backing of his home country's society—in this case, the American Vacuum Society (AVS), from which he has won previous awards.

Ruzic's citation for the award is for "outstanding achievements in pioneering work in magnetron sputtering development and the use of liquid lithium in fusion technology." He pointed to his wide-ranging research over the past four decades, including securing at least 15 patents and developing the technology to actually use flowing molten lithium in a fusion device.

"I've been convinced for a long time this is the right path to fusion energy and convincing other people that this is the right path to make fusion energy has been a 20-year challenge and still is," Ruzic said. "But some private companies, including Tokamak Energy, who's funding us in a big way, seem to agree, and so this ability to utilize and develop the technology to allow flowing molten lithium to be used in a fusion device has turned out to be something noteworthy as well."

"I've been convinced for a long time this is the right path to fusion energy."

—David Ruzic

The path to this point was long, and Ruzic was met with some detractors along the way.

"I was criticized…well, it was a suggestion 20 to 25 years ago in my career saying, 'You're working in too many areas. You should really pick one and then you can become really famous in it,'" Ruzic said. "I didn't choose that route because I saw the important synergies between the different things that still use the same core science."

Seeing how plasmas can interact with materials and how plasma processing used in semiconductors could relate to fusion technology has led, over the years, to the creation of the Center for Plasma Material Interactions (CPMI), which has housed Ruzic's research for decades.

More recently, Ruzic has led a charge to integrate research and industry through the Illinois Plasma Institute (IPI), which combines education with the drive to take innovations to market through commercial partnerships. "The real key with the IPI concept is that companies come and put people here, they bring their machines, and we can now advance that technology readiness more quickly into them," he said.

The IUVSTA Prize for Technology will be formally presented to Professor Ruzic at the International Vacuum Congress (IVC-23) in Sydney, Australia this September.

"I got lucky," Ruzic said. "The things I started working on 20 years ago actually have turned out to really work and I've had phenomenal students that have been able to carry that forward, too."

HOLLOWAY NAMED PRESIDENT OF UNIVERSITY OF TOLEDO

Dr. James Holloway (NPRE BS '82, MS '84) was recently inaugurated as the newest president of the University of Toledo. Holloway joins UToledo from the University of New Mexico, where he served as provost and executive vice president for academic affairs since July 2019. Holloway was the 2023 honoree of NPRE's Distinguished Alumni award.

Piper Fernau named first recipient of Blair and Jennifer Bromley Canada-U.S. Friendship Scholarship

In the late 1990s, Blair Bromley was a graduate student at the University of Illinois Urbana-Champaign from Canada, and like most graduate students, he received some financial support.

"I came to NPRE as an international student, and was supported financially through tuition waivers, research assistantships, and teaching assistantships," Bromley said. "I am somewhat doubtful that I could have obtained the same level of support at other universities in the United States, or perhaps even Canada, and for that I am very thankful, and very grateful."

Bromley went on to get his MS degree in aerospace engineering in 1998 and his PhD in nuclear engineering in 2001. He currently works as a reactor physicist at the Canadian Nuclear Laboratories (CNL).

"NPRE had (and still has) as an excellent educational program and a diverse and comprehensive array of professors with valuable knowledge, experience, and expertise, both inside and outside academia, and many good networking contacts within industry and at the national laboratories," Bromley said. "I developed a good educational and professional foundation within NPRE, that helped prepare me for post-doctoral studies, and later to serve as an R&D scientist at several national laboratories."

When the opportunity arose to give back to their alma mater, Dr. Bromley and his wife, Jennifer, a fellow Illinois alumna (MA '97 Teaching of English as a Second Language, MA '00 Linguistics) have been generous with their time and money.

In addition to supporting the NPRE Visionary Scholarship Program, Dr. Bromley has been an active member of the Department of Nuclear, Plasma & Radiological Engineering's alumni board, offering counsel to the department from a research/industry perspective.

When asked what advice he would give to current students preparing to enter the field, he said, "The advice for today is essentially the same advice for yesterday, and for tomorrow. Maintain the fundamentals and core skills, along with personal and professional ethics. They are a constant guide, the 'North Star' of one's career.

"Nuclear engineering is a most honorable and noble profession and career. Be quietly proud and also be humble. Never be entitled. Our role is serve and to improve the quality of life for humanity through our work. Learn quickly from the mistakes and successes of others. Do not be afraid to fail."

Beginning this school year, the Blair and Jennifer Bromley Canada-U.S. Friendship Scholarship will be given to an undergraduate (sophomore/junior/senior) student in NPRE who has demonstrated academic/scholastic merit, and who has shown accomplishments and dedication to one or more of the following: participation in RSOs and professional nuclear organizations such as the American Nuclear Society (ANS), Women in Nuclear (WiN), and North American Young Generation Nuclear (NA-YGN); public engagement; and public education and outreach. This latest financial gift continues a strong tradition of named scholarships within the department.

The scholarship's first recipient is current senior Piper Fernau. Fernau is pursuing her BS in NPRE in the Plasma and Fusion Science and Engineering concentration. She ranks highly among her peers academically and is a James Scholar. In terms of research, Fernau has been involved in Prof. Mohan Sankaran's SPEC Lab since freshman year. Her research focuses on using atmospheric plasmas to degrade PFAS, forever chemicals. Based on her research performance, she was named a DaRin Butz Foundation Research Scholar and an Illinois Scholar Undergraduate Researcher (ISUR).

Piper Fernau

Fernau has shown a commitment to STEM outreach. She was a Lab Assistant for our Worldwide Youth in Science and Engineering (WYSE) program for two consecutive summers, responsible for developing content, presenting lectures, and running demos and lab tours for high school juniors and seniors to learn about the NPRE fields. Fernau was a Course Assistant for NPRE 100 Orientation to NPRE, a course taken by all first-year students in the department. Fernau was a Women in Engineering (WIE) Orientation Mentor and is currently a WIE Ambassador for NPRE. Through these roles, she aspires to inspire her peers and advocate for visibility and representation of women and other underrepresented groups in STEM.

Lastly, Fernau has been highly active in both our American Nuclear Society and Women in Nuclear student chapters. In her sophomore year, Fernau served as Outreach Chair for ANS, responsible for organizing impactful events to promote nuclear energy awareness/advocacy booths, letter-writing campaigns to support the lifting of nuclear moratoriums, Boy Scout Nuclear Science Merit Badge sessions, and exhibits for Engineering Open House. Fernau was named the ANS Student Chapter Undergraduate Outstanding Service Award (2024) in recognition of her contributions. That same year, not content to just hold one officer position on one student organization, Fernau was also Content Chair for WIN.

In the end, for Bromley, this scholarship is an opportunity to follow the Golden Rule ("Do unto others, as you would have them do unto you") in a place that has meant so much to him and his family over the years.

"Or, in a more contemporary society, 'Pay it forward,'" he said.

Selected NPRE Scholarship Impact Statements (2024–25)

BARCLAY G. JONES ENDOWMENT IN NUCLEAR, PLASMA AND RADIOLOGICAL ENGINEERING SCHOLARSHIP

Bryan Park

MAJOR: NUCLEAR, PLASMA AND RADIOLOGICAL ENGINEERING

YEAR: SOPHOMORE (CURRENTLY A JUNIOR)

FAVORITE CLASSES: PHYS 211: MECHANICS

Why did you want to be a Grainger Engineer?

I wanted to become an engineer because I am proficient in math and science. I chose nuclear engineering specifically because I believe in the importance of nuclear energy for fighting climate change. I chose The Grainger College of Engineering because it is well-known for having well-taught and rigorous courses that will prepare me well for my future.

What is your greatest accomplishment?

I am most proud of getting good grades in my classes. I am looking forward to starting research in computational nuclear engineering this year.

What do you want to do after you graduate?

I want to work at a nuclear energy company that works on advanced nuclear reactors such as NuScale, Oklo, or Kairos Power.

MESSAGE FROM BRYAN:

"As an out-of-state student, receiving this scholarship means a lot, as it made it possible for me to attend one of the best engineering programs in the nation. Without this scholarship, I would have had to take out much larger loans, and it would have made deciding which school I chose a harder decision. Now, I can focus solely on my academics by focusing on classes, working on several projects, and participating in research."

CATHERINE PRITCHARD SCHOLARSHIP

Arnav Goyal

MAJOR: NUCLEAR, PLASMA AND RADIOLOGICAL ENGINEERING

YEAR: SOPHOMORE (CURRENTLY A JUNIOR)

FAVORITE CLASSES: NPRE 330: MATERIALS IN NUCLEAR ENGINEERING; NPRE 455: NEUTRON DIFFUSION TRANSPORT; ECE 210: ANALOG SIGNAL PROCESSING

Why did you want to be a Grainger Engineer?

I have always known I wanted to do engineering: I always loved my STEM classes and wanted to spend my life building things that helped people. I chose Grainger as it was an in-state school with a nationally acclaimed plasma and fusion program, which also allowed me to get involved in all the different engineering programs I am currently involved with. All these programs are also well-developed, with motivated students all aiming to do good in the world.

What is your greatest accomplishment?

As a freshman, I was able to get involved with research early on, in my first semester on campus. This has allowed me to develop my skills in the lab, working with my hands while also taking advanced courses in the classroom. This year, I had the chance to design the experiment being conducted which tested me in ways I didn't understand until the process was complete. I submitted our work to the ANS Student Conference and came back with an award for Best Paper in the Computational Methods section; this is an achievement I am most proud of. I wouldn't have been able to do anything without the help of my graduate students and the support system around me.

What do you want to do after you graduate?

Though I am not sure exactly where I will go after graduation, I want to work in the fusion industry. I am taking business classes in the coming semesters, and a dream job would involve commercialized fusion and attempting to mass market it. This would, hopefully, get rid of many of the problems associated with the energy crisis and help people improve their quality of life all over the world.

MESSAGE FROM ARNAV:

"As a student, I have designed my schedule to be as busy as possible. Some days I am volunteering on the quad for the American Nuclear Society, other days I am helping assemble the body tube for a student-designed rocket that will be launched in California. I spend more than 10 hours a week in a lab conducting research, too. Being involved in a lot of projects is a lot of fun and very educational, but I am able to commit myself to the work because I have to worry less about the other parts of my life, like paying for school. Thank you for the scholarships that have allowed me to participate in the many aspects of being a Grainger engineer at UIUC. I would not be able to be the student that I am today without them."

ROY AXFORD ENDOWED SCHOLARSHIP

Jack Gerrity

MAJOR: NUCLEAR, PLASMA AND RADIOLOGICAL ENGINEERING

YEAR: SOPHOMORE (CURRENTLY A JUNIOR)

FAVORITE CLASSES: MATH 257: LINEAR ALGEBRA W/ COMPUTATIONAL APPLICATIONS; NPRE 200: MATHEMATICS FOR NPRE; NPRE 451: NPRE LABORATORY

Why did you want to be a Grainger Engineer?

I wanted to work on producing clean energy that will transform the world, and

there is no better major than NPRE to do that.

What is your greatest accomplishment?

I am most proud of winning an award from the Nuclear Energy University Program, and I am hoping to publish my first research papers this year.

What do you want to do after you graduate?

After I graduate, I hope to obtain a PhD and work on innovating and improving clean energy technologies which will have large-scale impact.

MESSAGE FROM JACK:

"Thank you for your generous support. This scholarship significantly eases my financial burden, allowing me to focus on my studies and research in plasma and fusion science instead of getting another job to pay off some of my loans. This year, I am excited to work more hands-on projects like the fusor, work on my research projects, and gain experience that will shape my future in engineering. I have been able to help many other students this year with their projects while leading the American Nuclear Society's Project Development Committee. My journey at Grainger has been transformative, and I am deeply grateful for the impact you are making in my life and my academic pursuits."

GEORGE H. MILEY—LENR ENDOWED UNDERGRADUATE SCHOLARSHIP

Zach Nordan

MAJOR: NUCLEAR, PLASMA AND RADIOLOGICAL ENGINEERING

YEAR: SOPHOMORE (CURRENTLY A JUNIOR)

FAVORITE CLASSES: PHYS 325: CLASSICAL MECHANICS; NPRE 247: MODELING NUCLEAR ENERGY SYSTEMS; NPRE 455: NEUTRON DIFFUSION AND TRANSPORT

Why did you want to be a Grainger Engineer?

I wanted to become an engineer because I adore physics and math, and I want to find a way to learn more while also being able to help people through scientific advancement. I chose plasma engineering because I believe that bumps in the road on the way to commercial fusion energy are the most interesting engineering challenges that currently exist in the world, and that fusion energy, if developed could help more people than almost any other form of energy. I chose Grainger to pursue this because they have one of the strongest plasma physics programs in the entire country.

What is your greatest accomplishment?

I am most proud of my continued presence on the Dean's list in semesters where I am simultaneously completing projects for EOH, presenting research at conferences, and keeping a strong professional presence in the nuclear community.

What do you want to do after you graduate?

My dream job is to work as a new-gen fusion reactor designer at a private fusion company.

MESSAGE FROM ZACH:

"It means so much to benefit from this scholarship. I often find myself working really hard and trying my best to get some sort of recognition. I admit that this is not a great reason to work hard, but it is important to me that my work is seen and appreciated. A gift like this is how I know that I am doing good work that will one day pay off by helping others."

Jenna Russell, *continued from page 5*

What is the piece of advice you give most often to graduate students?

Lean on your faculty advisors and faculty members in your research areas. They are experts in their fields of nuclear engineering and will serve as mentors now and throughout your careers and can help make connections. Challenge yourself, with coursework and in your research. With challenge comes growth.

What are your short- and long-term goals for strengthening the graduate program?

In this role, I think it's important to be a consistent and reliable resource for our students and faculty members. I hope to streamline procedures, assist with the clarification of policy that graduate students must follow, and serve as a consistent support to our students.

Are there new initiatives or ideas you're hoping to introduce to enhance the graduate student experience?

I want to spend a bit of time familiarizing myself with NPRE and its students. When you're joining a new office or organization, I think it's important to understand the culture before introducing new things! With any change, I hope to positively impact student success and satisfaction.

Outside of work, what are some of your hobbies or interests?

My hobbies consist of driving my two boys, aged 8 and 11, to their hobbies: baseball, basketball and football. When I'm not doing that, I enjoy spending time with my family and friends, cooking, gardening and reading.

2025 Awards

NPRE Department Awards, Scholarships, and Fellowships

Outstanding Academic Achievement Award to a Graduating Senior

Elijah Capps
Richard He
Olivia Hunsberger
Dimitri Kalinichenko
Riley Trendler
Ceser Zambrano

Outstanding Undergraduate Research Award

Shaffer Bauer
Joseph Specht

Rising Undergraduate Research Award

Jack Gerrity
Arnav Goyal
Bingjie (James) Liu
Riya Patel

Daniel F. Hang Outstanding Senior Design Award

First Place: **Bella Pequette, Ceser Zambrano, Kenneth Burnett** | Dry Cask Storage Design for Pebble Bed Reactor Spent Fuel

Second Place: **Harrison Brosius, Riley Trendler, Sean Mahanes** | Liquid Lithium Tritium Breeding Facility to Support the Fusion Fuel Cycle

Third Place: **Abby Kuhn, Olivia Hunsberger, Xochil Arteaga** | Design of Spent Nuclear Fuel Co-Extraction and Cesium Separation Facility

Roy Axford Scholarship

Arnav Goyal
Jack Gerrity

Blair and Jennifer Bromley Canada-U.S. Friendship Scholarship

Piper Fernau

Jeff Binder Undergraduate Scholarship

Peter Cannon
Jasper Hoffman

Barclay G. Jones Undergraduate Scholarship

Sabaliauskas Benas
Gabriel Gozdziak
Bryan Park
Jason Ponciano

Catherine Pritchard Undergraduate Scholarship

Arnav Goyal

David Neil Ruzic Undergraduate Scholarship

Adam Kim
Zachary Nordan

Felix T. Adler Fellowship

Istiaque Ahmed
Noor Ahmed
Samuel Dotson
Tahmid Omi
Thomas Posthuma
Mouna Soumahoro

George H. Miley LENR Undergraduate Scholarship

Matias Habib
Zachary Nordan

Marvin E. Wyman Memorial Scholarship

Mustafa Sayeed
Erin Paprocki

Roy A. Axford Graduate Fellowship

Sari Alkhatib

Barclay G. Jones Graduate Fellowship

Istiaque Ahmed

Nguyen Thi Cuong Graduate Fellowship

Mohammad Mustafa

NPRE Visionary Scholarships

Madeleine Allman
George Atseff
Tommi Bachta
Mallorie Durian
Piper Fernau
Kailey Frangella
Julian Gamboa
Christian Gray
Austin King
Tabitha Papastathis
Prushchotum Sureshkumar
Kellen Valancius

American Nuclear Society, University of Illinois Student Chapter Awards

Undergraduate Outstanding Service Award

Harrison Brosius
Jack Gerrity

Graduate Outstanding Service Award

Jake Mitstifer

Students' Award for Excellence in Undergraduate Teaching

Katy Huff

NPRE Staff Award

Scott Dalbey

Certificate of Distinguished Service

Nick Norman

Engineering Open House Awards

Distinguished Technology Award

2nd Place: **The Fusor**

Outstanding RSO Exhibit

3rd Place: **The Fusor**

American Nuclear Society National Recognitions

2025 ANS STUDENT CONFERENCE

Commendation for Service and Leadership 2024-2025

Riley Trendler

Community Trailblazer Award

Piper Fernau

Best Presentation in Fusion and Plasma Physics

Best Paper in Fusion and Plasma Physics

Best Presentation Overall, Undergraduate

Adam Rousseau | "Low Temperature Plasma Synthesis of Boron Nitride Films on Arbitrary Surfaces"

Best Poster in Fuel Cycles, Waste Management, and Decommissioning

Nathan Glaser, David Barnett, Joseph Specht | "Online Processing System for Molten Salt Reactors"

Best Poster in Power Reactor Operations, Safety, and Reliability

Sam McDonald, Nitika Purohit, Krystian Szeliga | "Senior Design: A Carbon-Capture Assisted Advanced Gas-cooled Reactor for U.S. Deployment"

Best Paper in Computational Methods, Artificial Intelligence, and Machine Learning

Arnav Goyal | "Computational Error Field Validation Experiments on HIDRA"

ANS SCHOLARSHIPS

Joseph Naser HFICD Undergraduate Scholarship

Emily Gillmore

Accelerator Applications Division Scholarship

Jack Gerrity

Alan F. Henry/Paul A. Greebler Memorial Scholarship

Mahmoud Eltawila

Other Scholarships and Fellowships

NUCLEAR REGULATORY COMMISSION

U.S. Nuclear Regulatory Commission University Nuclear Leadership Program

Emily Gillmore
Brett Heberer
Matthew Lotze
Grant Roche
Mia Sawkiw
Owen Strong
Michael Todorov

University of Illinois at Urbana-Champaign Nuclear Engineering Fellowship Programs

Nicholas Dailey
Jake Mitstifer
Thomas Posthuma
Galen Selligman
Oleksandr Yardas

U.S. DEPARTMENT OF ENERGY

NEUP Fellowships

Anthony Boyd
Bruce Ciccotosto
Trevor Talbot

University Nuclear Leadership Program Scholarships (2024-25)

Elijah Capps
Spencer Fargusson
Piper Fernau
Jack Gerrity
Emily Gillmore
Arnav Goyal
Dimitri Kalinichenko
Nicholas Kut

Nitika Purohit
Owen Strong
Krystian Szeliga
Ceser Zambrano

NATIONAL SCIENCE FOUNDATION

Graduate Fellowship

Brandon Kamiyama
Braden Moore

NUCLEAR NONPROLIFERATION INTERNATIONAL SAFEGUARDS

Graduate Fellowship

Jacob Fritchie

NNSF STEWARDSHIP

Science Graduate Fellowship

Sean Peyres

University of Illinois

Sloan University Center for Exemplary Mentoring Affiliates

Isaac Pedroza
Carly Romnes

SURGE Fellowship

Giovanni Diaz
Emily Greene
Nina Mihajlov
Djenan Mouna Soumahoro
Isaac Pedroza

Grainger College of Engineering Scholarships

Engineering Visionary Scholarship

Olivia Hunsberger
Samuel McDonald
Nitika Purohit
Krystian Szeliga
Riley Trendler

Harold and Ruth Hayward/ Tau Beta Pi Scholarship

Riley Trendler

Illinois Engineering Achievement Scholarship

Richard He
Olivia Hunsberger
Nicholas Kut
Nitika Purohit
Krystian Szeliga
Riley Trendler

Illinois Engineering Outstanding Scholarship

Nitika Purohit
Krystian Szeliga
Riley Trendler

Illinois Scholars Undergraduate Research Program (ISUR)

Piper Fernau

PATHWAY Engineering Scholarship

Krystian Szeliga

Philip Lazzara Memorial Scholarship

Riley Trendler

Grainger Engineering Scholarship

Riley Trendler

Robert M. Stephens Engineering Scholarship

Olivia Hunsberger
Riley Trendler

Sargent and Lundy Engineering Scholarship

Nicholas Kut
Nitika Purohit
Riley Trendler

Semiconductor Research Corporation Undergraduate Research Program (SRC URP)

Linus Ringstad

Samsung Semiconductor Technology Program

Jack Gerrity
Aaron Hackett
Nicholas Landrum
Linus Ringstad
Po-Ting (Eric) Shih

Master of Engineering in Energy Systems—Taber International Scholars

Fatima Basathia
Alexander Farrell
Jace Haas

University Honors

Dean's List

Eligible undergraduates must have achieved a GPA for a given semester that places them in the top 20 percent of their college. The following listing is for Fall 2024.

Logan Blume
Harrison Brosius
Elijah Capps
Kailey Frangella
Julian Gamboa
Michael Gaughan
Jack Gerrity
Emily Gillmore
Arnav Goyal
Richard He
Brett Heberer
Olivia Hunsberger
Pragun Jain
Ashish Kashyap
Rhys MacMillan
Loic Magnan
Sean Mahanes
Zachary Nordan
Guiseppe Paladino
Tabitha Papastathis
Nitika Purohit
Grant Roche
Mustafa Sayeed
Sean Siewert
Joseph Specht
Owen Strong
Patrick Tomasiak
Michael Todorov
Riley Trendler
Kellen Valancius
Ceser Zambrano

Chancellor's Scholars

Chancellor's Scholars are motivated, academically gifted student leaders. Students participate in honors seminars, attend Scholar Adventurers presentations, and participate in social, intellectual and cultural activities, and maintain a minimum cumulative GPA of 3.25.

Kennedy Dempsey
Kailey Frangella
Arnav Goyal
Olivia Hunsberger
Zachary Nordan
Owen Strong
Riley Trendler

James Scholars (Fall 2024-Spring 2025)

This honors program is named for the University's fourth president, Edmund J. James who believed scholarship and research are fundamental to human progress. During his presidency, from 1904-1920, he brought world-class scholars to campus, developed graduate programs, and fostered community among faculty and students. His achievements helped transform Illinois into a campus of international importance.

Aadit Bhatia
Yu-Ching Chen
Andrew Clark
Kailey Frangella
Michael Furlin
Arnav Goyal
Olivia Hunsberger
Dimitri Kalinichenko
Matthew Lotze
Jason Ponciano
Linus Ringstad
Oliver Stehlik
Mason Sterling
Pruschothum Sureshkumar
Nikhil Vishnoi
Gabriel Walton

Grainger College of Engineering Honors

Mavis Future Faculty Fellows (2024-25)

Harun Ardiansyah
Aya Hegazy
Hammad Khalid
Yifan Mao

Faculty/Staff Recognitions

Campus Award for Excellence in Graduate Student Mentoring

Rizwan Uddin

Dean's Award for Excellence in Research

Zahra Mohaghegh (Associate Professor)

Syed Bahauddin Alam (Assistant Professor)

Nuclear Energy Institute Jason Jang Award

David Miller

Alumni Recognitions

NPRE Advocate Award

The NPRE Advocate Award recognizes alumni and friends who have demonstrated their loyalty to NPRE through volunteer efforts, financial contributions, and/or other forms of advocacy.

Carolyn Tomchik

"To Carolyn Tomchik, for her devotion to NPRE and her support to the present and future students of the department."

NPRE Distinguished Alumni Award

The NPRE Distinguished Alumni Award is presented to alumni who make notable advances in the field of nuclear science, and/or lasting contributions to society in general.

Shin Chang

"To Shin Chang, for her international achievements innuclear safety and the inspiration she gives to future generations of scientists and researchers."

The Grainger College of Engineering
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

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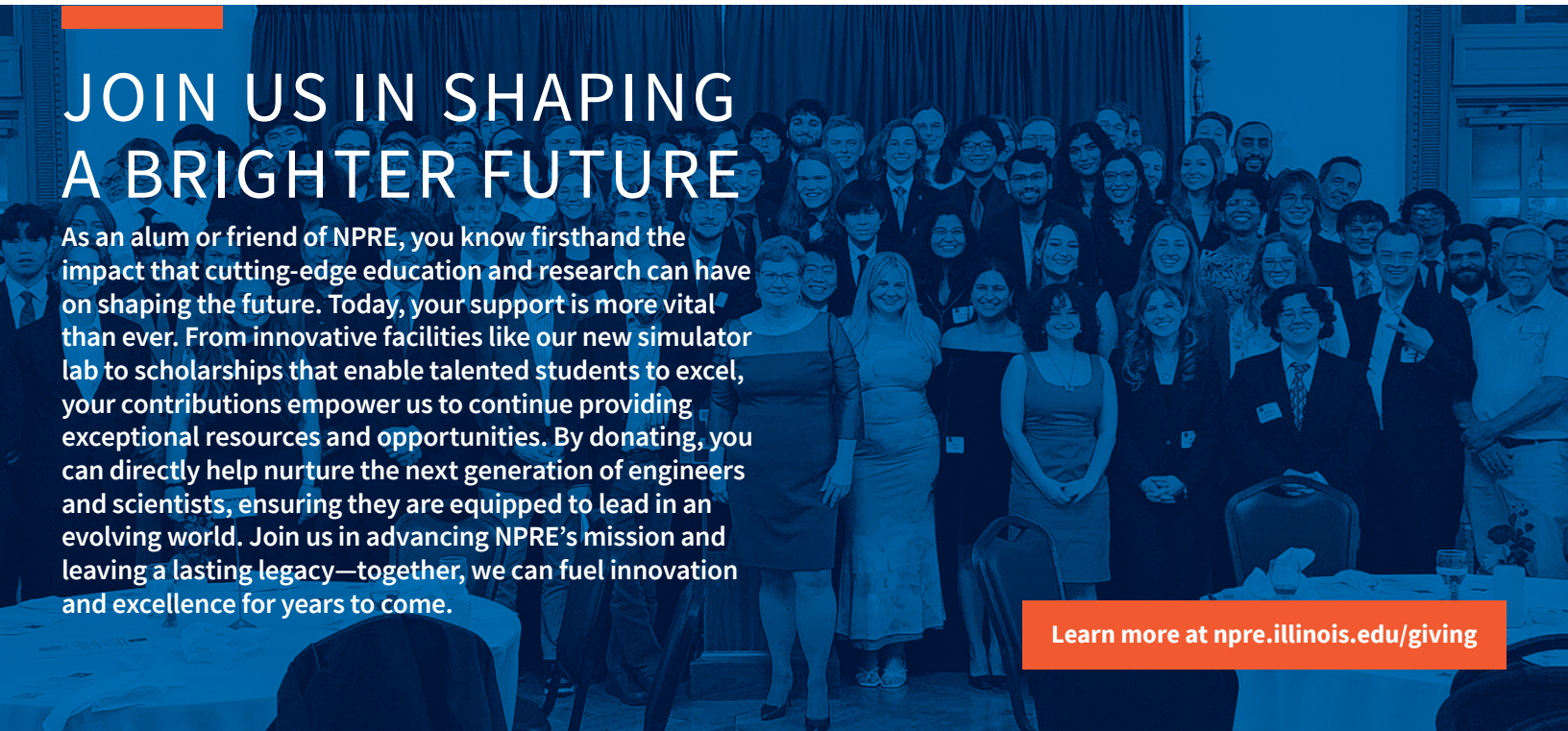
USA



JOIN US IN SHAPING A BRIGHTER FUTURE

As an alum or friend of NPRE, you know firsthand the impact that cutting-edge education and research can have on shaping the future. Today, your support is more vital than ever. From innovative facilities like our new simulator lab to scholarships that enable talented students to excel, your contributions empower us to continue providing exceptional resources and opportunities. By donating, you can directly help nurture the next generation of engineers and scientists, ensuring they are equipped to lead in an evolving world. Join us in advancing NPRE's mission and leaving a lasting legacy—together, we can fuel innovation and excellence for years to come.

Learn more at npre.illinois.edu/giving