ILLINOIS
Nuclear, Plasma & Radiological Engineering
GRAINGER COLLEGE OF ENGINEERING

FALL 2020
NEWSLETTER FOR ALUMNI & FRIENDS

NPRE: Building toward bigger and better

PAGE 5–6

DEPARTMENT OF NUCLEAR, PLASMA, AND RADIOLOGICAL ENGINEERING

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Caleb S. Brooks | associate professor

Davide Curreli | associate professor

Angela Di Fulvio | assistant professor

Brent J. Heuser | professor

Kathryn D. Huff | assistant professor

Tomasz Kozlowski | associate head, undergraduate programs | associate professor

Ling-Jian Meng | professor

Zahra Mohaghegh | associate professor

Magdi Ragheb | associate professor

David N. Ruzic | professor

Tatsuya Sakurahara | research assistant professor

R. Mohan Sankaran | assistant professor

James F. Stubbins | professor

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Despite challenges, NPRE builds on its strong foundation, toward bigger and better things

Rizwan Uddin

"Needless to say, the last six months have been challenging, but as always, NPRE has continued to progress, making great strides in our core mission."

What a year—or to be precise, six months—this has been! Needless to say, the last six months have been challenging, but as always, NPRE has continued to progress, making great strides in our core mission. The impact of the COVID-19 pandemic has been felt by the department—and the university at large—from every angle, and though we have had to adapt (through online classes, socially-distanced work in laboratories, and online classes, meetings and conferences), our students, faculty, and staff continue to accomplish great things.

Construction continues here at Talbot Laboratory. The addition will offer state-of-the-art instructional laboratory space for radiation measurements and nuclear materials (see page 5–6). NPRE's collaboration with industry has picked up even more pace. The department is in the process of beginning a new venture on the south end of campus, pushing forward with our collaboration with industry (the theme of last year's newsletter). The new *Illinois Plasma Institute*, headed up by Prof. David Ruzic, is set to become a research and development arm of selected companies, bridging an important gap in technology development (see page 5).

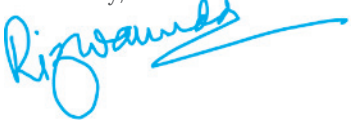
Faculty, research staff, and students have worked hard to expand the research portfolio of NPRE. Recently, our faculty and researchers have been given grants to make strides in the realms such as liquid metals, radiation detection, small-scale reactors, and corrosion response. We have added Professors Mohan Sankaran and Tatsuya Sakurahara to our faculty.

Our students, not surprisingly, have done a lot to bring pride to the department. The student chapter of the American Nuclear Society not only won the opportunity to host the 2021 national conference (now moved to 2022); these outstanding students also were winners of the 2020 Samuel Glasstone Award, given annually to the best student chapter in the nation (see page 11).

Finally, our alumni continue to show what is possible with an NPRE education. Texas A&M University Professor Yassin A. Hassan (MS '75, PhD '80) was officially named a Distinguished Alumnus of The Grainger College of Engineering. Robert F. Penn (BS '77) was named this year's NPRE Advocate honoree (see page 14).

I invite you to explore these pages and to regularly visit our website and social media to stay up to date on NPRE's forward march.

Sincerely,



Rizwan Uddin

NPRE PROFESSORS RANKED AS "EXCELLENT" BY THEIR STUDENTS

Fall 2019

Davide Curreli
Angela DiFulvio
Michael Kaminski
William Roy
Rizwan Uddin
Kathryn Huff
Becky Meline
William Roy
David Ruzic

Spring 2020

Caleb Brooks
Brent Heuser

Contents

Dalbey joins NPRE as facilities manager

Scott Dalbey serves as the facility operations coordinator responsible for ensuring that day-to-day operations within Talbot Laboratory and the Nuclear Radiation Laboratory buildings run smoothly. Dalbey also oversees portions of the building safety and emergency evacuation plans. He previously worked for the Illinois Sustainable Technology Center, until his home-inspection business took off. After a lengthy hiatus where he solely ran his personal business, Dalbey returned to the University of Illinois.

For more on Dalbey, go to npre.illinois.edu/dalbey-gatekeeper.

Stramaski hired as Graduate Programs Specialist

Kristie Stramaski joined NPRE this summer as its new Graduate Programs Specialist and Academic Advisor.

She has a Master's degree in Higher Education from Florida State University and a Bachelor's in English from Clemson University in Clemson, S.C. After receiving her Master's, she advised graduate students at Texas A&M University for over a decade. Prior to accepting the position at NPRE, she had been working with kindergarten students at a charter school that served students with primarily low socioeconomic status. "I know now, more than ever, academic advising and providing high-quality student services are my passions," she said.

Illinois Plasma Institute gets off the ground with seven-figure industry investment

The Illinois Plasma Institute (IPI) has secured a second research partnership, this time with Tokyo Electron Limited (TEL), an electronics and semiconductor company headquartered in Tokyo, Japan.

TEL is one of the three companies worldwide that make etching and deposition equipment for the semiconductor industry. The research contract with IPI is worth $2.055 million over five years.

"IPI is designed to do translational research," said David Ruzic, IPI director and NPRE professor. "That means taking our technologies and actually getting them into their products. They are sending a piece of state-of-the-art equipment here worth nearly $1M and their own employees, who are getting their Master's of Engineering in Plasma Engineering at the same time. They signed an agreement for five years, but hope to extend it beyond that, too."

The research agreement follows the announcement in March of IPI's first research partner, Japanese microprocessing technology developer Tokyo Ohka Kogyo Co., Ltd. (TOK). TOK's investment of $1.75 million over five years at the University of Illinois at Urbana-Champaign will provide for two graduate students. In addition, full-time TOK scientists will work in IPI. Since then, IPI's building in the University of Illinois's Research Park has been renovated and work has begun with TOK in the space.

TOK works with photolithography in producing photo resist chemical solutions that clean microchips after they have undergone plasma etching. Plasma etching processing techniques now use extreme ultraviolet lithography (EUV) to fabricate integrated circuits. As EUV techniques change and improve, photo resist solutions must change, as well.

"We have experience with EUV sources and light; (TOK) will work with us to develop better EUV photo resist," Ruzic said.

Ruzic also said more building improvements will start soon to prepare IPI for TEL's equipment.

"Tokyo Electron is a key partner for us, since they make state-of-the-art etching and deposition tools," Ruzic said. "They have joined the Illinois Plasma Institute to see if Illinois technology can make a direct impact on their products. I am excited to welcome them and very excited for our students who will get opportunities to witness technology transfer firsthand and gain valuable industry-related experience, right here on campus."

Mohan Sankaran joins NPRE faculty

Despite his background in chemical engineering, Prof. Mohan Sankaran was drawn to the Nuclear, Plasma, and Radiological Engineering (NPRE) program at the University of Illinois Urbana-Champaign (UIUC). He is the latest addition to the NPRE faculty and is settling into his new position at Illinois as a Donald Biggar Willett Professor in Engineering.

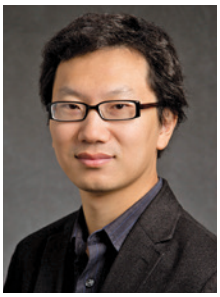
"The transition has been very smooth and successful, especially in light of the current situation," Sankaran said. "While it has been different and maybe not that way one would like with not being able to see people in person, I have received all the help I need through virtual channels."

He is looking forward to working with other faculty on developing research breakthroughs in plasma technology.

"UIUC is such a large community and there is so much going on," he said. "The interactions with colleagues across the university promise to catalyze my research forward in new directions. Similarly, teaching will allow me to interact with students, and hopefully even recruit some to my group."

Sankaran earned his B.S. degree in chemical engineering from UCLA and his Ph.D. in chemical engineering from the California Institute of Technology. He then joined the Department of Chemical and Biomolecular Engineering at Case Western Reserve University (CWRU) in Cleveland, Ohio in January 2005 as a tenure-track assistant professor. He rose through the ranks there and before he made the decision to move to UIUC, he was the Goodrich Professor of Engineering Innovation.

YZ to become Associate Head of Graduate Programs



Associate professor Yang Zhang (YZ) has served in many roles since joining the Department of Nuclear, Plasma, and Radiological Engineering at the University of Illinois in 2012. Now, he can add another to the list.

YZ was recently named the department's new Associate Head for Graduate Programs. The position had been vacant since former Associate Head Prof. Jean Paul Allain left in 2019 to direct the Nuclear Engineering department at Penn State University.

"[YZ] has shown the ideas, initiative, drive and skills for leadership positions, including his position at Beckman Institute," NPRE department head Rizwan Uddin said. "NPRE is fortunate to have him as Associate Head for Graduate Programs and DGS."

YZ started at the U of I as an assistant professor in 2012 and was promoted to associate professor in 2018. He recently received the Dean's Award for Excellence in Research from the Grainger College of Engineering and has been named a Donald Biggar Willett Faculty Scholar.

"I am absolutely thrilled to have this opportunity to serve NPRE, with the help and support from each one of you," YZ said. "Together, starting from small steps, we can make our grad program even more compelling. This is my home. This is our home."

Mohaghegh, Brooks promoted

Entering this fall semester, NPRE faculty members Zahra Mohaghegh and Caleb Brooks have been promoted to associate professors.

Mohaghegh is the Director of the of the Socio-Technical Risk Analysis (SoTeRiA) Research Laboratory and Industry Affiliates Program (IAP) in The Grainger College of Engineering, where she and her research team focus on the advancement of Probabilistic Risk Assessment (PRA) for complex technological systems.

"For me, being the first woman to attain a tenured professorship in our department is not only a goal achieved, but also a step in the right direction for women," Mohaghegh said. "My greatest accomplishment, however, is that I have been able to establish Probabilistic Risk Assessment (PRA) research and education in NPRE. Although building a new area comes with challenges, this path gives NPRE students the highly competitive science and skillsets essential to meet the growing demand for risk analysts in nuclear engineering.

"I am grateful for having been trained by professors who are pioneers of PRA and for the opportunity to train the next generation of PRA leaders at Illinois. I believe that the collaborative research environment at the University of Illinois has given me the opportunity to advance risk science and to make the University of Illinois a global leader in PRA and socio-technical risk analysis."

Mohaghegh joined NPRE in 2013. She received her PhD from the University of Maryland at College Park.

Brooks joined the NPRE faculty in 2014 as an assistant professor after receiving his PhD from Purdue University.

"I am excited to be able to continue working with such gifted faculty, staff, and students in NPRE," Brooks said.

CONSTRUCTION ALL AROUND TALBOT!

Talbot Laboratory has been in the middle of a construction frenzy over the past year. One of the projects, an addition to Talbot's southside, will offer NPRE students state-of-the-art instructional laboratories in radiation measurements and nuclear materials.

New classrooms for NPRE students and other majors in The Grainger College of Engineering will be available in the 122,000-square-foot Campus Instructional Facility being built just south of Talbot. And, to the east of Talbot, on the John Bardeen Quad, campus researchers are installing a geothermal monitoring well.

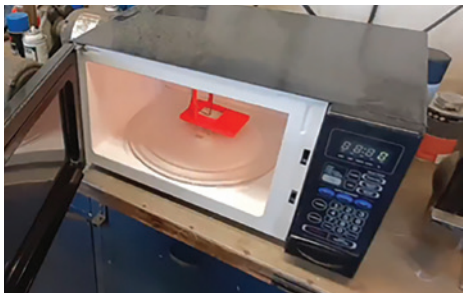
NPRE's two new laboratories will be housed on the first floor of Talbot's 3-story addition. NPRE will gain about 2,100 square feet of space, including the two laboratories and a few smaller rooms. *For more on Talbot's addition, go to* ***npre.illinois.edu/talbot-laboratory-expansion***.

A team is constructing a 450-foot-deep borehole for the geothermal monitoring well project. The cavity will contain a fiber optic cable that will be connected to a distributed temperature system to detect changes in the Earth's thermal profile. *For more on this, go to* ***go.npre.illinois.edu/geothermal_monitoring_well***.

Ruzic-led group develops simple N95 Respirator mask decontamination technology with microwave oven plasmas

In the early days of the pandemic, hospitals faced a shortage of personal protective equipment (PPE), especially N95 respirator masks. As COVID-19 cases rebound across the nation and we face another potential shortage, the question of how to decontaminate N95 respirator masks remains. Fortunately, a team led by NPRE professor David Ruzic has proven results of a solution that could be used to decontaminate respirator masks using a microwave oven, funded by a $30,000 grant from the Jump ARCHES endowment. Jump Applied Research in Community Health through Engineering and Simulation (ARCHES) is a partnership between Jump Simulation and Education Center at OSF HealthCare and the Health Care Engineering Systems Center in The Grainger College of Engineering.

Professor Ruzic's strategy consists of creating a plasma inside the microwave oven using common household supplies including ceramic coffee cups, wire, hydrogen peroxide, and saline solution. The combination of these materials allows for creation of an intense plasma, which can decontaminate the mask within approximately 30 seconds.



"This technology would enable hospitals, nursing homes, and first responders to use a microwave oven to decontaminate masks with materials they already have on hand," Ruzic said. "We have shown that 30 seconds of plasma exposure is sufficient to kill viruses and have submitted our findings to the CDC's Journal of Emerging Infectious Diseases. We have also sent treated masks to the CDC for testing and passed their filtration and fit standards, even after three cycles of decontamination."

For the full story, go to ***npre.illinois.edu/news/ruzic-mask-microwave***.

U of I researchers receive grant to lead new liquid metal project

The University of Illinois at Urbana-Champaign, led by NPRE research assistant professor Daniel Andruczyk, is part of a group tasked with advancing plasma science in a direction that has not been attempted before.

A three-year grant from the Office of Fusion Energy Sciences will fund the initiative, with the goal of creating a working liquid metal divertor for a fusion reactor.

"We know a lot about liquid lithium, but there's still a lot we don't know," Andruczyk said. "It's still a pretty open field. It's great that it's been recognized that if fusion reactors are going to happen, then we need to go down this path of using liquid metals."

Inside fusion reactors, there can be large heat fluctuations and instabilities. The divertor basically acts as an exhaust element of the reactor, removing impurities and waste products in the fusion process. The University's team will coordinate with the Princeton Plasma Physics Laboratory and Oak Ridge National laboratory on the project.

Other institutions, such as the University of California, Los Angeles, will be subcontracted to perform different tasks, but the three main institutions will head the project.

Princeton and Oak Ridge will be leading the design phase, and University researchers, led by Andruczyk, will be running the testing. The total funding for the grant is $3 million, with the University of Illinois receiving $750,000.

Andruczyk said that in this project, "the University is at the same level as two national labs. That speaks volumes for the University and the group. We've got the people and expertise to do this."

For the full story, go to ***npre.illinois.edu/news/liquid-metal-grant***.

Catching nuclear smugglers: fast algorithm could enable cost-effective detectors at borders

A new algorithm could enable faster, cheaper detection of weapons-grade nuclear materials at borders, quickly differentiating between benign and illicit radiation signatures in the same cargo. The development is a collaboration among researchers at the University of Illinois at Urbana-Champaign, the University of Michigan, Los Alamos National Laboratory, Heriot-Watt University (Edinburgh, UK), and the University of Edinburgh.

The growing terrorism threat based on the use of special nuclear materials–highly enriched uranium, weapons-grade plutonium, or materials that produce a lot of radiation–has reinforced the need for improved population protection mechanisms. Nuclear security aims to deter and detect the smuggling of these materials across national borders.

"We hope that the findings will be helpful in reducing the false positive alarms at radiation portal monitors, even in scenarios with multiple sources present, and enable the use of cost effective detectors, such as organic scintillators," said Angela Di Fulvio, an assistant professor in the University's Nuclear, Plasma, and Radiological Engineering department and corresponding author of the study recently published in Scientific Reports.

The researchers developed an algorithm capable of identifying weak radiation signals, such as might be seen from plutonium encased materials that absorb radiation. It works even in the presence of a high radiation background, including everyday sources such as cosmic rays from space and radon from the rock underfoot.

Based on their results, they believe the use of their algorithm could improve the ability of radiation portal monitors at national borders to tell the difference between potential smuggling activity and benign radiation sources.

Read the full story here at ***npre.illinois.edu/news/36509***.

NPRE researchers receive over $1 million in DOE grants

At the University of Illinois Urbana-Champaign, nuclear energy researchers are finding ways to take fuel and energy production into the future. Strong social, political, and scientific support to move away from fossil-fuel consumption has resulted in a new vision for next-generation nuclear energy sources. Toward this vision, two grants have been awarded to NPRE researchers by the Department of Energy, totaling over $1.5 million.

Small-scale nuclear reactors can provide a viable solution to decarbonizing energy generation, but appropriate markets must be identified to propel large-scale production of these reactor systems. That is the focus of one NPRE-led project that has received a grant by the U.S. Department of Energy.

Associate professor Caleb Brooks is the principal investigator on the two-year project "Evaluation of micro-reactor requirements and performance in an existing well-characterized micro-grid," which was awarded $800,000, with professors Kathryn Huff and Tomasz Kozlowski collaborating.

The objective of the proposed work is to quantify the opportunities and challenges of operating micro-reactors

in established micro-grids with diverse power generation sources. To this end, this project will develop the analysis capability for a diverse range of applications using software tools developed within Idaho National Laboratory's Hybrid Energy System (HES) group.

The second project is being led by Professor Brent Heuser, in collaboration with researchers from Oak Ridge National Laboratory and Westinghouse Electric Corp.

The primary objective of the proposed research project is to study the effect of surface microstructure, mechanical stress factors, and dpa (displacement per atom) damage on the corrosion response of stainless steel under two different alkaline PWR primary water alkalinizing agent chemistry conditions. We will investigate mechanical stress factors such as strain rate, residual stress, deformation induced persistent slip bands (PSBs), dpa damage, and fatigue cracks.

For the full story, go to ***npre.illinois.edu/news/neup-2020***.

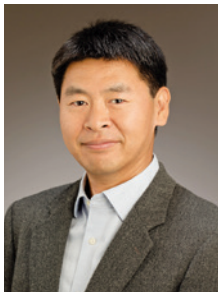
Meng extends imaging technique and device development for brain cancer therapy to include mapping for Alzheimer's disease

NPRE Prof. Ling-Jian Meng and his group are extending functional X-ray imaging techniques they developed for mapping trace metals in living animals to allow for 3-D imaging of iron, copper, and zinc in brain tissues of mice carrying Alzheimer's disease.

The National Institutes of Health awarded Meng and his collaborators a $2M grant in 2018 to develop X-ray Fluorescence Emission Tomography (XFET) imaging techniques to map metal-based compounds used to enhance radiation therapy in brain cancer treatment. The system was designed to achieve dramatically improved sensitivity to a broad range of metal elements such as gold, palladium and hafnium that emit fluorescence X-rays. Nanoparticles containing those metals are thought to aid cancer therapy by enhancing cancer-specific X-ray absorption and by generating radio-dynamic effects to target cancer cells.

Now, with additional NIH support of about $700K, the scientists are modifying the XFET system to allow imaging of lighter metals—iron, copper and zinc—known to be important in the pathobiology of Alzheimer's disease.

Many common neurodegenerative diseases, including Alzheimer's, involve the misfolding and aggregation of a naturally occurring protein that eventually leads to progressive neuron deterioration. Unusual concentrations and distributions in the brain of naturally occurring iron, copper, and zinc are associated with Alzheimer's, Parkinson's disease, amyotrophic lateral sclerosis (ALS), prion diseases, and Huntington's disease.



However, the precise roles of metals in the disease progression are largely unknown. Metals such as iron and copper are capable of forming reactive oxygen species that can damage proteins, DNA, and lipids through oxidative modification.

Meng and his group will develop a novel X-ray fluorescence emission tomography (PXFET) technique in which polarized X-rays are generated to excite target metals in the object. A geometrically optimized emission tomography system will be designed to collect the fluorescence X-ray signals. This technique potentially can offer a much lowered detection limit for trace metals when compared to the current benchtop XFET techniques.

Go here for the full story: ***npre.illinois.edu/news/34807***.

SoTeRiA Lab conducts research with International Atomic Energy Agency (IAEA) for Risk-Informed Analysis of Advanced Reactors

The Socio-Technical Risk Analysis (SoTeRiA) Research Laboratory in the Department of Nuclear, Plasma and Radiological Engineering (NPRE) at the University of Illinois Urbana-Champaign is developing Probabilistic Risk Assessment (PRA) technologies for advanced reactors with the International Atomic Energy Agency (IAEA) under the Coordinated Research Project (CRP) award I31030, "Methodology for Assessing Pipe Failure Rates in Advanced Water Cooled Reactors." This research is also partially supported by the U.S. Department of Energy, Office of Nuclear Energy University Program (NEUP), Reactor Concepts Research Development and Demonstration (RCRD&D) under Award #17-12614.

This IAEA project brings together experts from academia, industry, and regulatory agencies from eight countries, including Canada, Germany, Korea, Lithuania, Malaysia, Russia, Tunisia, and the United States. In summer 2020, Associate Professor Zahra Mohaghegh, who serves as a Chief Scientific Investigator and representative of the United States in this IAEA project, and Research Assistant Professor Tatsuya Sakurahara attended the third Research Coordinated Meeting (RCM) for this CRP. Other SoTeRiA members supporting this IAEA study include: Graduate students Wen-Chi Cheng and John Beal; Research Associate Ernie Kee and Research Scientist Seyed Reihani.

The successful deployment of a new fleet of advanced reactors requires innovative techniques to estimate safety and risk metrics with consideration of uncertainties induced by new designs and lack of operational data. In this IAEA project, the SoTeRiA Research Laboratory developed an Integrated Probabilistic Physics-of-Failure (I-PPoF) methodological framework to couple the physical degradation phenomena with models of maintenance work processes (e.g., in-service inspection, leak monitoring systems, and repair and replacement).

For the full story, go here: ***npre.illinois.edu/news/37063***.

NPRE lab introduces the use of RadResponder in the classroom

NPRE Laboratory (NPRE 451) is a course that introduces students to radiation detection techniques through a series of different hands-on laboratories. After getting familiar with state-of-the-art radiation detection systems, at the end of the semester, students get to design and perform a small-scale experiment of their choice, in an "open lab." They present the results to the class and are evaluated by instructors and peers on a final report and presentation.

During the Fall 2019 semester, the *open lab* main theme was the characterization of the radioactive fingerprint of the UIUC campus. Students explored and tested different methods to characterize the campus's baseline radioactivity, which would serve as a reference in case of an unexpected event.

Accurately recording large amount of detection data and keeping track at the same time of other important information—such as the sampling location—can be challenging, so RadResponder seemed to be an excellent tool to support this effort. RadResponder is the national standard and Whole Community solution for the management of radiological data. It is a product of collaboration between Federal Emergency Management Agency (FEMA), Department of Energy (DOE)/ National Nuclear Security Administration (NNSA), and the Environmental Protection Agency (EPA).

NPRE Lab, taught by assistant professor Angela Di Fulvio, introduced the use of RadResponder in the classroom for the first time. The groups of students took three different approaches to characterize the UIUC campus's radioactive fingerprint. "The primary goal of our experiment was to test soil and milk samples for radioactive nuclides," student Andrew Fink said. "This included local areas such as farmland and riverbeds, as well as further regions for comparison. These tests could highlight regions with higher background radiation or more naturally occurring radiation."

Go here for the full story: ***npre.illinois.edu/news/radresponder***.

Curreli, Zhang named Willett Faculty Scholars

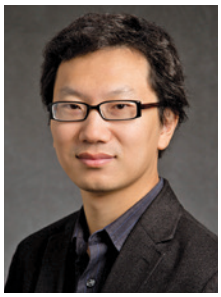
NPRE associate professors Davide Curreli and Yang "YZ" Zhang were both recently named Donald Biggar Willett Faculty Scholars.

This recognition is targeted for faculty members who are excelling in their contributions to the University of Illinois, in addition to excellence in research, teaching, and professional service.

"NPRE has been extremely fortunate to have some of the brightest young and mid-career faculty members in the GCoE, as well as among the nuclear departments around the country," department head Rizwan Uddin said.

On a broader scale, the Willett Research Initiatives in Engineering funds professorships, undergraduate and graduate student research, and related research activity. It honors the memory of Donald Biggar Willett (1897–1981), who attended the University of Illinois from 1916-1921.

Curreli has been at the University since 2012, when he came as a postdoctoral researcher from his native Italy. He began as an assistant professor at 2013 and was promoted to associate professor in 2019.



YZ also started at the U of I in 2012, after serving as a Clifford G. Shull Fellow at Oak Ridge National Laboratory in Tennessee. He was an assistant professor before being promoted to associate professor in 2018. He was also recently given the Dean's Award for Excellence in Research by the Grainger College of Engineering.

For the full story, go to ***npre.illinois.edu/news/curreli-yz-scholars***.

"NPRE has been extremely fortunate to have some of the brightest young and mid-career faculty members in the GCoE."

—Rizwan Uddin, Department Head

ANS wins bid to host national conference in 2022

Last year, the American Nuclear Society (ANS) Chapter at the University of Illinois at Urbana-Champaign won the bid to host the next ANS Student Conference in Spring 2022! The conference theme is "Saving the World One Atom at a Time."

"This theme reflects the important role the nuclear sciences will play in solving many of the world's grand challenges," said NPRE graduate student Nate Reid, one of the conference organizers.

"It also recognizes the atomic contributions we all make every day," he continued. "Together, these contributions form the foundations of solutions to these grand challenges. It celebrates the people that make science possible by acknowledging that we come to this conference from an infinitude of backgrounds and experiences. It encourages us to widen our circles and include scientists and engineers with a diversity of thoughts. Finally, it inspires us to be active participants in the solutions to the world's problems."

Reid and co-organizers, NPRE students Sam Dotson and Jeremy Mettler, learned of the Illinois chapter's selection on November 19 during ANS President Marilyn Kray's Special Session at the 2019 ANS Winter Meeting held in Washington, D.C.

"We all participated in several of the national ANS committee and division meetings, as well as the technical components of the conference," Reid said. "The three of us were awarded this designation for the work that we put into writing a bid for

Illinois to host the conference while highlighting the benefits of having the conference at our university. Our bid was selected by the Student Sections Committee of the national ANS organization to have the strongest proposal for hosting the conference out of all of the ANS student sections in the U.S. to submit."

The ANS Student Conference is a national meeting at which students can showcase the work they have done towards the ANS vision of advancing and promoting nuclear science and technology. Students' work from undergraduate and graduate research, senior design projects, and summer internships is presented and peer-reviewed at the end of the conference.

For the full story, go to ***npre.illinois.edu/news/34885***.

ANS student chapter named best in the nation again

In addition to earning the right host 2022's student conference, the University of Illinois's American Nuclear Society was named this year's winner of the Glasstone Award, given annually to the best student section. "In my humble opinion, the UIUC ANS chapter is the most active ANS student section in the nation," NPRE assistant professor Katy Huff, the chapter's faculty advisor, said. "Their 2020 Glasstone Award for Best Section confirms that the national American Nuclear Society Student Sections Committee agrees. Though dozens of student sections compete annually for this honor, UIUC has been recognized as Best Section twice in five years and, in the intervening time, has been consistently honored as a runner up or honorable mention.

"These accolades acknowledge the vibrant members, enthusiastic leaders, and their non-stop calendar of outreach and professional activities. This year's Glasstone award reflects the dedication and unparalleled energy in our student section's many activities including professional engagement, contributions to the national organization, professional development, community service, and outreach. As their faculty advisor, I couldn't be more proud."

YZ receives Dean's Award

Yang Zhang (YZ), an associate professor in the Department of Nuclear, Plasma, and Radiological Engineering, was awarded with the 2020 Dean's Award for Excellence in Research.

The award recognizes YZ's last five years of research accomplishments and publications. Since the award's inception in 1982, YZ is the fourth NPRE recipient, following J.P. Allain (2017), Zahra Mohaghegh (2013), and David Ruzic (1990).

"Centering around non-equilibrium physics, the research carried out by my amazing students and postdocs is best summarized by three words: molecules, materials, and machines," YZ said. "Our vision is to understand the emerging laws of nature at the molecular and electronic level, then create materials with desired properties, and lastly build intelligent machines out of these new materials."

His other recent awards include being named a Donald Biggar Willett Faculty Scholar this year and winning the Landis Young Member Engineering Achievement Award from the American Nuclear Society in 2017.

For more information on his work, check out his group website: ***z.engineering.illinois.edu/index.html***

Ruzic wins Gaede-Langmuir Award

NPRE Professor David Ruzic has received the prestigious Gaede-Langmuir Award from the American Vacuum Society (AVS).

The award is given every two years to recognize and encourage outstanding discoveries and inventions in the sciences and technologies of interest to AVS. According to AVS, the award consists of a cash award, a plaque setting forth the reasons for the award, and an honorary lectureship at a regular session of the International Symposium.

"I am so honored to receive this award," Ruzic said. "I have attended every AVS meeting since 1981 when I was in graduate school. Each year there is one award at this level, and I always try to attend the invited talk the winner gives. It is hard to believe that I will be the one giving it this year!"

AVS supports networking among academic, industrial, government, and consulting professionals involved in a variety of disciplines—chemistry, physics, biology, mathematics, all engineering disciplines, business, sales, etc.—through common interests related to the basic science, technology development, and commercialization of materials, interfaces, and processing area.

Award-winning Meline believes in "being real with students"

The awards rack up, but for Becky Meline, the students are what matters. Meline is a recipient of the 2020 Dean's Award for Excellence in Academic Advising. This award is given to two people annually to recognize their sustained excellence in undergraduate advising. She works as the Coordinator of Academic Programs in NPRE and also coordinates and co-instructs NPRE 100—an orientation course—and NPRE 199, a series of seminars to help students get more involved in

When asked about her typical daily activities, she said, "There is no typical day. In general, my situation is unique in that I advise both undergraduate and graduate students. A typical day can go from advising an undergrad on course selection to advising a graduate student on their dissertation to hosting a meeting to going over degree audits for seniors to make sure they graduate."

Meline is passionate about connecting her students to opportunities. She also believes that being honest with her students and telling them what they need to hear is critical to their success.

"I believe in being real with students," she said. "I am a very transparent individual. I believe that the students appreciate that and it makes me very approachable. One of the advantages that I have is that I have been with the department for a very long time. I am familiar with what we do, but also with the alumni."

She is also this year's recipient of the 2020 Engineering Council Outstanding Advising Award. Despite the many different responsibilities of the job and the challenges of advising, Meline feels that what she does is incredibly rewarding

"Being an advisor in a smaller department, I work with all the students and see them graduate from the program," she said. "What is very rewarding is when you realize you had an impact on someone's life. You helped them get into grad school, med school, first job, research position with faculty."

For the full story, go to ***npre.illinois.edu/news/becky-2020-awards***.

Taber Scholars

Created by Illinois alumnus Brad Radl, BS '80, the President and Chief Technology Officer of Taber International, the Taber International, LLC Scholarship is used to support graduate students in the Master of Engineering in Energy Systems Program in the Department of Nuclear, Plasma, and Radiological Engineering. Three students received the scholarship this year.

"Preserving the environment is absolutely vital, and I'd like to use my time, talents, and efforts throughout my career to play a role in doing that," graduate student **Sara Pattison** said. "I have always been interested in renewable energy and how technology continues to evolve and improve over my own lifetime."

This drive to protect the environment ultimately led Pattison to the Master of Engineering in Energy Systems program. With a desire to play an integral part in the development of newer, cleaner means of powering homes, she feels that this degree will serve her well in her future career.

"I chose to study energy systems because I want to help contribute to its overall promotion and success," Pattison said. "With this degree, I am trying to learn more about the energy industry. I'd like to gather as much information and experience as possible, and the University of Illinois is a great network of resources and opportunities to do just that."

During his studies, **Erwin Lavric** developed a passion for renewable and sustainable energy systems. His love for nature and the outdoors has evolved into a deep desire to protect the environment. Last year, Lavric had the opportunity to travel to Uganda with a team of engineers where he experienced firsthand some of the challenges that come with poverty. Clean water and energy—considered by many to be a right—are luxuries in certain parts of the world. Lavric and his team were tasked with collecting water samples, interviewing locals, and working on design improvements to the energy, water and sanitation systems there. Additionally, energy source and sustainable design coursework has given Lavric a deeper insight on how to tackle the challenges our society is currently facing.

"With this degree, I hope to prepare myself for a career in working with solar energy," Lavric said.

Lavric hopes to channel his passions and skills into a career that allows him to create a major impact in energy systems. By combining his background in civil engineering principles and his love for clean energy, he hopes to reduce the carbon footprint and play a part in facilitating the transition to more renewable energy sources. He intends to work as a project or development engineer working on renewable energy projects.

With passions for both environmental sustainability and science, graduate student **Sarah Gaither** was drawn to the Master of Engineering in Energy Systems program. She felt that Energy Systems was a field in which she could make a positive impact on the world. According to Gaither, "The EPA reports that over a quarter of greenhouse gas emissions in the US come from the generation of electricity. Given there are already proven cleaner technologies in this field, it is a great place to start to mitigate the negative impacts of climate change."

"My passion for Energy Systems comes from the role energy has in our society. The current discussions on climate change and renewable energy make it a dynamic field involving many differing and exciting fields such as policy, engineering, business, and many more," Gaither said.

Gaither has aspirations to use her skillset to facilitate the transition to more sustainable energy sources. She is currently pursuing a Master of Engineering in Energy Systems with a joint-degree MBA.

"With a focus on energy markets as well as a joint-degree MBA, I hope to combine my business and engineering knowledge to be a part of the sustainable energy transition," she said. "I believe this will require a transformation of the grid and utility business model that we know today. The introduction of distributed generation, energy storage, and electric vehicles are disruptors of the current electrical system. These new technologies give more power to consumers which requires suppliers to develop new services to maintain their bottom line. Developing these new products requires interdisciplinary knowledge, which I plan to provide."

MEng in Plasma Engineering grows as one-of-a-kind program

All of the processes which make semiconductor chips involve plasmas: etching, deposition and now lithography due to the introduction of EUV in high-volume manufacturing. Plasma Engineering is a Master of Engineering (M.Eng.) degree that prepares graduates to drive innovation and become leaders in these areas. Knowledge and experience in using and understanding plasmas is vital, but largely missing from the education of the professionals currently in the field. Finding solutions to current and future processing challenges requires a mastery of the core concepts of plasma engineering as well as topical depth in a professional focus area. This professionally-oriented Master's degree helps students to develop this expertise and gain hands-on experience with a practicum or a project.

"Our goal is to give students who don't necessarily want a PhD but still want that higher degree. This Master's program gives them a foothold into the industry they're interested in."

The Master of Engineering in Engineering with a concentration in Plasma Engineering is a one-of-a-kind program, housed in the Department of Nuclear, Plasma & Radiological Engineering. NPRE is one of the leading departments in plasma science, engineering and technology, with several world-renowned faculty members and their respective laboratories.

The program had its first graduate in May 2020, and this fall, the program has grown to six students. "My ultimate goal is to have 15 to 20 students in it every year," said program director Daniel Andrucyzk, an NPRE research assistant professor. "Our goal is to give students who don't necessarily want a PhD but still want that higher degree. This Master's program gives them a foothold into the industry they're interested in."

This non-thesis, 32 credit hour M.Eng. program provides an in-depth education in plasma processing, plasma technology and plasma science. This Master's degree in Plasma Engineering is specifically designed for students looking to enter industry upon graduation. The detailed curriculum, real-world experience, and laboratory experiences provided by this program equip graduates with the knowledge to utilize, understand and innovate plasma-related applications delivering highly marketable skills that are in demand by employers across various industries.

Robert Penn named 2020 NPRE Advocate Award winner

Dear Colleagues,

What an honor to be named for the 2020 NPRE Advocate! When I think of my NPRE experience, I smile with gratitude of being in such a wonderful, fulfilling, and knowledgeable group. As an undergraduate, my Professors included Professor Felix T. Adler, Bernie Wehing, George Miley, Dan Hang, A.B. Chilton, Finis Southworth, Barkley Jones, Philip Hopke, Department Chair Dr. Marv Wyman. My undergraduate colleagues were a small group—tough and very smart. We were a small undergraduate group competing in advanced classes with graduate students, as we were the first Nuclear Engineering undergraduate class. We were ranked third or fourth at the time in Engineering, along with Stanford, MIT, and Wisconsin. And after graduation, for the first three and more years in the workforce, I found my NPRE education had me head-and-shoulders smarter and more prepared than most MS and PhD engineers from other Universities.

"I found my NPRE [under-graduate] education had me head-and-shoulders smarter and more prepared than most MS and PhD engineers from other Universities."

My 40+ years in Nuclear are a testament to the education, agility, strength, perseverance and the "let's go figure it out" mentality that we learned at NPRE. My parents taught me to "see the assignment to completion." Today, I continue with my silent smile with thanks to my parents, the University and to NPRE for making me a much better person and a better educator in so many ways.

I am elated at being named with this honor. The letter arrived December 2019 from Professor Rizwan Uddin and Susan Mumm, naming me as selected for this honor. Then and now, there is no measure as to how truly honored my family, my friends, and I are to be named as 2020 NPRE Advocate. May I continue to do more for Professor Uddin and NPRE. And congratulations to my Professors, for guiding and providing me the fortitude to be a small part of this future.

2019–20 NPRE Awards

NPRE Advocate Award
Robert F. Penn

Outstanding Academic Achievement Award for a Graduating Senior
Heyuan Huang, Dario G. Panici, Dean R. Price

Outstanding Undergraduate Research Award
Jonathan A. Beal

Roy Axford Undergrad Scholarship
Anthony C. Evans, Anthony G. Leja, Andrew H. Liu

NPRE Visionary Scholarships
Thomas C. Brautigam, Andrew J. Ernat, Amber H. Hunter, Michael R. Hysick, Tony Kajic

Marvin Wyman Memorial Scholarship
Joshua M. Hoffman, Armando U. Lopez, Rosendo Martinez, Joseph A. Solar

Daniel Hang Outstanding Senior Design Award
Kaitlyn R. Butler, Alp Aktuna, Dario G. Panici, Andrew Fink

Felix Adler Fellowship
Yongseok Lee, Can Yang, Shao-Chun Lee

Nguyen Thi Cuong Graduate Fellowship
Moutaz Elias

Taber International Scholars
Sara J. Pattison, Erwin Lavric, Sarah N. Gaither

ANS Undergraduate Outstanding Service Award
Kaitlyn R. Butler, Alexandra T. Fanning

ANS Graduate Outstanding Service Award
Samuel G. Dotson

ANS Students' Award for Excellence in Undergraduate Teaching
Caleb Brooks

ANS NPRE Staff Award
Hannah E. Stites

Nuclear Regulatory Commission University of Illinois at Urbana-Champaign Nuclear Engineering Scholarship and Fellowship Program (Scholarships)
Anna C. Balla, Jonathan A. Beal, Andrew E. Christensen, Lauren N. Ditmars, Alexandra T. Fanning, Jordan C. Heidrick, Isabella M. Iaccino, Daniel In, August S. Kasten, Kip L. Kleimenhagen, Matthew Kozak, Matthew J. Koziol, Franklin McDonald, Dean R. Price, Julia K. Roessler, Anthony R. Ruzzo, James G. Shehee, Muzammil A. Siddiqui, Erik R. Smith, Shyam M.J. Upadhyay, Edward Vaughn

Nuclear Regulatory Commission University of Illinois at Urbana-Champaign Nuclear Engineering Scholarship and Fellowship Program (Fellowships)
Dominic R. Piedmont, Joesph L. Bottini, Katherine C. Hepler, Samuel G. Dotson, Zoe R. Richter, Natalie C. Gaughan, Logan Crevelt

U.S. Department of Energy Nuclear Energy University Program NEUP Scholars/Fellows
Mikayla M. Mohnar, Matthew S. Parsons

National Nuclear Security Administration Stewardship Science Graduate Fellowship
Heather N. Sandefur

NASA Space Technology Research Fellowship
Carly J. Romnes

Calvin Barnes Niccolls Memorial Scholarship
Angelo J. Minetti

Engineering Visionary Scholarship
Parker A. Allen, Reese J. Peterson, Anna C. Balla, David P. Leonhardt, Rierson M. Johnson, Thomas C. Brautigam, Jordan C. Heidrick, Julia K. Roessler

Illinois Engineering Achievement Scholarship
Benjamin A. Duban, Bruno J. Caruso, Parker A. Allen, Rierson M. Johnson, Angelo J. Minnetti, Anthony G. Leja, Julia K. Roessler, Justin B.Hearne, Amber H. Hunter, Shyam M. Upadhyay, Gavin A. Davis

Illinois Engineering Premier Scholarship
Connor A. Pigg

Illinois Engineering Freshman Scholarship
Armando U. Lopez, Andrew J. Ernat, Michael R. Hysick, Anthony C. Evans

Patterson Family Scholarship
Nicholas A. Dailey

William and Josephine Albrecht Engineering Scholarship
Amer H. Hunter

Edward E. & Lillian Hussemann Memorial Scholarship
Rosendo Martinez

Sloan University Center for Exemplary Mentoring Affiliates
Carly J. Romnes

SURGE Fellowship
Mikayla M. Molnar, Carly J. Romnes, Sonata M. Valaitis

Chancellor's Scholars
Alp Aktuna, Anthony C. Evans, Amber H. Hunter, Dario G. Panici

James Scholars
Parker A. Allen, Anna Balla, Jasmine Dinari, Joshua M. Hoffman, Heyuan Huang, Amber Hunter, Oliver W. Johnson, Julia K. Roessler, Runxia Wen, Eliza D. Wright, Oren M. Yang

Neumann hopes to give students better "View"

Martin Neumann had a vision for giving back to the University of Illinois. It just happened to include actually helping students see better.

Neumann (BS '99, MS '03, PhD '07), who serves on NPRE's Alumni Board, is the Senior Vice President of Operations at View, a company that produces Smart Windows. "If you've seen people with Transitions lenses in their glasses, it's very similar to that," he said. "This is glass that automatically tracks the sun. There's a see-through computer chip on top of the glass that automatically tracks the sun and tints, so you don't need blinds or shades, sort of like sunglasses for a building."

View Smart Windows comprise most of the windows on the new $75 million Campus Instructional Facility. First classes are expected to be held there by Fall 2021. *For more on this, go to* ***go.npre.illinois.edu/campus_instructional_facility****.*

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We place a particular focus on highly qualified students from the state of Illinois. Your gift is the catalyst for access to education, for nurturing ambition, and for turning passions into possibilities. Your investment changes lives. For more information, go to **grainger.illinois.edu/giving/evs**.