

# NPRE Partners with Industries

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Building for the future: new instructional labs

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Memorial to Barclay Jones

# DEPARTMENT OF NUCLEAR, PLASMA, AND RADIOLOGICAL ENGINEERING

## Faculty

**Rizwan Uddin** | department head | professor  
**Brent J. Heuser** | associate head, undergraduate programs | professor  
**Daniel Andruczyk** | research assistant professor  
**Caleb S. Brooks** | assistant professor  
**Davide Curreli** | associate professor  
**Angela Di Fulvio** | assistant professor  
**Kathryn D. Huff** | assistant professor  
**Tomasz Kozlowski** | associate professor  
**Ling-Jian Meng** | professor  
**Zahra Mohaghegh** | assistant professor  
**Magdi Ragheb** | associate professor  
**David N. Ruzic** | professor  
**James F. Stubbins** | professor  
**Yang Zhang** | associate professor

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**George H. Miley**  
**Clifford E. Singer**

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**Robert S. Averbach**  
**Jeffrey L. Binder**  
**Stephen A. Boppart**  
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**J. Gary Eden**  
**Masab H. Garada**  
**Brian E. Jurczyk**  
**Michael D. Kaminski**  
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**Susan M. Larson**  
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**Martin J. Neumann**  
**William R. Roy**  
**Michael W. Stowell, Jr.**  
**Robert A. Stubbers**  
**Clair J. Sullivan**  
**Dallas R. Trinkle**  
**Surya P. Vanka**

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**Amy J. McCullough** | M.Eng. programs coordinator  
**Susan K. Mumm** | coordinator of alumni relations  
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**Barbara J. Russell** | administrative aide  
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**Stoyan A. Toshkov** | senior research scientist  
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**Grace F. Witmer** | office support specialist

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THE GRAINGER COLLEGE OF ENGINEERING  
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## The Grainger College of Engineering

In April, the University of Illinois at Urbana-Champaign's College of Engineering became The Grainger College of Engineering, recognizing a new \$100 million gift from The Grainger Foundation and more than \$300 million in total support.

The Grainger Foundation's total support represents the largest amount ever given to a public university to name a college of engineering, with more than \$200 million provided in the last six years.

The re-naming was in recognition of the contributions of The Grainger Foundation to the excellence of the college and in honor of distinguished alumnus William W. Grainger.



## Building on its historic strengths, NPRE continues to inspire, innovate and impact (I<sup>3</sup>).



Rizwan Uddin

To further improve the educational experience for our students, construction of an addition to Talbot Laboratory has begun ([see page 5](#)). When completed next year, the addition will offer state-of-the-art instructional laboratory space for radiation measurements and nuclear materials. Undergraduates in NPRE also benefit from our low student-to-faculty ratio, and avail valuable research experience. Stuti Surani, a senior who has been involved in undergraduate research since her freshman year, is a prime example ([see page 9](#)).

Taking advantage of NPRE's strengths in fusion science and engineering, and to fill a market need, NPRE will start offering a Master of Engineering in Plasma Engineering degree starting Spring, 2020 ([see page 5](#)).

Faculty, research staff and students continue to expand the research portfolio of the department. Impactful studies that span from basic science to applied industry-sponsored R&D are being conducted in the department. Translating their expertise and leadership in basic science, research faculty members are increasingly diversifying their efforts to innovative research of interest to industry ([see page 6](#)). Collaboration with industry and sponsorship of industry-sponsored research have spread across the interests of our faculty, from work in Probabilistic Risk Assessment (PRA), advancement of semi-conductor processing, plasma modeling and manufacturing technologies, and investigations of innovative uses for nuclear energy.

Collaborations with industry translate into new opportunities for our students, as recent senior design teams discovered in working with ASML, the world's largest supplier of photolithography systems for the semiconductor industry ([see pages 6-7](#)).

Finally, as many of you might already know, Prof. Barclay G. Jones, a beloved NPRE teacher, advisor, mentor, leader and colleague, passed away in January 2019. He was an inspiration to many, and is sorely missed ([see page 10](#)).

I invite you to explore these pages and to regularly visit our website to get a glimpse of NPRE's forward march.

Sincerely,

Rizwan Uddin

“Translating their expertise and leadership in basic science, research faculty members are increasingly diversifying their efforts to innovative research of interest to industry.”

## NPRE TEACHERS RANKED AS EXCELLENT BY THEIR STUDENTS

### Fall 2018

Davide Curreli

Richard L. Holm

Michael Kaminski

William R. Roy

Rizwan Uddin

Yang Zhang

### Spring 2019

William R. Roy

Yang Zhang

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## GROWTH



## Curreli promoted to associate professor

Davide Curreli has been promoted from assistant to associate professor with tenure.

The director of the Laboratory of Computational Plasma Physics, Curreli focuses on plasma edge and plasma-material interaction modeling, plasma physics and fusion. He has been with NPRE since 2012, as a postdoctoral researcher for a year, then as an assistant professor.

For more on this story, go to [go.npre.illinois.edu/curreli\\_promotion](http://go.npre.illinois.edu/curreli_promotion).



## Witmer joins NPRE staff

Grace Witmer has joined NPRE as an Office Support Specialist, assisting Becky Meline, Coordinator of Academic Programs, in NPRE Student Services.

Witmer has worked at Illinois for just over two years, starting as extra help and later providing office support in The Grainger College of Engineering's Advancement Office. She earned a Master of Arts in Translation and Interpreting in 2017 from the University of Illinois at Urbana-Champaign. She also holds a bachelor's degree in Spanish from Ripon College in Ripon, Wisconsin.



## Construction all around Talbot!

Talbot Laboratory has been in the middle of a construction frenzy for the past several months! 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, \$8 million 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](http://npre.illinois.edu/talbot-laboratory-expansion).

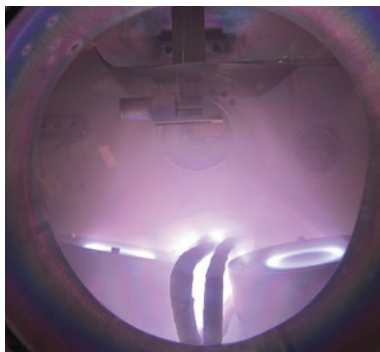
The \$75 million Campus Instructional Facility project is an example of a new public-private partnership model available to the university that allows for tax-exempt financing. In this agreement, a nonprofit entity works with a developer, architect, engineer and construction manager. First classes are expected to be held there by Fall 2021. For more on this, go to [go.npre.illinois.edu/campus\\_instructional\\_facility](http://go.npre.illinois.edu/campus_instructional_facility).

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](http://go.npre.illinois.edu/geothermal_monitoring_well).

## MEng in Plasma Engineering established

Students wanting to make their careers in plasma industrial and medical technologies will soon be able to earn a Master of Engineering degree for that purpose through The Grainger College of Engineering. Administered by NPRE, the MEng in Plasma Engineering degree program, the first of its kind in this country, will begin in Spring 2020.

The degree's primary requirements—courses in plasma physics, plasma engineering applications and a plasma physics laboratory—are offered in NPRE. Students also will be required to do a project/internship course. Students will



be able to choose among a selection of advanced courses, including plasma waves, computational plasma physics, plasma-material interactions, gaseous electronics and, eventually, plasma medicine. Elective courses, including ones in business and entrepreneurship, can also be taken toward the degree.

The new program will be attractive to students who enjoy the applications of plasma physics but who are not interested in pursuing research and/or a doctoral degree.

For more information, go to [go.npre.illinois.edu/plasmameng](http://go.npre.illinois.edu/plasmameng).



# NPRE grows industrial research collaborations

In addition to their work to advance fundamental science in all aspects of nuclear, plasma, and radiological engineering, NPRE faculty have been growing their interactions with industries, partnering with them on many applied technologies.

These exchanges have spread across the faculty's research interests, including Probabilistic Risk Assessment (PRA), semi-conductor processing, plasma manufacturing technologies and modeling, and innovative nuclear energy applications.

## PRA Industry-Focused Scientific Innovation

Increased competition and fluctuations in the commercial electric sales market have renewed focus for nuclear power plants to develop risk-informed approaches for safe and cost-effective operational strategies.

Collaborating on this issue with industry partners, Prof. Zahra Mohaghegh, Director of the Socio-Technical Risk Analysis (SoTeRiA) Research Laboratory, has established The Grainger College of Engineering SoTeRiA Industry Affiliates Program (IAP) (see [riskanalysis.illinois.edu](http://riskanalysis.illinois.edu)) for large-scale and cost-shared industry projects.

One of SoTeRiA-IAP's initial research thrusts is developing models for Fire PRA to help increase realism in nuclear industry risk estimations. A \$1 million project with the South

**"If industries are paying you to do it, they will absolutely want to hire the students that were doing that work."**



David Ruzic recently took a sabbatical and worked with scientists at ASML.

Texas Project Nuclear Operating Company supports this effort, which is part of the Department of Energy's U.S. Industry Opportunities for Advanced Nuclear Technology Development Program.

## Plasma/fusion connections

In his 35 years on campus, Prof. David Ruzic, Director of the Center for Plasma-Material Interactions, has gained among the highest number of principal investigator contracts with industry among all Grainger College of Engineering faculty.

Industries currently supporting Ruzic's work include ASML (semiconductor light source); Tokyo Electron Ltd. (semiconductor etching); Starfire Industries, LLC (plasma sources, power supplies and neutron generators); General Motors (atmospheric pressure plasma for joining); Lockheed Martin (plasma material coatings); DuPont (o-ring degradation in plasma); and General Fusion and Tokamak Energy (lithium used on fusion reactor walls). Ruzic is also working with Applied Materials (semiconductor chip equipment, services and software supplier); LAM Research (semiconductor processing equipment designer and manufacturer); and LytEN (a chemical machinery and equipment company).

Industrial collaborations often translate into future jobs for NPRE students. "If industries are paying you to do it, they will absolutely want to hire the students that were doing that work," Ruzic said.

Knowledge gained from the interactions also has educational benefits. For example, in taking on an ASML project, a recent



Zahra Mohaghegh, center, and her team members from the Socio-Technical Risk Analysis (SoTeRiA) Research Laboratory.

student team earned NPRE's Daniel F. Hang Senior Design Award. The winning team discussed the application and prototype design of a hydrogen plasma for particle elimination to avoid tin particle migration and gain more efficient extreme ultraviolet lithography (EUV) production. (See [go.npre.illinois.edu/2019\\_hang\\_award](http://go.npre.illinois.edu/2019_hang_award).)

Also on the plasma side, Prof. Davide Curreli is working with Posco, a large South Korean steel manufacturer, to model plasma deposition. The company wants to optimize plasma technology at atmospheric pressure to deposit a special

ceramic coating onto steel, improving the manufacturing process and the steel products' microstructure. (See [go.npre.illinois.edu/posco\\_plasma\\_project](http://go.npre.illinois.edu/posco_plasma_project).)

## Nuclear energy

Profs. Caleb Brooks and Kathryn Huff have worked with soil science Prof. Andrew Margenot on utility giant Exelon Corp.'s project to examine re-using lost nuclear power plant heat for greenhouse and biofuel needs. (See [go.npre.illinois.edu/exelon\\_greenhouse\\_project](http://go.npre.illinois.edu/exelon_greenhouse_project).)

# NPRE in DOE-funded partnership to shape future U.S. fusion energy designs

NPRE, Oak Ridge National Laboratory and the Princeton Plasma Physics Laboratory have partnered in a U.S. Department of Energy-funded program that will play a key role in characterizing designs for the future of fusion energy in this country.

Research Prof. Daniel Andruczyk, who directs and operates the unique HIDRA plasma/fusion facility in the Center for Plasma-Material Interactions in NPRE, said the three partners will define the design for a liquid lithium divertor system of a future fusion facility.

The NPRE-ORNL-PPPL strategy will focus on using flowing liquid lithium to coat the divertor, the part of a tokamak fusion reactor that exhausts waste particles and heat. The U.S. leads the world in developing the silvery metal lithium as a plasma-facing component. The DOE has authorized a 3-year grant of approximately \$1 million annually for the researchers to conduct a national study that would bring the liquid metal research under one umbrella.

NPRE, ORNL and PPPL have been charged with organizing future research on the subject; scientists from other institutions will coordinate their studies and funding requests through the partnership, according to Andruczyk.

Essentially, flowing lithium cleans the plasma in a fusion reactor by absorbing unreacted hydrogenic species, helium and other impurities, that can drain the plasma of energy. "Plasma can operate with lithium and not shut the reaction down," Andruczyk said.



Daniel Andruczyk, right, with HIDRA.

Defining the type of liquid metal is an early step. Remaining questions include determining lithium's rate of flow, wetting properties, temperature limits, evaporation limits, capacity for absorbing deuterium and helium, reaction with the underlying solid surface, and performance when struck with plasma-emitted neutrons.

Long-term goals beyond three years include the evaluation of other liquid metal plasma-facing components if studies identify difficult or insurmountable challenges with lithium, and a plan to build and test components in present-day tokamaks. For more information, go to [go.npre.illinois.edu/fusion\\_partnership](http://go.npre.illinois.edu/fusion_partnership).

Essentially, flowing lithium cleans the plasma in a fusion reactor by absorbing unreacted hydrogenic species, helium and other impurities, that can drain the plasma of energy.



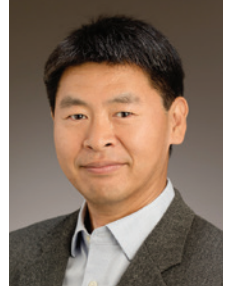
## Meng gains \$4M NIH award to develop a hyperspectral single-photon technique to image peripheral vascular disease

Prof. Ling-Jian Meng will lead a large multi-institutional consortium to develop a hyper-spectral single-photon imaging technique for early diagnosis and therapeutic intervention monitoring of peripheral vascular disease (PVD).

The project, funded by a \$4M grant from the National Heart, Lung, and Blood Institute (NHLBI), will involve a multidisciplinary team of researchers from NPRE, the Schools of Medicine at Yale University and at the University of Pennsylvania, and the Science and Technology Facility Council (STFC) in the United Kingdom. The team will also be working with Redlen Technology of Canada, the world-leading supplier of cadmium zinc telluride detectors, to develop and fabricate a dedicated CZT detector platform for this project.

Peripheral vascular disease (PVD) affects approximately 8 million Americans and an estimated 10 percent of the worldwide population, with increasing prevalence in older individuals. PVD has significant health implications, resulting in progressive limb ischemia, a condition when not enough

blood or oxygen is getting to parts of the body. This can lead to pain, numbness or tiredness in the legs, difficulty walking, non-healing ulcers, limb amputation, and, in severe cases, death. There is a critical need for a non-invasive approach for the comprehensive assessment of molecular and physiological changes of the lower extremities in patients with peripheral vascular disease (PVD) in response to therapeutic interventions, and assessing these changes will be critical for optimizing and following PVD therapy.



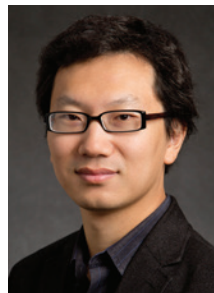
In this project, the researchers will develop a **Dynamic Extremity SPECT (DE-SPECT)** system for clinical imaging of PVD in lower extremities. The system will be installed at the Yale School of Medicine for animal and patient studies. See more at [go.npre.illinois.edu/meng\\_PVD\\_imaging](http://go.npre.illinois.edu/meng_PVD_imaging).

## DOE-NEUP funds NPRE studies on molten salt properties; PRA

NPRE gained two major contracts over the summer from the U.S. Department of Energy Nuclear Energy University Program. One project is to better understand the properties of molten salt for advancing molten salt reactor technology. The other supports developing an Integrated Probabilistic Risk Assessment (I-PRA) algorithm for deploying nuclear power plant innovations.

NPRE Profs. Yang Zhang and Brent Heuser, working with Argonne National Laboratory, will examine the thermodynamic, structural and dynamic properties of molten salts at the atomic and electronic scale. The scientists were awarded a three-year, \$800,000 grant to conduct molecular dynamics simulations driven by machine-learned, high-dimensional neural network potentials, combined with neutron/X-ray scattering and thermodynamic experimental validations.

At least six start-up companies have proposed MSR designs. However, current science cannot accurately predict molten salt's varying melting points, heat capacity, free energy for potential corrosion reactions, solubility of fission and corrosion products, or effect of tritium, a fuel used in the reactors. This knowledge gap poses a major roadblock in MSRs' development and commercialization. For more information, go to [go.npre.illinois.edu/molten\\_salt\\_properties](http://go.npre.illinois.edu/molten_salt_properties).



Zhang



Heuser



Mohaghegh

Prof. Zahra Mohaghegh and her Socio-Technical Risk Analysis (SoTeRia) Research Laboratory in NPRE also gained a three-year, \$800,000 NEUP grant for developing the I-PRA algorithm. The tool will be used to advance safe and cost-effective strategies for deploying new technologies.

Increased competition and fluctuations in the commercial electric sales market have renewed focus on using risk-informed approaches for developing safe and cost-effective operational strategies for nuclear power plants. Among these are new technologies to improve operational flexibility and efficiency while maintaining safety. For more information, go to [go.npre.illinois.edu/mohaghegh2019NEUP](http://go.npre.illinois.edu/mohaghegh2019NEUP).



## The benefits of an early start in undergraduate research

NPRE senior Stuti Surani is a prime example of the benefits a student can reap from starting research early as an undergraduate. She began as a freshmen, and has worked with three NPRE professors.

Surani was proactive in contacting faculty members to work in their labs, and participating in their research has created experiences for her that couldn't have been found in the classroom. "I learned about different subfields of the department. It also allowed me to have a diverse and rounded resume," she said. "This helps you choose from different fields for grad school or industry. For example, I can work in both reactor physics and radiation detection, due to having experience in both."

In Prof. Rizwan Uddin's Virtual Education and Research Laboratory, Surani learned how to manipulate Unity game software to create the virtual experience of a nuclear reactor. In Prof. Tomasz Kozlowski's Analysis of Reactor Transients and Stability (ARTS) group, she assisted a graduate student in computer simulations and data analysis for uncertainty quantification research.

Most recently joining Prof. Angela Di Fulvio's Neutron Measurement Laboratory, Surani's project of developing and characterizing a neutron spectrometry system led to her summer internship at Idaho National Laboratory.

"Research is very different from courses. While working on a project, you develop an in-depth understanding of the field and apply your knowledge. You make a lot of mistakes and learn through practice rather than just through studying. This makes each experience valuable."

Other gains for Surani have included being published as a co-author on a research paper with Kozlowski's group, and being chosen for NPRE's 2019 Outstanding Undergraduate Research Award.

Working with several research groups has helped Surani zero in on her interests. "Reactor physics for me was an exciting and challenging field that I was very much interested in. However, with radiation, I could focus more on the physics of the problem and that was more attuned to my tastes. Unless I



switched concentrations, I would never have realized this, because a lot of this understanding comes from taking it into practice." For more, go to [go.npre.illinois.edu/undergrad\\_research\\_starting\\_early](https://go.npre.illinois.edu/undergrad_research_starting_early).

## Kozlowski plays role in Exelon-led research to model, improve BWR efficiency

Prof. Tomasz Kozlowski is playing a role in an Exelon Corp.-led project to model and improve the efficiency of boiling water nuclear reactors.

The objective of the two-year project is to gain a deeper understanding of BWR two-phase flow and reactor physics behavior. Collaborators hope to improve reactivity and thermal margins predictions for the current BWR fleet, with the goal of producing a direct positive economic impact on fuel cycle energy production and costs. The project will further develop the Consortium for Advanced Simulation of Light Water Reactors (CASL) Virtual Environment for Reactor Applications (VERA) platform, currently limited to pressurized water reactors, to include BWR modeling and simulation capabilities.

The U.S. Department of Energy is providing \$5 million in funding for the project, while industrial funding will amount to another \$1.7 million. The multi-institutional effort involves scientists from Exelon and Global Nuclear Fuel Corp., Oak Ridge and Idaho national laboratories, and Pennsylvania State University, North Carolina State University, University of Michigan and Kozlowski from Illinois. For more information, go to [go.npre.illinois.edu/kozlowskiexelonindustryproject](https://go.npre.illinois.edu/kozlowskiexelonindustryproject).





# Student groups' dedication spells S-U-C-C-E-S-S

Putting outstanding effort into both academic and outreach activities this past year, NPRE student groups—the American Nuclear Society (ANS) and the Women in Nuclear (WiN) chapters of the University of Illinois at Urbana-Champaign—both achieved distinction within their national organizations.

At the national ANS student conference held in April at Virginia Commonwealth University, the Illinois chapter extended a tradition of recent success by gaining five awards for presentations—the second highest number for all universities participating. *See conference results at [npre.illinois.edu/news/npre-students-excel-ans-student-conference](http://npre.illinois.edu/news/npre-students-excel-ans-student-conference).*

The triumph follows excellent showings at the 2016 and 2017 conferences. In 2016, the Illinois chapter won more awards than any other university group, including the Glasstone Award, recognizing the society's most outstanding student section in the



Women in Nuclear



American Nuclear Society

country. The Illinois chapter brought home five awards in 2017, including

a Commendation for Service and Leadership for then-ANS President Aristidis Loumis.

The Illinois WiN group capped a revitalization effort that spanned the last couple of years when the group gained the national 2019 Chapter Excellence Award in July. Over the past few years, Illinois chapter members have devoted extra efforts to advancing the national mission: providing professional development and networking for men and women working in nuclear energy and technology fields and promoting understanding and awareness of the value of nuclear energy and technology.

A demonstration of that initiative was an invitation during the summer to a delegation of 25 national WiN members to tour NPRE laboratories and other facilities in The Grainger College of Engineering at Illinois. *View more on WiN at [go.npre.illinois.edu/WiN\\_ChapterExcellence](http://go.npre.illinois.edu/WiN_ChapterExcellence).*

## Tribute to Barclay G. Jones

A cornerstone of NPRE and beloved for many years by the department's students, alumni, faculty and staff, Emeritus Prof. Barclay G. Jones passed away Sunday, January 27.

Jones came to Illinois as a graduate student after earning his bachelor's degree in mechanical engineering in 1954 from the University of Saskatchewan in Canada. He became an assistant professor at Illinois after earning a master's and PhD in 1960 and 1966, respectively. He was promoted to associate professor in 1968 and full professor in 1972. Jones served as Associate Chair of the Nuclear Engineering Program from 1981 to 1986 and was Acting Head of the newly formed Nuclear Engineering

Department for a year, then served as permanent Head from 1987 to 2000. He was recognized as one of NPRE's founders when its 50th anniversary was celebrated in September 2008. He achieved emeritus status in August 2011.

Known for his kindness and consideration of NPRE's students, Jones was honored in 2010 when students, colleagues and alumni forged a grassroots campaign to establish a graduate fellowship in his honor. The same year he was presented the NPRE Distinguished Alumni Award. He was presented the Illinois Engineering Alumni Award for Distinguished Service in 2017.

Jones' research interests included thermal-hydraulics, reactor safety, multiphase flow, boiling heat transfer,



turbulence measurement and modeling, flow-induced vibrations and aeroacoustics, human-machine interfaces for reactor control and simulation, and food irradiation safety. *For more, go to [npre.illinois.edu/news/npre-community-loses-founder-barclay-jones](http://npre.illinois.edu/news/npre-community-loses-founder-barclay-jones).*

# Two NPRE students honored as Knights of St. Patrick

Two NPRE students were chosen as The Grainger College of Engineering 2019 Knights of St. Patrick—an honor bestowed upon only one in a thousand of the college’s 9,000+ students. Alyssa Hayes and Eliza Wright were among the nine students recognized for leadership, excellence in character, and exceptional contribution to the college and its students.

In addition to pursuing her bachelor’s degree in NPRE and serving as a teaching assistant and mentor in NPRE 100 Orientation to NPRE and ENG

100 Engineering Orientation, Hayes, who graduated in May, devoted time to a number of extra-curricular activities. Among them were the American Nuclear Society student chapter, the Women in Nuclear organization of which she was President, the Illini Ridgebacks Quidditch Team, Women in Engineering, and the Champaign County Humane Society.



Eliza Wright and Alyssa Hayes

Among outreach efforts, Hayes traveled to high schools and middle schools throughout the state to tell the students about nuclear power. She helped customize and add demonstrations to the presentations to best suit the audience members’ ages and academic backgrounds.

Choosing to change attitudes and welcome diversity by working within the system, Wright turned to the college’s Morrill Engineering Program and the National Society of Black Engineers (NSBE) student organization. As a

member of the college’s Advisory Committee on Diversity and Inclusion, Wright organized Infusion 2019, a week-long series of events held in February and intended to “celebrate the differences in all of us.”

For more on Alyssa and Eliza, go to [go.npre.illinois.edu/2019stpatknights](http://go.npre.illinois.edu/2019stpatknights).

## HUFF CHOSEN FOR STANLEY H. PIERCE AWARD

In recognition of her dedication in working with NPRE students, Prof. Kathryn D. Huff was chosen as the 2019 winner of The Grainger College of Engineering Stanley H. Pierce Award. Selected by the student-run Engineering Council, the annual Pierce Awards recognize one undergraduate student and one faculty member college-wide for their efforts to develop empathetic student-faculty cooperation.

“Professor Huff has exhibited a type of genuine interest and caring for the well-being of every student in the NPRE department,” said one student in nominating Huff. For more on this, go to [go.npre.illinois.edu/huff2019pierceaward](http://go.npre.illinois.edu/huff2019pierceaward).

## RUZIC PROMOTED TO FELLOW GRADE IN SPIE; CHOSEN FOR ROSE AWARD

Prof. David N. Ruzic has been promoted to the grade of Fellow in the International Society for Optics and Photonics (SPIE). An outstanding educator, Ruzic also has been chosen for the 2019 Rose Award for Teaching Excellence from The Grainger College of Engineering.

Ruzic’s connection to SPIE has been through his research and development of extreme ultraviolet lithography, a technology

important to semiconductor manufacturing. Ruzic has been an invited speaker at the organization’s conference on Advanced Lithography since the conference’s creation. He and his students have published extensively in SPIE-related journals and conference proceedings. For more information, see [go.npre.illinois.edu/ruzic\\_spie\\_fellow](http://go.npre.illinois.edu/ruzic_spie_fellow).

On the teaching side, Ruzic has built a well-earned reputation for engaging students, being included in the List of Teachers Ranked Excellent by Their Students almost every semester since he started at the University of Illinois almost 35 years ago. For more information, view [go.npre.illinois.edu/ruzic\\_rose\\_award](http://go.npre.illinois.edu/ruzic_rose_award).

## GRADUATE STUDENT LANG GAINS BEST PAPER AWARD

NPRE graduate student Eric Lang’s research to support an international effort examining neutron irradiation impacts on tungsten-based materials gained the Best Student Paper Award at the 2018 American Nuclear Society Technology of Fusion Energy (TOFE) Topical Meeting.

His work was entitled “Pre-irradiation comparison of W-based alloys for the PHENIX campaign: microstructure, composition, and mechanical properties.” For more information, go to [go.npre.illinois.edu/Lang\\_2019TOFE\\_best\\_paper](http://go.npre.illinois.edu/Lang_2019TOFE_best_paper).



## BLAIR BROMLEY AND BRIAN JURCZYK CHOSEN FOR NPPE ADVOCATE AWARDS

NPPE alumni Dr. Blair P. Bromley, a nuclear engineer and reactor physicist at the Canadian Nuclear Laboratories (CNL), and Dr. Brian E. Jurczyk, co-founder and President/Chief Executive Officer of Champaign, Illinois-based Starfire Industries, LLC, are the 2019 winners of the NPPE Advocate Award.

Bromley, MS 98 Aerospace Engineering, PhD 01 NPPE, has been cited for advancing NPPE’s missions through his many years of excellent counsel, commitment to the NPPE Constituent Alumni and Industry Advisory Board (CAIAB), and generous philanthropy on behalf of NPPE students. For more information on Bromley, go to [go.npre.illinois.edu/bromley\\_2019\\_advocate\\_award](http://go.npre.illinois.edu/bromley_2019_advocate_award).

Jurczyk, BS 95 Aerospace Engineering, MS 97, PhD 01, MBA 01, has been cited for advancing NPPE’s missions by his dedication to mentoring students, innovation of plasma technologies through entrepreneurial enterprises, and commitment to the NPPE CAIAB. For more information on Jurczyk, go to [go.npre.illinois.edu/jurczyk\\_2019\\_advocate\\_award](http://go.npre.illinois.edu/jurczyk_2019_advocate_award).

## PHI NGUYEN CHOSEN FOR NPPE DISTINGUISHED ALUMNI AWARD

Cited for inspiring and serving the NPPE community through his scientific excellence, corporate leadership, and generous philanthropy on behalf of NPPE students, alumnus Phi L. Nguyen has been selected for the 2019 NPPE Distinguished Alumni Award.

Retiring this year as a Vice President and Director of Engineering at Intel Corp. where he had worked for 28 years, Nguyen, BS 1988, MS 1990, now provides consulting in the semiconductor industry. He also serves on NPPE’s alumni group, the Constituent Alumni and Industry Advisory Board.

In 2018 Nguyen established the Nguyen Thi Cuong Fellowship in NPPE to honor his mother, a remarkable woman who led her family out of Vietnam after the fall of Saigon. Nguyen was born in that city and, following a perilous journey, immigrated to the U.S. in 1975. He grew up in Rock Falls, Illinois.

The Distinguished Alumni Awards are presented to NPPE alumni who make notable advances in the field of nuclear science, and/or lasting contributions to society in general. For more on Nguyen, go to [go.npre.illinois.edu/nguyen\\_2019\\_Distinguished\\_Alumni](http://go.npre.illinois.edu/nguyen_2019_Distinguished_Alumni).

## XIANG LIU WINS GRAINGER ENGINEERING ROSS MARTIN AWARD

Xiang Liu, PhD 18, is the 2019 winner of The Grainger College of Engineering Ross Martin Award, recognizing the year’s most outstanding research achievement by a graduate student in the college.

Liu, a postdoctoral research scientist in the Characterization and Advanced Post-Irradiation Examination Division at Idaho National Laboratory, also was the national winner of the American Nuclear Society’s 2018 Mark Mills Award. That honor recognizes the graduate student author who submits the best original technical paper contributing to the advancement of science and engineering related to the atomic nucleus. For more information, see [go.npre.illinois.edu/liu\\_2019\\_RossMartin](http://go.npre.illinois.edu/liu_2019_RossMartin).

## YASSIN HASSAN ELECTED TO NAE

NPPE alumnus Yassin Hassan, MS 75, PhD 80, has been elected a member of the National Academy of Engineering (NAE). Election to NAE is among the highest professional distinctions accorded an engineer.

Hassan is cited for his work on experimentally validated thermal hydraulic analyses of multiphase flow fields for nuclear reactor operations. He joined Texas A&M University in September 1986 and is the Sallie & Don Davis ’61 Professor in Engineering, a professor in the Department of Nuclear Engineering and the J. Mike Walker ’66 Department of Mechanical Engineering. For more on this, see [go.npre.illinois.edu/hassan\\_NAE](http://go.npre.illinois.edu/hassan_NAE).

## JAMES HOLLOWAY NAMED PROVOST AT UNIVERSITY OF NEW MEXICO

NPPE alumnus James P. Holloway, BS 82, MS 84, is the new Provost and Executive Vice President for Academic Affairs at the University of New Mexico.

Holloway spent much of his career at the University of Michigan, starting there as an assistant professor in nuclear engineering in 1990. His most recent post, from 2013 until this past July, was as Vice Provost for Global Engagement and Interdisciplinary Academic Affairs.

Holloway’s research in the nuclear engineering field has focused on computational and mathematical modeling of neutral particle transport, plasma kinetics and hydrodynamics, and related problems in inverse problems and plasma tomography. For more, view [go.npre.illinois.edu/holloway\\_UniversityNewMexico\\_provost](http://go.npre.illinois.edu/holloway_UniversityNewMexico_provost).



## Energy Systems MEng degree growing strong

The Grainger College of Engineering Master of Engineering in Energy Systems degree is now in its sixth year, and has graduated 60 engineers who want to make a difference in affecting climate change, sustainability and modern energy solutions.

Students who have earned the degree have gone on to rewarding careers for a long list of employers, including ExxonMobil, General Electric, Palomar Solar, Tektronix, TERI—The Energy and Resources Institute, and Tesla Motors. Many outstanding students have been awarded Taber International, LLC, scholarships, established by Brad Radl, a 1980 NPRE alumnus and President and Chief Technical Officer of Taber International.

Here is an introduction to recent Energy Systems students:

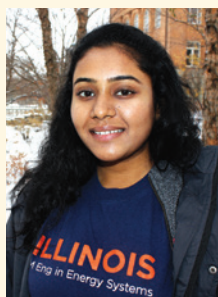


### Bradley Flanagan

Flanagan's passion for renewable energy caught fire after a travel abroad to Costa Rica showed him how the resources can be used and managed successfully.

“Surprisingly enough, Costa Rica is in the top three most sustainable countries in the entire world,” said Flanagan, a 2018 Taber Scholar. “(The country's residents) are powered almost 100 percent by clean renewable energy. They are definitely not as wealthy as the majority of Americans, but they all live much more simplistic lives, and consume significantly less energy (small homes, one car per household, etc.)”

Having earned the MEng degree in May, Flanagan hopes to concentrate his future career on solar photovoltaics technology. “I hope to combine my undergraduate background in industrial and systems engineering (BS May 2018, University of Buffalo, New York), which provides me with a business perspective, with the technical skills that I have learned through my Energy Systems MEng degree.”



### Kruti Subhash Chand Goyal

Summer vacations at her grandmother's home in a small town in the state of Gujarat in India taught Goyal how power stoppages disrupt lives. “These experiences inspired me to study renewable energy sources, as I believe they have more penetration than conventional resources,” she said. “I do

not want to be a mere advocate of this cause, but actively work towards advancement in the field that deserves to be more progressive than corrective.”

This passion led Goyal in fall 2018 to the Energy Systems degree at Illinois after she completed her bachelor's degree in chemical engineering at D.J. Sanghvi College of Engineering in Mumbai, India. Selected as a 2018 Taber Scholar, Goyal worked on campus with Sun Buckets, a social business company that develops portable cookstoves to harness solar energy. She also worked at the Illinois Sustainable Technology Center as a researcher to test different crops for their heating value and viability as a potential clean-energy feedstock.

Having graduated in May, she will be working for Chicago consulting firm E3Tec Services, LLC, as an associate chemical engineer. E3Tec services the chemical process industry for mitigation of petroleum fouling, energy efficiency technologies, and removing technical and economic barriers of Ocean Thermal Energy.



### Chinedu Oputa

Oputa gained a prestigious Environmental Defense Fund Climate Corps Fellowship to help support him in earning his Energy Systems Degree. “The Texas Military Department was seeking innovative solutions to increase renewable energy generation in its energy portfolio while at the same time

reducing its costs,” Oputa said. “Through a partnership with the Environmental Defense Fund, I was hired to conduct a feasibility analysis for renewable energy generation opportunities that would reduce costs and increase the amount of renewable energy generation in the overall TMD energy portfolio.”

Through the experience, he said he realized “technical viability is only secondary to economic viability in project development. An energy project might be able to produce the great amount of energy based on the siting location but if it is not economically viable, the chances of getting approval for it will be very low.”

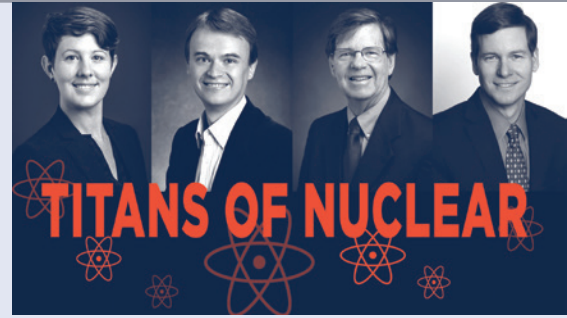
With his current position at First Solar in San Francisco, Oputa has realized his goal of managing commercial and utility development of solar projects.

“I get to apply my technical and financial skills through analyses to see how technical and project site factors affect the financial competitiveness of projects,” said Oputa, who holds a bachelor's degree in mechanical engineering from the University of Texas at El Paso. “The skills and knowledge I gained from the Energy Systems program have been instrumental in my ability to run these analyses, grab concepts and produce quality deliverables.”



## OUTREACH

NPRE's interaction with colleagues, students and the public is an important part of our educational mission. The past year saw a number of outreach efforts on the part of the department and our student groups.



NPRE faculty members Kathryn Huff, Tomasz Kozlowski and Jim Stubbins, and alumnus John Kotek are all featured on the *Titans of Nuclear* podcast. See [go.npre.illinois.edu/nuclear\\_titans](http://go.npre.illinois.edu/nuclear_titans).



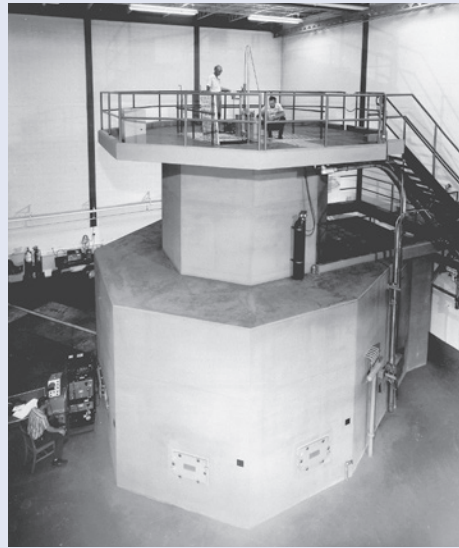
Two dozen high school students from five states spent a week on the Urbana campus during the summer for the Exploring NPRE Camp. See [go.npre.illinois.edu/2019\\_high\\_school\\_camp](http://go.npre.illinois.edu/2019_high_school_camp).



Thirty-five scientists from around the world traveled to the Urbana campus in June as NPRE hosted the fourth annual International Technical Workshop on Fuel Cycle Simulation. See [go.npre.illinois.edu/fuel\\_cycle\\_workshop](http://go.npre.illinois.edu/fuel_cycle_workshop).



SPEED-Interchange, now in its 10th year, continues its successful mission to facilitate networking between NPRE students and potential employers. See [go.npre.illinois.edu/speed\\_interchange](http://go.npre.illinois.edu/speed_interchange).



The Illinois Distributed Museum has included the TRIGA Mark II Nuclear Reactor among 88 exhibits of University of Illinois at Urbana-Champaign innovators and innovations. See [npre.illinois.edu/news/triga-reactor-included-illinois-distributed-museum-exhibits](http://npre.illinois.edu/news/triga-reactor-included-illinois-distributed-museum-exhibits).



NPRE alumna Deborah Laughton was the featured speaker during The Grainger College of Engineering LAUNCH! event, welcoming the college's 1,500 new freshmen and transfer students in August.



Twenty-five delegates from the national Women in Nuclear organization toured facilities in NPRE and The Grainger College of Engineering in July. See [go.npre.illinois.edu/WiN\\_delegation](http://go.npre.illinois.edu/WiN_delegation).



NPRE students got a first-hand look at Sweden's solutions for storing spent nuclear fuel during this 2019 study abroad experience. See [go.npre.illinois.edu/Sweden\\_study\\_abroad](http://go.npre.illinois.edu/Sweden_study_abroad).



## NPRE PRIDE POINTS

- 1 NPRE faculty and students have been recognized with nearly 20 national awards over the past five years.
- 2 NPRE houses HIDRA, a unique plasma/fusion facility.
- 3 NPRE is the only nuclear engineering department in Illinois, a state that has recommitted its support for nuclear energy.
- 4 NPRE has partnered with nearly 20 industries that support faculty research and/or students.

## NPRE hosts Exelon appreciation event

NPRE hosted Exelon Corp. executives in March in appreciation of the company's partnership and investment in NPRE students and programs.

Scot Greenlee, Senior Vice President of Engineering and Technical Support; Ken Peterson, Vice President of Nuclear Fuels; and Ed McVey, Director of BWR Core Design, toured NPRE facilities and chatted over lunch with students who have held internships at Exelon or have been recipients of Exelon-NPRE Visionary Scholarships.

Exelon established for NPRE Visionary Scholarships a \$500,000 endowment that combines the company's pledge with a dollar-for-dollar matching gift from The Grainger Foundation Matching Challenge program. *For more, see [go.npre.illinois.edu/exelon\\_appreciation\\_event](http://go.npre.illinois.edu/exelon_appreciation_event).*



From left, Exelon executives Scot Greenlee, Ed McVey and Ken Peterson tour Prof. Caleb Brooks' Multiphase Thermo-fluid Dynamics Laboratory.



## Creating a legacy by supporting students

In creating the Blair and Jennifer Bromley Canada-U.S. Friendship Nuclear, Plasma, and Radiological Engineering Visionary Scholarship Fund, the couple have demonstrated their commitment to the NPRE Department and its students. And, said Blair, it's been their way to establish a legacy.

"Everyone has their own form of legacy; this is one way that one can help future students and professors as well," he said.

Until the end of 2019, The Grainger Foundation matches gifts such as the Bromleys. Blair, a nuclear engineer and reactor physicist at the Canadian Nuclear Laboratories (CNL), and Jennifer, a librarian, explain why NPRE has gained their support:

"The reason I was able to come (to the University of Illinois) was due to the fact that previous alumni and other sources of funding provided support which allowed me to come. So when someone helps you, you feel a great sense of gratitude," Blair said.

Added Jennifer, "Another reason for supporting this scholarship at Illinois is that we believe in the importance of education; supporting the next generation of scholars."

Blair hopes the gift encourages other alumni. "Our hope is that more and more alumni will realize that it's an important thing to support future generations." *For more on this gift, see [go.npre.illinois.edu/bromley\\_EVS\\_gift](http://go.npre.illinois.edu/bromley_EVS_gift).*



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A group of graduates in blue gowns and caps are walking down a set of stairs on a brick building. The scene is dimly lit, suggesting dusk or dawn. The graduates are in various stages of descent, some looking towards the camera and others looking at each other.

THERE'S STILL TIME TO  
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IN THE LIFE OF AN NP  
STUDENT BY MAKING A GIFT  
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From now until December 31, 2019, all gifts made to NP  
Visionary Scholarships will be matched dollar-for-dollar through The Grainger Matching Challenge program. So far, NP  
Visionary Scholarships and The Grainger College of Engineering Visionary Scholarships have supported 19 NP  
students since the awards were created two years ago. That support has made the difference in whether several of those students could attend the University of Illinois at Urbana-Champaign.

Your investment yields real rewards and, until the end of this year, is worth twice as much! For more information, see [go.npre.illinois.edu/npre\\_visionary\\_scholarships](http://go.npre.illinois.edu/npre_visionary_scholarships).