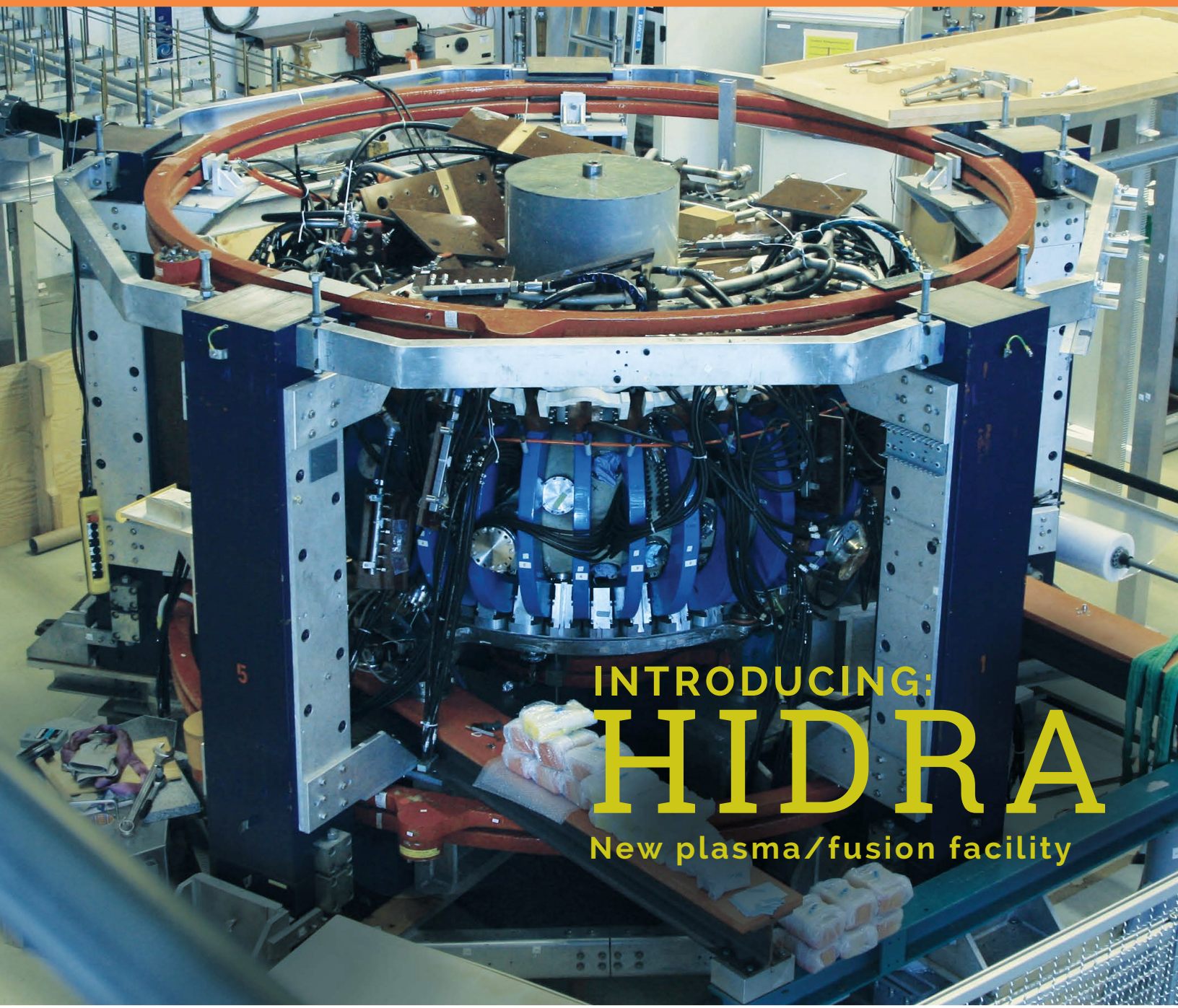
NPRE ILLINOIS

DEPARTMENT OF NUCLEAR, PLASMA, AND RADIOLOGICAL ENGINEERING

FALL 2014

NEWSLETTER FOR ALUMNI & FRIENDS



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DEPARTMENT OF

NUCLEAR, PLASMA, AND RADIOLOGICAL ENGINEERING

James F. Stubbins | department head
Rizwan Uddin | associate head of academic programs
Jean Paul Allain | associate professor
Roy A. Axford | professor
Caleb S. Brooks | assistant professor
Davide Curreli | assistant professor
Brent J. Heuser | professor
Tomasz Kozlowski | assistant professor
Ling Jian Meng | associate professor
Zahra Mohaghegh | assistant professor
Magdi Ragheb | associate professor
David N. Ruzic | professor
Clifford E. Singer | professor
Clair J. Sullivan | assistant professor
Yang Zhang | assistant professor

Jont Allen | affiliate faculty
Michael Aref | adjunct assistant professor
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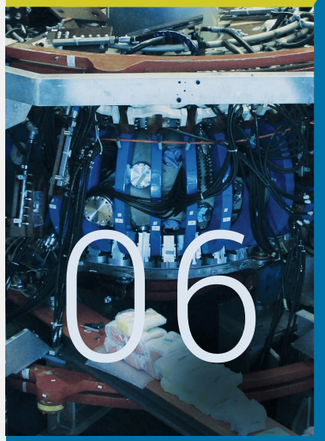

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NPRE's momentum continues to build

Department Head James F. Stubbins

We are thrilled to add another new faculty member this year! This brings the total number of new faculty to seven in the past three years. Our Department has grown to 15 total faculty. With the addition of Dr. Caleb Brooks, an experimentalist in the thermal/hydraulics area, we continue to ramp up the level of vitality and breadth of research interests and capabilities growing ever stronger in the Department. Caleb joins us after recently completing his PhD in the School of Nuclear Engineering at Purdue. We expect to hire one more faculty member this year, and we all are looking forward to more great things to come.

NPRE has taken a very major step forward this year with the acquisition of the WEGA facility from the Max Planck Institute of Plasma Physics in Greifswald, Germany. The Institute is constructing a new, larger plasma experimental facility, and to make way, has given us WEGA. The WEGA device, which has been renamed HIDRA (Hybrid Illinois Device for Research and Applications), gives us a colossal boost in our abilities to perform fusion-relevant experiments on plasma-materials interactions, a hallmark of our plasma program in NPRE. Our new HIDRA experimental facility will be installed later this year and dedicated sometime in Spring 2015. Along with the new facility, we have also hired our first Research Assistant Professor, Daniel Andruczyk, to develop new research activities and educational programs around the HIDRA facility. This additional faculty position and major new experimental facility will allow us to further expand our plasma/fusion efforts.

There are other new major developments this year. Last fall, we had the ABET (formerly the Accreditation Board for Engineering and Technology) visit. The ABET Board met this summer and extended

> "Your contributions to our program over the past year have given us a tremendous lift."

a full six-year accreditation for our bachelor's degree program. I would personally like to thank several of you who helped with this process.

On the heels of the ABET visit last year, we will have a full review of all aspects of the program this year by a five-member External Review Committee. The Committee is comprised of top academic professionals in areas covering our discipline. We are looking forward to this review to show off our many major accomplishments over the past few years. The review, now a campus-wide initiative on a five-year cycle, will take place in mid-November.

Our academic reach has also been extended through the establishment of a new Master of Engineering in Energy Systems degree. This master's degree will bring students together from many science and engineering disciplines to learn broadly about energy systems science and technologies, economics, social and environmental impacts, and management to establish future energy industry leaders.

Also occurring this fall, on November 20, will be the visit of Dr. Peter Lyons, DOE Assistant Secretary for Nuclear Energy. Dr. Lyons will give the inaugural address in our new NPRE Leadership Speaker Series. This will certainly raise our visibility on campus and beyond.

In speaking of our visibility, I would like to take this opportunity to congratulate Prof. Rizwan Uddin, the latest of our faculty to be named a Fellow of the American Nuclear Society. Rizwan's computational contributions to the understanding of nuclear energy and his laudable direction of the cutting-edge Virtual Education and Research Laboratory in NPRE have gained international recognition and make us very proud.

In other good news, we learned over the summer that NPRE and the Aerospace Department will share in a large remodeling project in Talbot Lab. The project with fill in the central space in the building after the removal of the 3-million-pound. testing machine. This will provide major new laboratory space for both departments, much of which will be dedicated to undergraduate teaching labs.

This has been another very productive year for our research and graduate programs. We have won some interesting new research awards, many of which are detailed in the following pages, and continue to be active in other ongoing research activities. We have new Department of Energy Nuclear Energy University Program (NEUP) and Nuclear Regulatory Commission faculty support awards, and have extended our research reach with Prof. Clair Sullivan's two new awards through two major consortia: the Consortium for Nonproliferation Enabling Capabilities (CNEC) and the Consortium for Verification Technology (CVT).

This also has been an extraordinary year for engagement with our alumni, through programs such as our seminar series, Interchange event, and other gatherings. Your contributions to our program over the past year have given us a tremendous lift. We sincerely appreciate those of you who have given generously of your time, energy and resources. We particularly value your help with the ABET review this year. Your support and engagement in the future are encouraged and greatly appreciated. Please come to campus and meet our new faculty when you have the chance. We always value your input to maintain an excellent academic program.

James F. Stubbins
Willett Professor and Department Head

NPRE gains major plasma/fusion facility

The Max Planck Institute for Plasma Physics (IPP) has gifted a multimillion dollar plasma/fusion advanced physics testing facility to the University of Illinois as a result of the relationship the Nuclear, Plasma, and Radiological Engineering plasma/fusion group has developed with the German institute.

"This machine will allow research to be done here that cannot be done anywhere else."

The machine, being renamed the Hybrid Illinois Device for Research and Applications, or HIDRA, will make NPRE one of a handful of US nuclear departments offering such a significant facility for plasma/fusion research and education.

"This machine will allow research to be done here that cannot be done anywhere else," said David Ruzic, NPRE professor and director of the Center for Plasma-Material Interactions (CPMI) at Illinois. "With HIDRA, we will do unique things that are critically needed by the fusion community."

Ruzic and his colleagues secured the device upon learning that the Max Planck Institute in Griefswald, Germany, wanted to replace it with the construction of the world's biggest stellarator, Wendelstein 7-X, (W7-X) a plasma device for controlled nuclear fusion reaction. That project has cost $1 billion over the last 10 years, and will go into operation soon.

Ruzic's former postdoctoral research associate, Daniel Andruczyk, had worked on the machine at IPP prior to coming to Illinois. NPRE recently hired Andruczyk as a research assistant professor to run the machine.

"The machine that we are calling HIDRA was called WEGA, and it was the test bed for many diagnostics and control systems that were being developed for the new W7-X optimized stellarator," Andruczyk said. "I was there for three years working on heating systems and diagnostic development."

Illinois' acquisition of HIDRA began in summer 2013 when Andruczyk, then a research engineer stationed at the Princeton Plasma Physics Laboratory (PPPL); NPRE Assistant Prof. Davide Curreli; and PhD student Peter Fiflis joined IPP scientist Andreas Werner for dinner, and they joked about relocating the facility to Illinois. Later during that conference, the Illinois group ran into Dr. Thomas Klinger, IPP's director, who confirmed that the WEGA facility would be shut down and given away. The possibility of transferring the facility to the Nuclear

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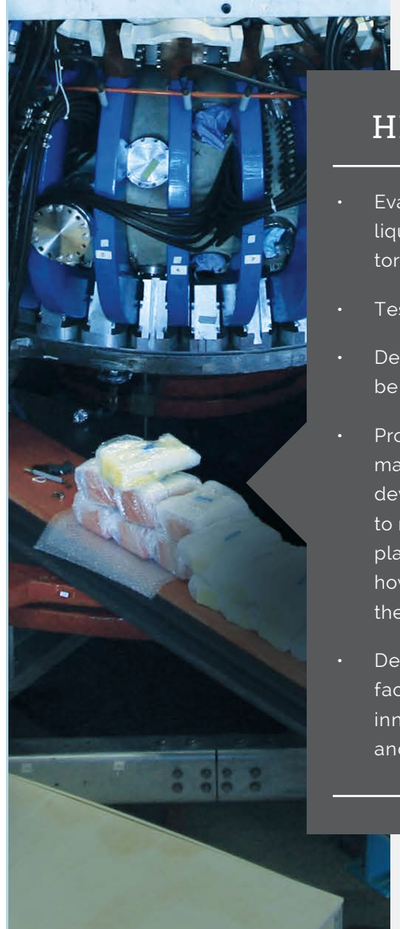

HIDRA'S MANY USES:

The new HIDRA facility, unique in that it combines a tokamak and a stellarator, will be used for a multitude of scientific investigations within NPRE.

A tokamak is a torus- or donut-shaped vacuum chamber surrounded by magnetic coils that create a toroidal magnetic field. A second set of coils along the axis, or the hole in the donut shape, can create a plasma current, which makes an additional magnetic field, effectively twisting it throughout the vessel. This circulates the particles, confining them to the center of the ring, to prevent the plasma from escaping. A drawback of the tokamak concept is it has to operate in pulsed mode because the plasma current is induced by an increasing current in the center coils. Once the voltage driving the current reaches its maximum value, the pulse stops.

A stellarator, on the other hand, can create an indefinite plasma, albeit not at as high a temperature. Also based on a donut-shaped vessel, a stellarator relies entirely on meticulously designed coils to generate a helically-shaped magnetic field containing the plasma.

HIDRA WILL BE USED TO:

- Evaluate whether a full toroidal liquid metal loop can operate in a toroidal machine
- Test low recycling regimes
- Determine whether deuterium can be removed and recycled easily
- Provide a test bed for advanced materials testing, processing, and development of in-situ diagnostics to measure the time-scale of plasma-material interactions and how material surfaces respond to the fusion plasma
- Design an advanced multi-user facility named HIDRA-MAT for innovative materials testing and processing
- Address fundamental problems of edge plasma physics
- Calibrate numerical kinetic models of cross-field electron transport in partially ionized conditions
- Extend CPMI's investigation of lithium walls for small-scale, linear fusion devices to a medium-sized toroidal device
- Explore the science of continuous vapor shielding
- Address fundamental questions regarding the survivability of materials exposed to high heat fluxes

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Radiation Laboratory (NRL), CPMI's home at Illinois, then became serious.

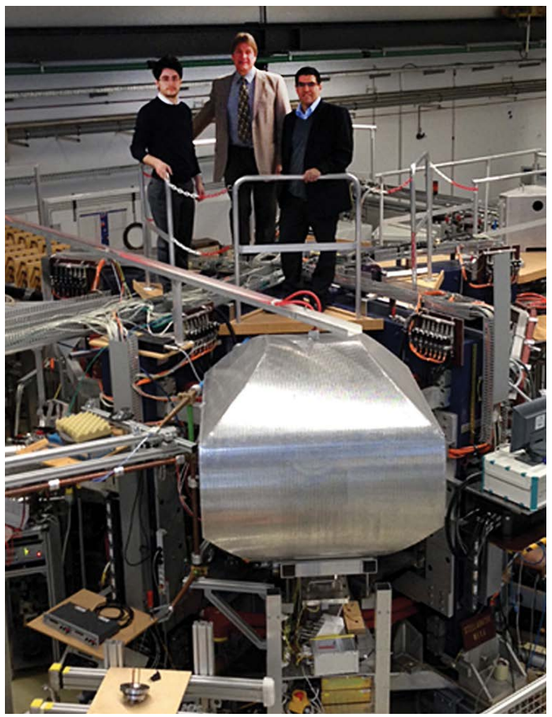
"Hosting a plasma device like HIDRA inside NRL is not trivial," Curreli said. "Prof. Ruzic and [NPRE Associate] Prof. [Jean Paul] Allain gave me full support with the operation, so I proceeded with the investigations and the discussions with IPP.

"I was asking them to give us their million-dollar experiment on which they had worked and conducted research for a decade! And I had to understand exactly the infrastructure required to host and operate that device.

"A big question mark was on the power supplies (they are million-dollar pieces of equipment), that at the end we managed to get. The whole operation involves many technical challenges: it never happened that a European toroidal reactor was moved from Europe to the United States. All its major power components are rated for EU standards, and they must be adapted to operate in the US electrical network."

By January 2014, the technical details were resolved, and Ruzic, Allain and Curreli all traveled to Germany to finalize the deal.

"This is what Illinois does," said Andreas Cangellaris, dean of Illinois' College of Engineering. "Our amazing faculty members like Professors Ruzic, Allain, and Curreli take on projects that strain the limits of feasibility. They look them in the eye. They get the job done. And they open entirely new avenues of research for our faculty and new educational experiences for our students. They do the impossible every day."



From left: Assistant Prof. Davide Curreli, Prof. David Ruzic, Associate Prof. Jean Paul Allain

"Our NPRE program is top notch, and HIDRA has unique features that will further strengthen the U of I's reputation in plasma/fusion research."

Realizing the unique capabilities HIDRA brings to the Illinois campus and the opportunities it will create for disciplines across the College of Engineering as well as beyond the university, the College and the Office of the Vice Chancellor for Research will share NPRE's shipping costs and infrastructure support for HIDRA. The equipment itself will be at no cost to NPRE or the university.

"Our NPRE program is top notch, and HIDRA has unique features that will further strengthen the U of I's reputation in plasma/fusion research," said Peter Schiffer, Vice Chancellor for Research. "I look forward to hearing about the new discoveries that this equipment will enable."

Ruzic and the CPMI team foresee many uses for all of HIDRA's functions. It will be helpful in investigating plasma-material interactions, liquid metals, plasma nano-synthesis, fusion transport models and materials processing. Ruzic said the device will also be available for use by other departments, increasing NPRE faculty's interdisciplinary work.

"We can start collaborating with new people because we have something that can do very unique things," he said. In addition to enabling research, HIDRA will be an exceptional teaching tool. Students will learn as they help rebuild the device this summer and fall. Plans are for Andruczyk to teach 200-level, 400-level and 500-level courses in Fusion Device Operations as early as Spring 2015.

"I will be teaching a class in the design and operations of fusion devices," Andruczyk said. "It's all well and good to know the plasma equations and know the theory, but learning what goes into designing, building and testing such a device is extremely important, and as far as I know there is nowhere else that really offers a course like this."

"WE'RE THE PLASMA PEOPLE."

So begins a new video that details the work and introduces the people of the Center for Plasma-Material Interactions (CPMI) in NPRE.

The video shows CPMI faculty and students working to further the application and knowledge of plasma physics – in fusion energy, semi-conductor processing and industrial plasmas. CPMI is a unique place where experts focus their research on connecting the fundamental science to applied knowledge through both computational and experimental means.

Watch the video at **http://youtu.be/wK2LmlMbl_U**

He continued: "We want to look at not only how to build a machine, to cool the machine, and determine what magnetic fields are needed, but also look into materials, PFC design, diagnostics and control systems. This way, HIDRA can be continuously improved while providing a good hands-on opportunity for students to gain experience in fusion."

Only a handful of other universities, including Massachusetts Institute of Technology and Columbia University in New York City, have comparable fusion facilities.

"We were very fortunate, but this is a case in which hard work produces opportunity," Ruzic said. By hiring both Allain and Curreli in the past year, NPRE has shown an expanded commitment to plasma and fusion science.

"This facility brings a whole new dimension to our research in plasma-materials interactions: research that will provide unique, unrivaled new information about materials performance, and research we can take into the classroom to teach a whole new generation of fusion researchers," said NPRE Department Head Jim Stubbins. "HIDRA is a world-class research facility that will propel our leadership in the field of plasma-materials interactions even further ahead."

DEPARTMENT

Faculty doubles in size, expands areas of expertise

NPRE's faculty has almost doubled in size, with the hiring of seven new faculty members since 2011.

Newest faculty members: Jean Paul Allain, Caleb S. Brooks, Davide Curreli, Tomasz Kozlowski, Zahra Mohaghegh, Clair J. Sullivan, and Yang Zhang

These young assistant and associate professors have significantly strengthened the Department's plasma/fusion focus, and have provided new expertise in nuclear reactor simulations and systems, nuclear materials, probabilistic risk analysis, and radiation detection and homeland security.

"These new faculty members have brought a new vitality to NPRE and have allowed us to move into new and developing areas in our field," said Department Head Jim Stubbins. "They have also brought a new set of strengths to our academic programs, and allowed us to extend and fortify our teaching efforts. We have been extremely fortunate to attract such a talented, dedicated and committed group of new faculty. They bring a wealth of experience to our program from the variety of previous professional positions they held before joining NPRE.

"These new faculty have joined us at a critical juncture in the growth of the program," Stubbins continued. "NPRE has been blessed with a strong and stable faculty for many years leading up to the new faculty hirings. The newest faculty members have built on these strengths and brought new perspectives to the program. Their influence on our undergraduate and graduate programs has been profound: they have substantially broadened our research strengths and led us into new areas, including risk analysis and homeland security. As a further example, with two new plasma/fusion faculty hired a year ago, we were able to acquire the WEGA experimental fusion device. That development would never have been possible without those two new key people.

"NPRE has plans to grow further," Stubbins maintained. "We hope to expand on some of the areas that our newest faculty have opened up. We now have the challenge to find new hires at the same level of excellence and vision as those new faculty who have just joined us."

"They have substantially broadened our research strengths and led us into new areas, including risk analysis and homeland security."

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EXPERIMENTALIST JOINS NPRE

Brooks focuses on multiphase flow and heat transfer

The newest member of the NPRE faculty, Caleb S. Brooks, joins six other young assistant and associate professors who have been hired in the Department since 2011.

Almost doubling NPRE's total faculty numbers, these new hires expand Illinois's expertise in areas of plasma/fusion technologies, probabilistic risk analysis, radiation detection, homeland security, nuclear materials, and nuclear reactor simulations and systems. NPRE has received almost $1.8 million in funding from the US Nuclear Regulatory Commission's program to support the new faculty working in nuclear energy.

Brooks earned his PhD in August from Purdue University under the directions of Profs. Takashi Hibiki and Mamoru Ishii, with the dissertation, "Wall Nucleation and the Two-fluid Model in Subcooled Boiling Flow." Brooks had been working as a graduate research fellow in Purdue's Thermal Hydraulics and Reactor Safety Laboratory. He also earned bachelor's and master's degrees in nuclear engineering from Purdue (2008 and 2012, respectively).

Brooks' research focus will help to fill a gap created with the retirement of Emeritus Prof. Barclay G. Jones, who had made decades-long contributions to nuclear engineering aspects of thermal hydraulics, reactor safety, multiphase flow, boiling heat transfer, and human-machine interfaces for reactor control and simulation.

Brooks believes his modeling and experimental work will be a complement in developing and validating the equations that computer experts – such as NPRE Prof. Rizwan Uddin and Assistant Prof. Tomasz Kozlowski – use in nuclear reactor system simulations.

"With nuclear reactor safety, a lot of attention is going toward the improvement of computational tools," he said. "Fundamental understanding of boiling and two-phase

Assistant Prof. Caleb S. Brooks

(water and steam) flows is still needed to improve the modeling and robustness of these tools."

Information gained from his modeling work can improve the simulations' precision. "It's unfeasible to do full-scale experimental testing, so scaling becomes a very important consideration. Experiments at non-prototypical conditions need to be designed such that the findings can be applied to these very complex systems. With better experimental data more accurate modeling can be developed and implemented, and the simulations can be benchmarked."

The work that Brooks does also can have applications for fusion energy, where extreme heat fluxes present challenges in cooling components; aerospace, in which microgravity conditions complicate traditional approaches to heat transfer; and oil and gas transport, in which fluid fluctuations and build-up of gas in pipes impacts system effectiveness and structural integrity.

In addition to collaborating with Uddin and Kozlowski, the newest NPRE faculty member foresees working as well with other faculty in NPRE and Engineering at Illinois.

"Illinois is such a great school – there are so many resources here," said Brooks. "The NPRE faculty showed they are very interested in the type of research I do, and revamping the previous work of Prof. Jones. I could not have foreseen a better fit for my research and teaching interests than what has been provided here at Illinois."

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ALLAIN AND CURRELI: Strengthening plasma/fusion group

With the recent acquisition of the HIDRA tokamak/stellarator facility (see p. 6), and the 2013 additions of Associate Prof. Jean Paul Allain and Assistant Prof. Davide Curreli, along with the considerable contributions of veteran Prof. David Ruzic and his Center for Plasma-Material Interactions (CPMI), NPRE has become a significant force in plasma/fusion science.

Allain is interested in using radiation-induced synthesis to establish a new class of materials, and examines the integral role nuclear materials science, quantum computing and nuclear detection, radiation-modified surfaces play in biomedical areas. He is an affiliate of the Bioengineering and Materials Science and Engineering departments at Illinois as well as an NPRE faculty member.

He believes the new HIDRA facility will provide a useful test bed for his team's development of in-situ diagnostics that can measure in the time-scale of plasma-material interactions how material surfaces respond to the fusion plasma.

From left: Associate Prof. Jean Paul Allain, Assistant Prof. Davide Curreli

"Computer-aided design of plasma devices allows huge reductions of development costs in both research and industry."

"We will also design an advanced multi-user facility for innovative materials testing and processing in a station we have named HIDRA-MAT," Allain said.

Curreli concentrates his research on developing numerical simulations of plasmas.

"Computer simulations can provide a much bigger amount of information on a given plasma process," he said. "Computer-aided design of plasma devices allows huge reductions of development costs in both research and industry, giving the possibility to know before building what the performance of a device will be."

Among uses Curreli believes the CPMI team will have for HIDRA will be in addressing fundamental problems of edge plasma physics, in which the plasma interacts dynamically with background gas and material walls in nuclear fusion reactors.

"One of the biggest problems is, for example, the 'cross-field electron transport,' that is related to how the plasma electrons behave in presence of a strong magnetic field," he said. "We can think of targeted experiments on HIDRA to validate electron transport models."

Assistant Prof. Tomasz Kozlowski

KOZLOWSKI: Improving reactor safety through computer simulations

Assistant Prof. Tomasz Kozlowski directs computer simulations that support a $3.5 million US Department of Energy (DOE) project aimed at improving cladding for nuclear fuel rods.

Led by Prof. Brent Heuser, the project has been in response to the 2011 nuclear disaster at the Fukushima site in Japan. Although the accident scenario that occurred in Japan is extremely unlikely in the United States, a proactive response to develop improved nuclear fuel is considered prudent within the worldwide nuclear industry.

Kozlowski is one of a growing number of researchers taking advantage of high-performance computers such as the Illinois Campus Cluster to predict optimal outcomes prior to experiments and in some cases to explain the outcomes afterward.

"All my research is computational," Kozlowski explained. "I am able to simulate nuclear accidents by projecting the deterioration of reactor conditions due to mechanical failures, such as pipe breaks and fuel degradation. That involves heavy simulation of fluid flow, neutron transport and material performance."

Kozlowski solves special differential equations for neutron transport using both the deterministic and the Monte Carlo methods.

"That is theoretically a very accurate method, but because it's computational intensive, it can be very slow. The Campus Cluster allows me to quickly calculate the neutron and power distribution inside the reactor, which is almost as good as an experiment."

Kozlowski works with a team of scientists from Illinois, the University of Michigan, University of Florida and Idaho National Laboratory, with manufacturer ATI Wah Chang from Albany, Ore., assigned to help produce new materials. The United Kingdom has contributed $1.5 million by joining the American partners with some principal investigators from the University of Manchester.

The current standard for cladding are zirconium-based alloys. These alloys react with steam at high temperature. The resulting zirconium oxide liberates hydrogen, which is a flammable gas. The goal of the current grant is to propose another material that could be a replacement for the current cladding material or a coating that would prevent water from coming into contact with the Zr-based cladding.

In his computer modeling, Kozlowski is testing the response of the reactor when factoring in other variables such as a change in materials, geometry and temperature.

"Many of the possible candidates for coatings may have negative effects on reactivity, and require more frequent fuel replacement or increasing the amount of fissile material required for the reactor to become critical," he said.

Kozlowski indicates that convincing industry to replace anything that it is currently using will be difficult, but not impossible. The DOE philosophy is to develop new or modified fuel materials to be deployed in existing reactors.

"Changing the cladding material would take around 15-20 years," Heuser said. "We're hopeful that if we can find a coating that works, the time frame would be much shorter. The goal would then be deployment on a shorter time scale."

Simulations will help researchers reach that goal, Heuser concluded. "Computation is proving very important. We want to take an intelligent approach to performing calculations that will guide future experimental campaigns."

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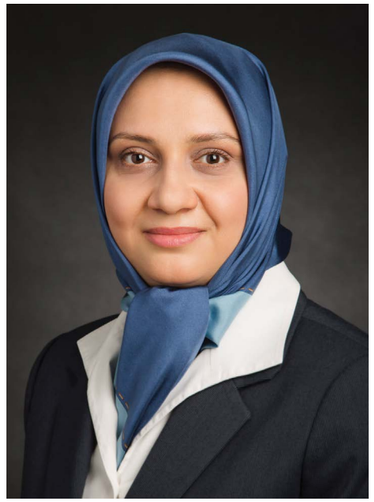
MOHAGHEGH: Socio-Technical Risk Analysis Initiative

Risk analysis is the solution to complex problems, and represents the pinnacle of interdisciplinary research and education. Following the Three Mile Island disaster in 1979, probabilistic risk assessment (PRA) has become a key pillar of the risk-informed nuclear regulatory framework, and is now a requirement for every nuclear power plant (NPP) in the United States. Enhancing the prevention of catastrophic technological accidents and the protection of environment requires advancement in multidisciplinary PRA. It demands the development of a common vocabulary within diverse engineering and social science domains in order to address risks emerging from the interface of social and technical systems.

Worldwide, there are very few engineering faculty with interdisciplinary educational training in both reliability engineering and socio-technical risk modeling. Assistant Prof. Zahra Mohaghegh brings to the University of Illinois this unique interdisciplinary background along with over 10 years of experience in PRA methodologies and applications. She has pioneered the development of Socio-Technical Risk Analysis (SoTeRiA), which is a multi-level theoretical risk framework, and is now the name of Mohaghegh's research team in NPRE.

The SoTeRiA research team (soteria.npre.illinois.edu) has expanded quickly since January 2013, when Mohaghegh joined NPRE. The team has been committed to solving complex problems by making scientific contributions, and by building collaborations with multiple departments at Illinois, national laboratories, industry partners, and international institutions. The group currently includes PhD and master's degree students, undergraduate and international interns, a postdoctoral research associate, and a research scientist, from diverse domains including nuclear engineering, mechanical engineering, industrial engineering, and information science. As an advisor of multidisciplinary graduate projects, Mohaghegh is affiliated with Industrial and Enterprise Systems Engineering (ISE), the Graduate School of Library and Information Science (GSLIS), and the Institute of Informatics, all at Illinois, in addition to her NPRE appointment.



Assistant Prof. Zahra Mohaghegh

The collaboration of the SoTeRiA team has led to the improvement in socio-technical risk theories and the integration of deterministic and probabilistic techniques.

The collaboration of the SoTeRiA team has led to the improvement in socio-technical risk theories and the integration of deterministic and probabilistic techniques. The theoretical contribution of SoTeRiA projects is the incorporation of two types of underlying phenomena into PRA (i.e. physical and social failure mechanisms). This incorporation helps identify and manage root causes of systems failure and reduces unnecessary conservatism in NPP operation and design. The methodological contributions of these research projects relates to the integration of classical PRA techniques with simulation-based methods, leading to the development of an Integrated PRA (I-PRA) that enables the modeling of emergent risk behavior by depicting the dynamic interactions of risk contributing factors within their ranges of variability and uncertainty. These cutting-edge PRA models are quantified with state-of-the-art big data analytics techniques, which expand the classical approach of data extraction and implementation for risk analysis. SoTeRiA's research is the first application of big data analytics for PRA, and access to the National Center for Supercomputing Applications (NCSA) at Illinois will facilitate SoTeRiA's leadership in this area.

Some of SoTeRiA's ongoing research projects include: fire PRA in NPPs; probabilistic physics modeling for location-specific loss of coolant accident (LOCA); incorporating human error and organizational factors in technical system risk models; socio-technical risk-informed emergency preparedness, planning and response modeling for severe nuclear power accidents; and evaluating the monetary value of PRA.

Since January 2013, the SoTeRiA research team has supported a large-scale project, the Risk-Informed Resolution of Nuclear Regulatory Commission's Generic Safety Issue 191 (GSI-191). The project, sponsored by the South Texas Project Nuclear Operating Company (STPNOC), is conducted in collaboration with the University of Texas at Austin, ABS Consulting, Alion Science and Technology Corp, Texas A&M University, and the University of New Mexico. The main objective of the Risk-Informed GSI-191 project is the quantification of risk associated with fibrous insulation material in the STPNOC containment building using PRA, uncertainty quantification, thermal-hydraulic analysis, and laboratory experiments.

SoTeRiA team members have organized, chaired and presented the results of their research at both the American Nuclear Society Risk Management Embedded Topical Meeting and the International Probabilistic Safety Assessment and Management Conference. Recently, one graduate researcher from the SoTeRiA team, Nick O'Shea, was awarded a three-year fellowship from the Department of Energy to support his risk analysis research.

Mohaghegh has also focused on the development of new risk analysis courses in NPRE, which not only enhances graduate research studies, but also prepares engineers and analysts to enter into the nuclear industry and regulatory agencies with a better understanding and knowledge of uncertainties, and how to prevent the "unexpected."

SULLIVAN: Radiation detection contributes to arms control, emergency response work

Since joining NPRE's faculty in 2012, radiation detection expert Clair Sullivan has grown a large research program, with major awards from organizations such as the National Nuclear Security Administration (NNSA).

Sullivan, an assistant professor, has been granted $2.25 million in research funding as part of larger efforts by NNSA to verify nuclear arms control, and enable capabilities for nonproliferation.

Over the next five years she will have available $750,000 from a $25 million grant to the Consortium for Verification Technology (CVT) for research and development in nuclear arms control verification technologies, including nuclear safeguards effectiveness. The consortium includes scientists from 13 universities and eight national laboratories.

Sullivan said one key aspect to aiding the United States in treaty verification is in making sure there are information barriers in place. This ensures that countries are living up to their treaty obligations regarding nuclear weapon dismantlement and nuclear material blend-down without compromising their sensitive state secrets. Better isotope identification algorithms, such as those developed in Sullivan's Radiation Detection and Isotope Identification lab, can help provide such information barriers to allow the US to conduct treaty verification.

Assistant Prof. Clair Sullivan

Nuclear safeguards support the International Atomic Energy Agency's mission to monitor the Nuclear Nonproliferation Treaty and the commitments of signatory countries to refrain from developing new nuclear weapons. Other work under the consortium will include efforts in geophysical modeling for the detection of underground nuclear detonations to support test monitoring.

Sullivan will also get $1.5 million over five years from another $25 million grant to the Consortium

for Nonproliferation Enabling Capabilities (CNEC). Comprised of researchers from eight universities and several national laboratories, CNEC will provide the US government with cutting edge research and development to identify and address multi-disciplinary and cross-functional technology and research needs that are critical to detecting foreign nuclear weapon proliferation activities.

Sullivan said the CNEC grant covers nonproliferation issues other than radiation detection. Specifically, the consortium's research projects will include technologies to enhance simulation capabilities, algorithms, and modeling; new test and evaluation models for detection sensors; new remote sensing capabilities; and applications of data analytics and data fusion to better characterize and detect special nuclear materials.

SULLIVAN CHOSEN FOR DARPA YOUNG FACULTY AWARD

Assistant Prof. Clair Sullivan has been chosen to receive the prestigious Young Faculty Award from the Defense Advanced Research Projects Agency (DARPA) for work that combines nuclear engineering with big data analytics.

The project, "A New Approach to Stand-Off Detection of Special Nuclear Material Using Big Data Analytics," is aimed at sorting potential radiation threats from non-threatening stimuli.

It is possible to create very dense networks of radiation detectors using commercial, off-the-shelf technology. "[The equipment] can pick up all kinds of nuisance alarms; it's a total needle in the haystack kind of problem," Sullivan said.

Her solution is to pull in other sources of informational data – such as real-time weather, traffic patterns, GIS information, and other open-source data – to adjudicate potential detection on the radiation network.

"When you have a puzzle, what do you do? You start by grouping together like colors, then the edges, so you can start assembling," she said.

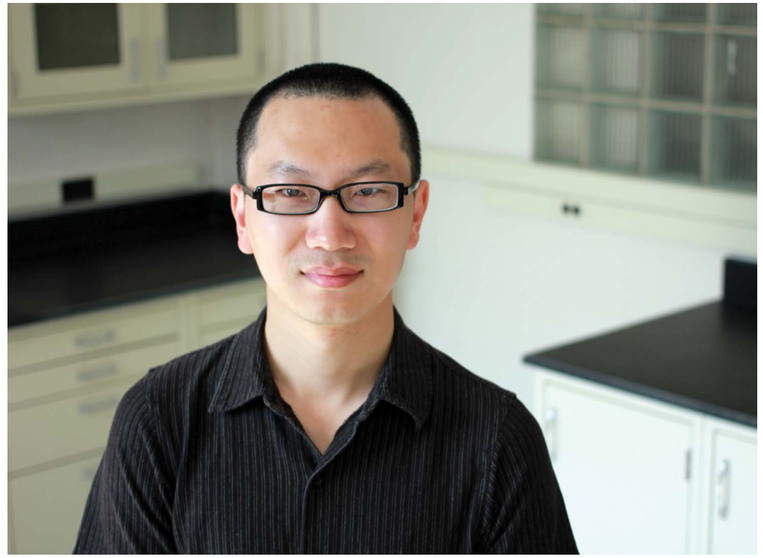
"Big data" is defined by the "four Vs": volume, velocity, veracity, and variety. The volume of data in true big data is considered to be larger than any single computer or cluster of computers can analyze. Velocity refers to the fact that all data useful to this project is in constant motion between the cloud and several series of computer servers. Data veracity suggests not all the data points within a data stream are correct, thus requiring complicated filtering mechanisms. Finally, proper analytics require the inclusion and analysis of a variety of data types to adjudicate an alarm.

"Then you look for hits in the time-tagged, geo-tagged data," Sullivan said.

The objective of the DARPA Young Faculty Award (YFA) program is to identify and engage rising research stars in junior faculty positions at US academic institutions and expose them to Department of Defense (DOD) needs as well as DARPA's program development process.

The YFA program provides funding, mentoring, and industry and DOD contacts to awardees early in their careers so they may develop their research ideas in the context of DOD needs. The program focuses on untenured faculty, emphasizing those without prior DARPA funding. The long-term goal of the YFA program is to develop the next generation of academic scientists, engineers and mathematicians in key disciplines who will focus a significant portion of their career on DOD and national security issue.

ZHANG: Group discovers atom movement rules in ionic glass material



Assistant Prof. Yang Zhang

The way that atoms move within a class of network-forming ionic glass materials depends upon whether the material consists of an odd or even number of atomic structural units, Illinois researchers have discovered.

Assistant Prof. Yang Zhang and his graduate student, Ke Yang, co-supervised by Chemistry Prof. Jeffrey S. Moore, have been joined by Dr. Madhusudan Tyagi, a research scientist at the National Institute of Standards and Technology (NIST), in investigating whether these characteristics of species of ionic glass can help them in creating a new intrinsically self-healing material.

The group discovered the phenomenon in observing liquid material as it cooled and formed glass. The Journal of the American Chemical Society published their work online. The odd-even effect previously had been documented in crystalline material, but had not been known in amorphous or glassy material, where the atomic or molecular arrangements are disordered. In solid crystals, the odd-even effect is determined by how the crystals' atoms are structured or packed. In ionic glasses, which are essentially extremely viscous liquids, the odd-even effect is dynamic and is determined by how the atoms move, Zhang said. The researchers discovered that the material made of an even number of atomic structural units becomes a glass quicker upon being cooled than the material with an odd number of atomic structural units.

The group has been working at the NIST Center for Neutron Research in Gaithersburg, Maryland, to conduct neutron scattering experiments to better understand the microscopic origin of the odd-even effect. The potential for self-healing lies in controlling the atoms' movement to fill cracks or fractures within a material.

Many self-healing materials rely on additional agents to promote self-healing. Zhang and Moore see a potential for the ionic glass material to achieve repeated self-healing cycles and improved efficiency to adapt to dynamically changing environments. The scientists believe the material could be useful in coatings for residential and industrial use.

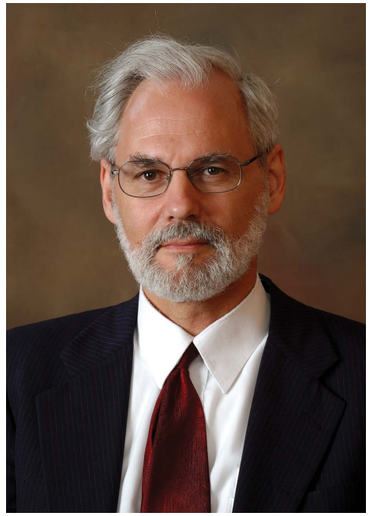
Zhang and Moore see a potential for the ionic glass material to achieve repeated self-healing cycles and improved efficiency to adapt to dynamically changing environments.

College now offers Master of Engineering in Energy Systems

More and more, the global workforce demands professionals with training in energy areas and sustainable engineering. Private firms, public agencies and laboratories working toward modern energy solutions deal with multiple aspects of energy systems. Managers in modern industry are looking for people with a firm understanding of these different aspects, and the ability to communicate with colleagues working across traditional disciplinary lines.

In one year, students can earn this professional master's degree that will prepare them for leadership positions in the energy industry. Learn more at ease.illinois.edu.

To meet this need, the College of Engineering at Illinois began offering a Master of Engineering in Energy Systems degree in Fall 2014, with NPRE administering the program. This degree will provide a broad interdisciplinary education in energy systems for a variety of students who will find such a background useful in the pursuit of their career goals.



Co-Director Clifford Singer

The inaugural offering has attracted four students, and more are expected as the program becomes established and its benefits become known to energy companies and professionals.

Clifford Singer, College of Engineering Initiative on Energy and Sustainability Engineering Co-Director, notes, "We are delighted that students have already been admitted to a degree program only first announced this year, and that three of them were already placed in organizations dealing with energy systems before the start of the fall semester."

"The degree program will educate some of our best students broadly in the energy systems and energy analysis areas," said NPRE Department Head Jim Stubbins. "This broad background will provide the overarching perspective they will need as they move into leadership positions in the energy industry."

Solar panels on the Illinois campus

The degree requires 32 hours of graduate credit, consisting of courses in core material, a primary field area, an area of specialization, individually tailored work in a practicum or project, and topical breadth. Primary fields and areas of specialization include:

- Electrical Energy Conversion, Transmission, and Distribution
- Thermal Energy Systems and Combustion Engines
- Chemistry and Chemical and Materials Engineering
- Nuclear Power Generation
- Wind Energy
- Solar Energy and Climate Change
- Environmental Engineering for Energy Applications
- Biomass Energy Resources
- Geologic Energy Resources
- Energy Markets, Reliability, Safety, and Security

The master's degree is designed for students who do not expect to pursue a PhD and who are self-supporting financially, or who have outside sources of financial support. Degree requirements can be met by combining academic work with an internship or outside employment, providing for some students a potential avenue for financial support.

Students with bachelor's or master's degrees in the natural sciences or engineering will be considered for admission if they have a 3.00 grade point average on a 4.00 scale for the last two years of their undergraduate study. A background in engineering is not required for admission to the Master of Engineering degree program.

Prospective applicants should apply via Graduate College Admissions to the College of Engineering Master of Engineering degree program and indicate an interest in the Energy Systems Concentration.

For more information, consult ease.illinois.edu and contact Singer at csinger@illinois.edu or Associate Dean William Butler at gpp@illinois.edu.

"The degree program will educate some of our best students broadly in the energy systems and energy analysis areas."

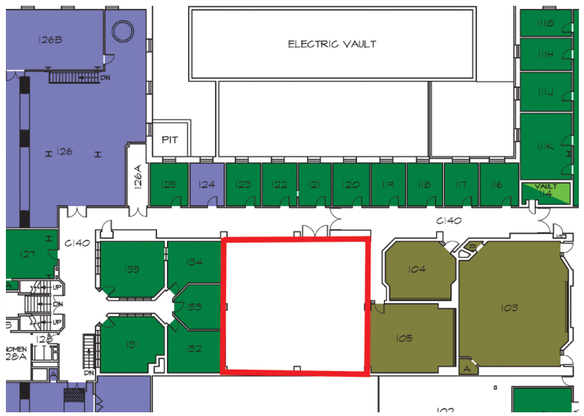
Lab expansion to benefit students, researchers

A $3.2 million project for renovating the Talbot Laboratory building will include a major upgrade and expansion of instructional laboratories for NPRE.

Talbot Lab renovation highlights:
$3.2 million
Begins in 2015
Complete in 1 ½ - 2 years
2,100 sq. ft. on first floor dedicated to NPRE

In particular, NPRE will enhance students' educational opportunities at Illinois with a new Radiation Measurements Instructional Laboratory, new Fluids Laboratory, and a new Nuclear Materials Laboratory.

"This additional space will allow us to transform our undergraduate teaching experience to include more hands-on educational opportunities," said Department Head Jim Stubbins. "This will include an expansion of the radiation measurements experimental opportunities, and allow us to re-establish a much stronger effort in fluids and heat transfer for nuclear systems and in nuclear materials.



Talbot Lab first-floor renovation plan

"We also feel that this will allow us to complement our major lecture courses with a much stronger experimental background," Stubbins continued. "Some of this space will allow us to expand areas of our research efforts. This, again, will have a major impact on both our undergraduate and graduate programs."

According to the plan, NPRE will claim 2,100 square feet on the building's first floor for the instructional laboratories.

The new space is in the center of Talbot Laboratory. It also is directly adjacent to the recently remodeled Virtual Education and Research Laboratory (VERL) that contains Prof. Rizwan Uddin's VisBox, a state-of-the-art, 3-D visualization system. This proximity will allow NPRE to more closely integrate the power of the virtual learning techniques with direct hands-on experiments.

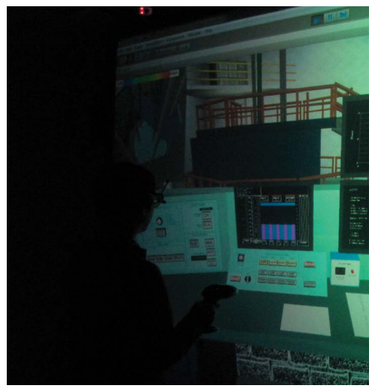
"We foresee that this combination will provide a unique instructional environment where concepts can be experienced in both virtual and real space to provide a more comprehensive understanding of the underlying principles," Stubbins said.

Talbot Laboratory on the Bardeen (Engineering) Quad

"This additional space will allow us to transform our undergraduate teaching experience to include more hands-on education opportunities."

NPRE plans to expand the student computer facilities in conjunction with lab development to provide a better coordination between the experimental and (computer) analysis functions of both the Radiation Measurements and the Nuclear Materials labs.

Construction, which requires the removal of the Mechanical Testing Facility (MTF) 3-million-pound press that starts from the building's basement and rises three floors, could start next summer. Once the space is cleared, the construction should proceed rapidly so that the new lab space could be available in 1½-2 years.



Visbox 3-D visualization system, adjacent to the renovated lab space

The renovation was one of four College of Engineering at Illinois projects picked for the University of Illinois Urbana Campus Facilities Matching Funds Program. The campus, the College of Engineering, NPRE, and the Department of Aerospace Engineering that is also housed in the building and will also gain instructional laboratories, will share the project's costs.

The Radiation Measurements lab, taking up half the available space, will support NPRE radiological students as well as a growing number of students and interactions in the areas of nuclear medical imaging and nuclear medicine therapeutic technologies.

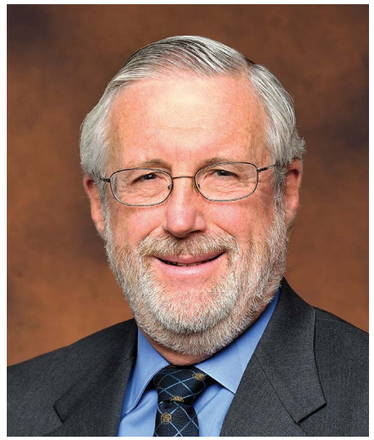
The space would house the facilities for NPRE 444, Nuclear Analytical Methods Lab. That course currently has no assigned laboratory space, although the course is required for NPRE students in the radiological degree path and is an open elective for other students. Bioengineering students interested in these technologies are likely to participate in the course. Also expected to participate are a growing number of graduate students who use the course as a basis for advanced research in the areas of radiation detection with applications in homeland security and medical imaging.

The Nuclear Materials Laboratory, taking up the remaining NPRE space in the renovation, would complement the Materials Properties Instructional Laboratory on Talbot's second floor. The new materials lab also would provide significant instructional space for developing new materials with irradiation resistance and advanced mechanical properties. The new lab would furthermore concentrate on testing and analysis facilities that would not be available elsewhere in the college.

DEPARTMENT

Leadership Speaker Series: A forum for global ideas

Providing a forum for global leaders to present policies and platforms that shape the sciences of nuclear, plasma, and radiological disciplines is part of NPRE's mission.



Dr. Peter B. Lyons, US Assistant Secretary for Nuclear Energy

Helping the Department accomplish this goal is the newly created NPRE Leadership Speaker Series, an effort NPRE and its sponsoring alumni group, the Constituent Alumni and Industry Advisory Board, believe will carry impact across the University of Illinois and beyond.

"This new speaker series will provide NPRE with the ability to invite major leaders in the nuclear and related areas to campus," said Department Head Jim Stubbins. "We envision this as an opportunity to provide the entire campus community with a broader perspective on the things we do and raise the visibility of NPRE on campus and beyond.

"We also see this as a golden opportunity for our students and faculty to interact with the top leaders in our community to exchange ideas and to impress them with our capabilities," Stubbins said. "This is an annual event and in the coming years we expect to invite leaders from all parts of the nuclear, plasma, and radiological areas as well as those dealing with even broader issues of social and technical impact. We are extremely delighted to have Dr. Peter Lyons, a leader who has had such broad impact on the nuclear field, as the inaugural speaker in this series. He certainly sets a high standard for us to meet with future speakers."

Dr. Peter B. Lyons, US Department of Energy Assistant Secretary for Nuclear Energy, will deliver the series' inaugural talk on Thursday, November 20. Open to the public, the talk will be at 3 p.m. in Room 1122 of the National Center for Supercomputing Applications building on the Urbana campus.

Lyons was confirmed as the Assistant Secretary on April 14, 2011, after serving as the Acting Assistant Secretary since November 2010. He was appointed to his previous role as Principal Deputy Assistant Secretary of the Office of Nuclear Energy (NE) in September 2009.

Under Lyons' leadership, the Office has made great strides in incorporating modeling and simulation into all programs through the Nuclear Energy Advanced Modeling and Simulation program and the Energy Innovation Hub. He focused on management of used fuel by contributing to the development of the Administration's Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste. In addition, NE established the Small Modular Reactor Licensing Technical Support program for a new generation of safe, reliable, low-carbon nuclear energy technology. And he championed the Nuclear Energy University Program, which has successfully supported NPRE and other US universities in preparing the next generation of nuclear engineering leaders.

Prior to joining DOE, Lyons was sworn in as a Commissioner of the Nuclear Regulatory Commission (NRC) on January 25, 2005, and served until his term ended on June 30, 2009. At the NRC, Lyons focused on the safety of operating reactors, even as new reactor licensing and possible construction emerged. He was a consistent voice for improving partnerships with international regulatory agencies. He emphasized active and forward-looking research programs to support sound regulatory decisions, address current issues and anticipate future ones. He was also a strong proponent of science and technology education.

Before becoming a Commissioner, Lyons served as Science Advisor on the staff of US Senator Pete Domenici and the Senate Committee on Energy and Natural Resources where he focused on military and civilian uses of nuclear technology from 1997 to 2005. From 1969 to 1996, Lyons worked at the Los Alamos National Laboratory where he served as Director for Industrial Partnerships, Deputy Associate Director for Energy and Environment, and Deputy Associate Director-Defense Research and Applications. While at Los Alamos, he spent over a decade supporting nuclear test diagnostics.

Lyons has published more than 100 technical papers, holds three patents related to fiber optics and plasma diagnostics, and served as chairman of the NATO Nuclear Effects Task Group for five years. He received his doctorate in nuclear astrophysics from the California Institute of Technology in 1969 and earned his undergraduate degree in physics and mathematics from the University of Arizona in 1964. Lyons is a Fellow of the American Nuclear Society, a Fellow of the American Physical Society, and was elected to 16 years on the Los Alamos School Board.

Lyons grew up in Nevada and is a resident of Washington, DC.

RECEPTION TO HONOR AXFORD

NPRE has invited alumni and friends to join us in Santa Fe, New Mexico, on Sunday, Nov. 2, 2014, for a Celebration of Prof. Roy Axford, a reception recognizing Axford's outstanding contributions to nuclear science and education.

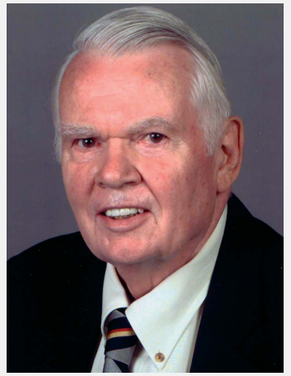
Over the past five decades, Axford has become one of the most decorated teachers at the University of Illinois. Many of his graduate students have enjoyed notable careers in national laboratories.

As a tribute, the Department is making the Roy Axford Fund a priority for fundraising efforts.

"Through his meticulous devotion to teaching, Roy has touched the lives of almost every NPRE student over the past five decades," said Department Head Jim Stubbins. "Our vision is to grow the Axford Fund to provide scholarships for undergraduate students, and possibly fellowships for graduate students. In this way, Roy's influence will continue to be felt for years to come."

To make a gift with the online donation form, visit NPRE.illinois.edu/giving-opportunities and choose the Axford Fund.

The reception will be held from 3-5 p.m. at La Fonda on the Plaza, 100 E. San Francisco St., Santa Fe, NM 87501.



Prof. Roy Axford

Watch: "A Word from Roy Axford"
http://youtu.be/YdN87P-32gc

Interchange: Six years of making connections

Now in its sixth year, the Interchange event presents students with a plethora of opportunities open to nuclear, plasma/fusion, and radiological engineers. It also brings to campus alumni and company representatives who enjoy meeting the bright young minds who will shape their professions.

Through Interchange, students network with the visitors about industries, national laboratories and regulatory agencies that encompass NPRE's disciplines.

"Interchange originated as we had a number of alumni who wanted to reconnect with the department while returning to campus for Homecoming," said Becky Meline, Coordinator of Academic Programs. "As well as seeing familiar faculty faces, these visiting alumni wanted to meet some of our current students to learn about what the new generation experiences in our program. In the process, our students benefit from this opportunity to network with our alumni who are established professionals in the related industry and research fields."

Interchange dates have shifted now so that sometimes they coincide with Homecoming, such as the 2014 event. But, the purpose has remained to connect alumni and constituent friends with NPRE faculty and students to the common benefit of all as the word "interchange" suggests: "the action of interchanging things, especially information" or a "reciprocal exchange."

Recently, a student returning from an internship with Exelon Corp. illustrated to Meline how beneficial this exchange can be.

"He believed that, because of Interchange, he made the connections that resulted in his getting the internship," she said. "He further credited the internship with helping him to see the industry applications of the theory learned in his classes, and with convincing him to pursue a career in the nuclear utilities."

"Meeting with our students is definitely a high point for our visitors," Meline pointed out. "The College of Engineering and NPRE at Illinois have excellent students, and we like to show them off!"

NPRE alumnus Gabriel Chavez, a DCS Senior Program Manager for Exelon Generation Corp., has participated in Interchange.

"NPRE Interchange is a great forum for students to ask working professionals about the specific areas they're interested in," Chavez said. "While Engineering Open House and the Engineering Expo are great opportunities to engage companies, Interchange provides a more personal setting: groups tend to be small and give the students the opportunity to ask questions that are relevant to them."

Enrollment numbers in nuclear engineering programs have fluctuated over the decades, Meline noted, and programs such as Interchange give NPRE students an indication of future prospects.

"It is vital to the continued viability of NPRE that the students see what they might do with an NPRE degree in one, three, five, 10, 20 or more years after graduation," she maintained. "And that's one of the pluses meeting with our Interchange visitors provides our students; our students see the different professional trajectories and paths they can take."

Interchange is a flexible event so that alumni and constituent visitors can choose the activities they believe will accomplish the most while they are on campus. The standard format has involved small group informational sessions with students, and a more formal panel discussion in which visitors present their organizations and the ways students might become involved. Other activities, including student mock or actual interviews and resume reviews, can be arranged, as well as meetings with faculty and research laboratory tours.

Visitors interested in participating should contact Meline at bmeline@illinois.edu.

Sullivan teams with Google to develop radiation detection equipment

Assistant Prof. Clair Sullivan believes her project with Google Glass could lead to a handy piece of equipment for first responders.

Sullivan's Google Glass display

Military personnel, policemen and firemen often carry 40 pounds of equipment, and are reluctant to add to that weight. But, said Sullivan, "The real estate of their eyes is not going to be used by them."

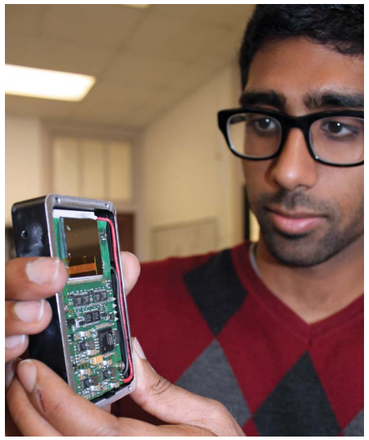
"We have all this information [that radiation sensor network can potentially provide], but how are we going to convey that to the people that really need it?" she asked.

Google invited Sullivan to become a Google Glass Explorer, which is a beta tester for the product to help resolve that question. The see-through, heads-up display that Sullivan is developing with Google Glass will provide emergency personnel with real-time information about possible nuclear and/or radiological threats, she said. As they walk about, the responders will see through the glasses a small display that will reveal radiation levels to them.

Once alerted, the emergency workers can gain further information using the device's global positioning system, and can report on the situation using the device's built-in phone system and Gmail account. Google Glass also can detect audio commands from the wearer, Sullivan said.

Meng's new SPECT device greatly improves sensitivity, resolution

Associate Prof. Ling-Jian Meng and his students have developed a new device that should greatly improve sensitivity and resolution capabilities available through radiological imaging.



"The advanced technology holds promise for gamma camera use in mainstream nuclear medicine."

The advanced technology holds promise for gamma camera use in mainstream nuclear medicine, and could lead to the development of gamma ray microscopes in biological laboratories.

Meng's device increases by several thousand the number of micro cameras used for single-photon emission computed tomography (SPECT) imaging. The key innovation of the group's artificial compound eye (ACE) gamma camera for SPECT Imaging is the combination of state-of-the-art ultrahigh resolution semiconductor detector technologies and advanced aperture fabrication techniques into a highly sensitive gamma camera design for SPECT imaging.

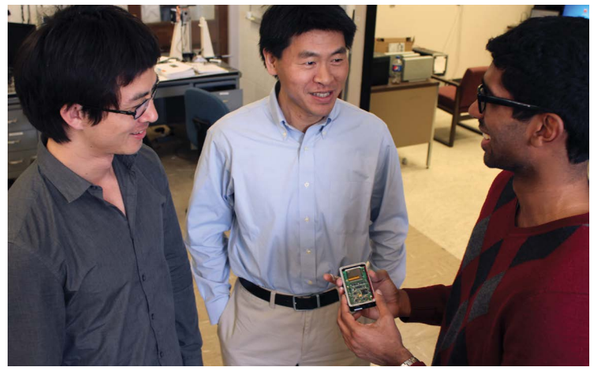
"This might open great possibilities in the future for SPECT imaging," Meng predicted.

Recent advances in detector technology and readout electronics that have resulted in the rapid decrease in detector size have allowed the group to pack more cameras into a much smaller space. Previously, a typical gamma camera could be 40 by 40 centimeters in size; now they could be shrunk to a few centimeters, Meng said.

While current SPECT instruments held fewer than 100 cameras previously, they can now contain up to tens of thousands of micro-camera elements. These improvements allow for more options in focusing the mini cameras and optimizing the visible area.

Meng said the new device provides very detailed spatial resolution while focusing on a very small number of cells to image.

His group currently holds a utility patent on their device, which is biologically inspired in mimicking and inverting the vision of a fruit fly. The group is working with colleagues from Harvard Medical School and Brookhaven National Laboratory on the research, which the National Institutes of Health is funding. Meng said remaining challenges are the cost of materials for hardware and the need to gather together expertise in several areas: detector physics, image processing, system integration, biology and chemistry. This work is supported by a new grant from the National Institute of Biomedical Imaging and Bioengineering (NIBIB).



From left: Xiaochun Lai, graduate student; Associate Prof. Ling Jian Meng; Jon George, graduate student

From top: Becky J. Meline, Prof. David N. Ruzic

Meline, Ruzic earn advising, teaching honors

Becky J. Meline has earned kudos for her work in advising students, and Prof. David N. Ruzic has been recognized as Teacher of the Year.

Celebrating 10 years of service to the University of Illinois at Urbana-Champaign, Becky Meline, Coordinator of NPRE Academic Programs, was recognized at the 2014 NPRE/ANS Honors Banquet in April. Veteran Prof. David Ruzic also was recognized as the 2014 NPRE Teacher of the Year.

Receiving the Engineering Council Award for Excellence in Advising the past three years as well as in 2010, Meline advises all NPRE incoming freshmen and transfer students on course registration and works. Her door is constantly open to the nearly 170 undergrads and 70 graduate students who call NPRE home.

Ruzic has earned the Teacher of the Year honor many times in NPRE, as well as most all teaching awards the College of Engineering and campus has to offer. In Spring 2014 he taught NPRE 101, Introduction to Energy Sources, a course that attracts students from across the College. Ruzic taught NPRE 423, Plasma Laboratory, in Fall 2013. Both semesters he was included on the campus List of Teachers Ranked as Excellent by Their Students.

NPRE Teachers Ranked as Excellent by their Students

Fall 2013
Jean Paul Allain
Michael D. Kaminski
David N. Ruzic
Clair J. Sullivan
Rizwan Uddin
Yang Zhang

Spring 2014
Richard L. Holm
William R. Roy
David N. Ruzic
Clifford E. Singer
Clair J. Sullivan
Rizwan Uddin

Remembering founder Daniel Hang

Daniel Frank Hang, among the founders of nuclear engineering education at the University of Illinois and a passionate advocate of what is now the Nuclear, Plasma, and Radiological Engineering Department, passed away December 15, 2013, at the age of 95.

In honor of Hang's contributions, the NPRE Department instituted the Daniel F. Hang Outstanding Senior Design Award. Read about the inaugural award winners on p. 36.

"Dan will be greatly missed," said NPRE Department Head Jim Stubbins. "For many years after his retirement (in 1984), Dan would be in the office helping out, particularly with alumni activities and the alumni board. He took immense pride in NPRE, and served as a strong voice for the department."

Hang first came to Illinois to earn a bachelor's degree in electrical engineering in 1941, then returned in 1947 for graduate school. Earning a master's degree in electrical engineering in 1949, he continued teaching at Illinois until his retirement in 1984. While on the Electrical Engineering Department faculty in the late 1950s, Hang joined a small group of other engineers interested in nuclear engineering. Hang helped establish the program with a master's degree curriculum in the 1958-59 academic year. He later became a full professor with responsibilities in both the Electrical and Nuclear Engineering Departments.

Daniel Frank Hang

"Dan loved the (TRIGA) reactor that we had here," recalled Prof. Emeritus and former NPRE Department Head Barclay G. Jones. Soon after the reactor was established on campus in the early 60s, Hang traveled to the West Coast to visit General Atomics, the reactor's manufacturer, to become licensed to operate the facility. Jones said Hang performed detailed research work with the reactor, and served on its overseeing committee for several years. The TRIGA was shuttered in 1998.

Hang's interest in engineering economics resulted in his forming a company, HTH Associates, responsible for developing a Nuclear Fuel Management Code that many major utilities in the US and abroad have used. He also served on a state committee charged with identifying sites in Illinois to store low-level nuclear waste.

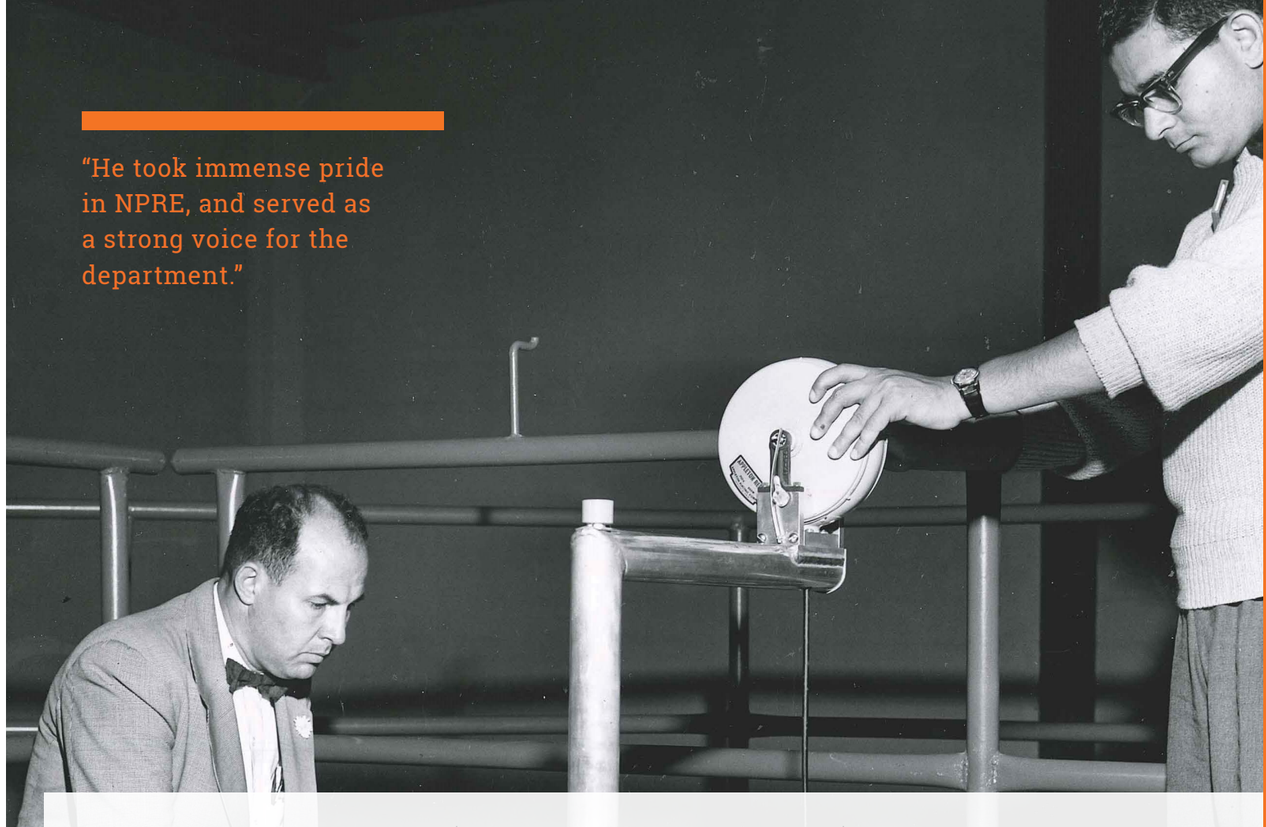
Hang was involved in a number of professional organizations throughout his career. He became a licensed Professional Engineer in 1950, joined the National Society of Professional Engineers (NSPE) in 1955, and became a life member in 1984. He was a strong advocate for engineers to become licensed and taught refresher courses all over the state to prepare students for the licensure exam.

Hang was a Senior Life Member of the Institute of Electrical and Electronics Engineers (IEEE), and a life member of the American Society for Engineering Education (ASEE), serving on their examining boards for many years.

He joined the American Nuclear Society (ANS) in 1963 and became a life member in 1984. NPRE alumni and friends attending ANS national meetings can recall fondly the camaraderie Hang made possible during social events he hosted in conjunction with the conferences. Keeping these events friendly and informal, Hang held the gatherings in his hotel room and included "beer in the bathtub."

Hang was a member of ABET (formerly Accreditation Board for Engineering Technology), responsible for accrediting programs such as NPRE's, and was a site evaluator for this organization. He was a member of the Illinois Engineering Council and served in various capacities supporting Mathcounts, Worldwide Youth in Science in Engineering (WYSE), Future Cities, and E-Week. He served as a faculty advisor to Tau Beta Pi.

The University of Illinois Alumni Association honored Hang with the 1997 Loyalty Award, and that organization's Constituent Leadership Award in 2004. From the Illinois Society of Professional Engineers Hang received both an Honorary Membership commendation for outstanding service to the engineering profession and the Illinois Award, the society's highest honor for meritorious service. In September 2013 the Department of Electrical and Computer Engineering (ECE) presented Hang with the department's Distinguished Alumnus Award.



"He took immense pride in NPRE, and served as a strong voice for the department."

Federal grants further research on nuclear materials, NPRE infrastructure

From top: Dept. Head Jim Stubbins, Prof. Brent Heuser, Assistant Prof. Clair Sullivan

NPRE research on the irradiation tolerance of advanced structural materials has secured funding from the US Department of Energy Nuclear Energy University Programs (NEUP). The program also will support NPRE with a grant for research and instructional infrastructure.

Department Head Jim Stubbins and Prof. Brent Heuser will lead NPRE's share of the materials work, awarded $800,000 over three years. Stubbins and Heuser will be joined in the award by their collaborators, Prof. Peter Hosemann of the University of California-Berkeley and Dr. Meimei Li of Argonne National Laboratory.

The project will examine the irradiation performance of two classes of advanced steels that have shown good mechanical properties performance.

"The research is aimed at using accelerated irradiation damage experiments with ion beams to help predict the behavior of the materials when used in a nuclear reactor neutron irradiation environment," Stubbins said. "The predicted behavior will be used to design future in-reactor irradiation testing experiments. The ion irradiation approach allows for highly accelerated damage accumulation but has the drawback that the damage rates and alloy activation issues are much different."

The infrastructure grant, worth $191,000, will provide equipment funds for three projects.

In the first, Heuser will develop an in situ steam delivery system so that the corrosion process in Zircaloy and other cladding materials can be studied in a new Environmental Transmission Electron Microscope on the Illinois campus. This work will support the ongoing international damage-tolerant cladding programs that Heuser leads.

The second is for purchasing a special neutron detection system that operates on the principal of the phase transition of a supercooled gel when irradiated with neutrons. A collaboration faculty member at Yale and the University of Pisa developed these high sensitivity neutron detectors that will support the current research work of NPRE Assistant Prof. Clair Sullivan.
The third part of the award is to extend Stubbins' high temperature corrosion and mechanical properties testing laboratory facilities.

Longtime staffer Idell Dollison retires

For 13 years, office administrator Idell Dollison has been NPRE's go-to person.

On any given day a steady stream of people – students, faculty, other staff and visitors – have brought to Dollison their plethora of questions to be answered, issues to be resolved, and numerous requests to be fitted into Department Head Jim Stubbins' crowded schedule. Regardless of the piles of work on her own desk, Dollison has greeted each guest and each challenge with poise and a reassuring smile.

Jim Stubbins with Idell Dollison at the NPRE/ANS Honors Banquet in April 2014

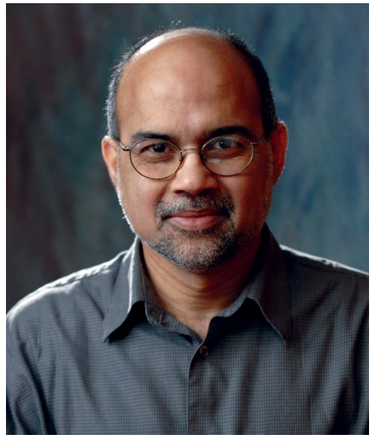
Since retiring in June, Dollison now will bring that same grace to a new chapter in her life. Having worked at the Chanute Air Force Base, the Union Pacific Railroad headquarters in Omaha, Nebraska, and for a Connecticut law firm, Dollison began her career at Illinois in 1994 as a secretary for the U of I Foundation, then went to work in Admissions & Records for the School of Music's Graduate Music Office.

She started at NPRE as office manager in 2001, and was later promoted to office administrator, earning a master's degree in library and information science in the meantime. Dollison's duties in NPRE have included efficiently coordinating a multitude of activities for the Department Head's office. She has served as the main conduit for the department head, faculty, adjuncts, visiting scholars, postdocs, and staff. Her responsibilities have included office administration, project management, web maintenance, human resources, safety, event organization, and so much more.

Said Dollison: "I will treasure and miss all the good times at the University of Illinois and especially with my NPRE family."

Uddin selected as ANS Fellow

Prof. Rizwan Uddin has been selected as a Fellow of the American Nuclear Society (ANS), the organization's highest membership grade, awarded to ANS members for outstanding accomplishment in any one of the areas of nuclear science and engineering.



Prof. Rizwan Uddin

An ANS member for 25 years, Uddin has been recognized for seminal contributions to advance the understanding of density wave oscillations, nuclear-coupled density wave oscillations, and boiling water reactor stability. He has also been recognized for significant contributions to advance coarse mesh nodal methods and to relax the limitations on coarse mesh methods to make them applicable to a much larger class of engineering problems.

Uddin also is one of the pioneers in the development and use of 3D immersive, virtual reality systems and computer-games for education and training in the nuclear field. He directs the Virtual Education and Research Laboratory (VERL). This work was featured as a cover story in the January 2013 edition of *Nuclear News*.

His research contributions have resulted in over 100 peer-reviewed publications in archival journals and conference proceedings.

Recently Uddin has been examining issues that arise as nuclear industry moves from analog to digital systems. In Spring 2013, he co-organized a major symposium on the Urbana campus addressing those challenges, and also led sessions on those issues at the 2013 ANS Winter Meeting in Washington, D.C.

For almost every semester that he has taught a class at Illinois, Uddin has appeared in the campus "List of Teachers Ranked as Excellent." He also has been the recipient of the departmental Teacher of the Year Award for over 10 of the last 17 years.

Three of his PhD advisees have received the national ANS Mark Mills Award for the best original technical paper contributing to the advancement of science and engineering related to the atomic nucleus.

Uddin earned a bachelor's degree in mechanical engineering from Middle East Technical University in Ankara, Turkey. He earned a master's and PhD in NPRE in 1983 and 1987, respectively. After earning his degrees, Uddin started his academic career at the University of Virginia, returning to Illinois in 1996.

Undergrads garner national ANS scholarships

Four NPRE undergraduates have been awarded national scholarships from the American Nuclear Society.

Clockwise from top left: Louis J. Chapdelaine, Kathryn A. Mummah, Jonathan Rolland, Christopher Kuprianczyk

Christopher A. Kuprianczyk of Chicago, Illinois, and Jonathan D. Rolland of West Sayville, New York, have been awarded American Nuclear Society (ANS) Undergraduate Scholarships, given to students who have completed one year in a course of study leading to a degree in nuclear science, nuclear engineering, or a nuclear-related field, and who will be sophomores in the upcoming academic years, and to students who have completed two or more years and will be entering as juniors or seniors.

Kathryn A. Mummah of Wheaton, Illinois, won an ANS Sophomore Undergraduate Scholarship Award, made to students who have completed one year in a course of study leading to a degree in nuclear science, nuclear engineering, or a nuclear-related field, and who will be sophomores in the upcoming academic years.

Louis J. Chapdelaine of Eagan, Minnesota, has received the 2014-15 ANS Joseph R. Dietrich Memorial Scholarship Award for students who have completed two or more years in a course of study leading to a degree in nuclear science, nuclear engineering, or a nuclear-related field. This award honors Joseph R. Dietrich, who served as president of the American Nuclear Society from 1977-1978. Dr. Dietrich was internationally known for a pioneering career in nuclear power reactor development that spanned more than thirty years.

STUDENTS

Undergrads learn from Sweden's success in spent nuclear fuel storage

Four NPRE undergraduates who journeyed to Sweden this summer to learn about how the country handles long-term storage of spent nuclear fuel gained insight into why that country's plan has garnered more public support than the United States' approach.

"Sweden's success makes you want to be involved in figuring out a long-term solution in the US."

Final approval is expected next year for construction of the Spent Fuel Repository in Forsmark, on Sweden's eastern coast line. Forsmark residents competed with their neighbors to the south, in Oskarshamn, which also wanted to host the final repository and which is home to the Äspö Hard Rock Laboratory, a unique geological research facility. There, experiments have been performed 500 meters underground in preparation for the final site.

Residents of the two municipalities in consideration wanted to be chosen because of expected financial gains. In fact, said NPRE Assistant Prof. Tomasz Kozlowski, Sweden's economic development arm has offered the runner-up $40 million to make up for jobs not gained with the final site and expected to be lost when the laboratory is no longer needed.

In contrast, the Yucca Mountain Nuclear Waste Repository, designated as the United States' solution in 1987, was defunded in 2010 for political reasons. Environmentalists and residents of Las Vegas, over 100 miles from the site, highly contested its designation. Early in 2012, a Department of Energy Blue Ribbon Commission urged the government to locate a consolidated, geological repository, but advised that political stagnation could be avoided by creating an independent organization with access to the federal Nuclear Waste Fund. While some officials continue to favor Yucca Mountain, the issue remains unresolved.

"In the United States, the building of a long-term nuclear waste storage facility has been far from successful," observed Sarika Malani, one of the students. "In Sweden, two municipalities volunteered for the repository to be built on their land, and truly wanted their land to be chosen for the final site.

"This difference in community approval between the two countries depended partly on the way in which the members of the community were approached, and the methods used to do site investigations. The system which SKB (the Swedish Nuclear Fuel and Waste Management Company) employed proved to be very successful in the planning of the repository."

"Seeing how SKB methodically informed communities that are geologically eligible for the repository was eye-opening," student Joel Exner observed. "SKB's transparency on the impact of building the repository has paid dividends. When the community was informed, the perks (e.g. job creation and town infrastructure improvements) outweighed any concerns. In fact, in a recent poll in the municipality where the repository is planned, 82 percent of the public said they were in favor of having the repository in their hometown, with only 11 percent opposed. That sort of public excitement over hosting a nuclear facility seems almost impossible to imagine in the US, so it was great to hear how SKB cultivated this public attitude."

What they learned on the trip also made an impact on students Kevin D'Souza and Patrick Keane. "I had little to no knowledge on this topic prior to this (summer) course," said D'Souza. "This trip opened my eyes to how other countries approach this controversial subject. I am now more confident in our society to grow and learn the truth about nuclear energy and spent fuel storage." Added Keane, "I believe that the underground storage of radioactive matter is the most effective, and efficient, method of shielding the public from tons of spent nuclear fuel."

Unknowns remain even with the underground storage solution, Exner pointed out. "Engineering this repository means trying to foresee any problems that might arise over the next 100,000 years, and it was interesting to see the potential issues that were being researched. One question that stuck out was from the world of microbiology: could little-known subterranean microorganisms live near the canisters (in which the spent fuel would be stored), and would they produce copper-corroding sulfide? I don't think a single student in the classroom knew that microorganisms could cause any problems."

Malani, Exner, D'Souza and Keane were the only US students to have participated in the course. Kozlowski, who had worked for Sweden's Royal Institute of Technology (KTH) prior to joining the NPRE faculty in 2011, has connections with the course's organizers and gave one of this summer's lectures. NPRE Adjunct Prof. William Roy gave four lectures. Kozlowski explained the course was limited to 30 students, with half coming from Sweden and the remainder from other countries.

Students participating attended lectures the first week, and did field work the second, including mapping in the Äspö Hard Rock Laboratory.

Sweden derives 45 percent of its power from 10 nuclear reactors at three sites, while another 45 percent of the country's power comes from hydroelectricity. The country does not have its own oil resources.

"One of the best things about the trip was the ability to meet students from around the world whose backgrounds weren't necessarily in nuclear engineering," Malani said. "This allowed students to get many different perspectives from not only the countries represented, but also from the different educational backgrounds (chemistry, geology, environmental engineering, etc.). These differences allowed for a wide spectra of questions and opinions, which enhanced the learning experience."

Said D'Souza, "The most important thing I learned was how organized and thoughtful a project as large and impacting as spent fuel storage has to be. The amount of planning that has gone into Sweden's storage facility is remarkable and has opened my eyes to the vast world of engineering.

"Prior to this course, I never looked at topics with the big picture in mind. Now, after learning the details of the back end of the fuel cycle, I have more of a base for knowledge from other classes. I also am more open to the post-graduation opportunities that exist outside of the US."

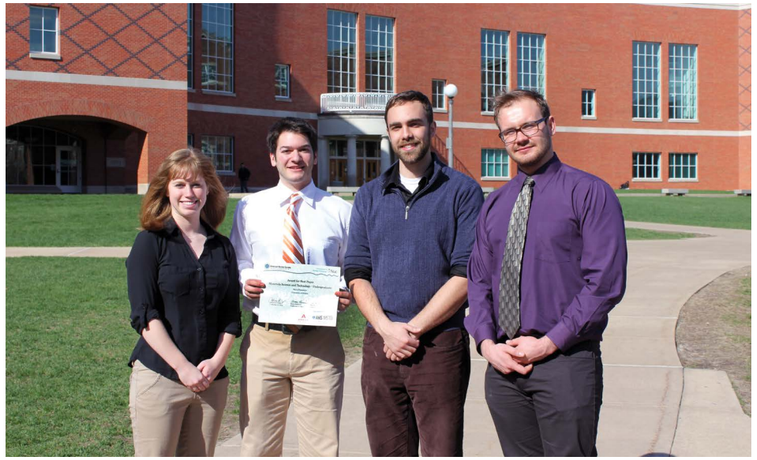
Said Exner, "Simply seeing another country succeed in solving the spent nuclear fuel storage issue has sparked an interest in the field that I wouldn't have thought possible prior to this trip. Sweden's success makes you want to be involved in figuring out a long-term solution in the US. We should learn from SKB, from both a technical and PR standpoint."

Computer chip processing design earns awards

An NPRE student team recognized at the Spring 2014 American Nuclear Society Student Conference for research that could result in smaller computer chips is the inaugural recipient of the Daniel F. Hang Outstanding Senior Design Award in NPRE.

The Hang award was created in honor of the late Emeritus Prof. Daniel F. Hang, one of the Department's founders. Hang, who died at the age of 95 in December 2013, was passionate about nuclear engineering design, and emphasized the coupling of economics analysis with successful design work. He strongly advocated students becoming licensed Professional Engineers.

Seniors Shane M. Keniley, Amanda M. Lietz, Pawel A. Piotrowicz, and Gianluca A. Panici were presented the award at the 2014 NPRE/ANS Honors Banquet held in April. The team earlier had received the Best Paper Award in the Materials Science and Technology Section of the 2014 ANS Student Conference held in early April in State College, Pennsylvania. Their winning paper was entitled "Plasma Synthesized Lanthanide Particles for Extreme Ultraviolet Lithography (EUV)."



The winning NPRE student design team, from left: Amanda Lietz, Gianluca Panici, Shane Keniley, Pawel Piotrowicz

The students' design details a system that would create fuel elements for lithography of microchips, which would drastically reduce the size of computer chips for electronic devices, thus making it possible to reduce the size of the devices themselves.

Industry fabricates computer chips by patterning them with light (lithography). The chips become smaller by reducing the width of the trenches patterned by this light. Current industry standards employ a 193 nanometer excimer laser to pattern the trenches. Researchers predict EUV light will be able to decrease that size to 13.5 nanometers within one to three years. The students' system of using BEUV (Beyond EUV) light would further reduce the size to 6.5 nanometers.

The students' research involves the use of terbium – a rare earth metal that is malleable, ductile and very hard – and a composite plastic to create fuel particles for use in BEUV lithography. After dropping one-by-one, and accelerating, the fuel particles would be shot by a powerful laser, strong enough to highly ionize the terbium. As these ions recombine with electrons, they would emit the BEUV light, which would then be focused by mirrors to cut trenches in the computer chips. A composite particle increases the efficiency of this process, creating more intense BEUV light than would be possible with a pure terbium particle.

Geringer wins ANS Best Paper Award

Robert J. Geringer won the Best Paper Award for the Operations and Power Section of the 2014 American Nuclear Society Student Conference.

Robert J. Geringer

Geringer's project, "Establishing a Framework for Reactor Size Choice by Exploring Financial and Non-Financial Parameters of Small Modular Reactors," concerned the economics of nuclear reactor size choice and scenarios in which building many small modular reactors could be preferred over building a few large ones.

"Small modular reactors (SMRs) offer a compelling alternative to larger light-water reactors (LRs)," Geringer said. "The concept of 'economy of scale,' that the unit cost of a commodity gets cheaper with the size of the facility, has driven this upward trend. While a smaller reactor, on paper, has a higher cost per megawatt of power, it has several advantages that offer an alternative to a larger reactor. In theory, these smaller units could be manufactured off-site and shipped to the site nearly complete. An efficient, specialized factory, akin to an airplane factory, could construct each unit much faster (and cheaper) than separate teams at different locations. Once a factory is operational, the construction time and cost would be highly stardardized, in contrast to the delays and cost overruns endemic to larger reactors.

"Small modular reactors (SMRs) offer a compelling alternative to larger light-water reactors (LRs)."

"Additionally, the shorter construction time of SMRs allows a variety of deployment strategies, including one in which revenue from an early unit (representing some fraction of the total capacity) could finance later units on the site," he continued. "This concept of 'self-funding' is attractive if raising the necessary amount of capital to finance a full-scale reactor is difficult."

The paper was based on project work Geringer conducted with Prof. Clifford Singer.

Students awarded Department of Energy fellowship, scholarships

NPRE graduate student Nicholas O'Shea has been awarded a fellowship, and two undergraduates, Christopher Keckler and Jonathan Rolland, have been awarded scholarships through the US Department of Energy Integrated University Program.

Through the Integrated University Program, the DOE has awarded $5 million for 41 undergraduate scholarships and 33 graduate fellowships to students in nuclear energy-related engineering and science programs at universities across the country.

O'Shea will receive $155,000 spread over the next three years as he pursues a master's degree and PhD. Having earned his bachelor's in NPRE in 2013, O'Shea is working with Assistant Prof. Zahra Mohaghegh and the Socio-Technical Risk Analysis (SoTeRiA) Research Group. SoTeRiA focuses on the advancement of probabilistic risk assessment for nuclear power plants and other complex engineering systems by integrating probabilistic and deterministic techniques.

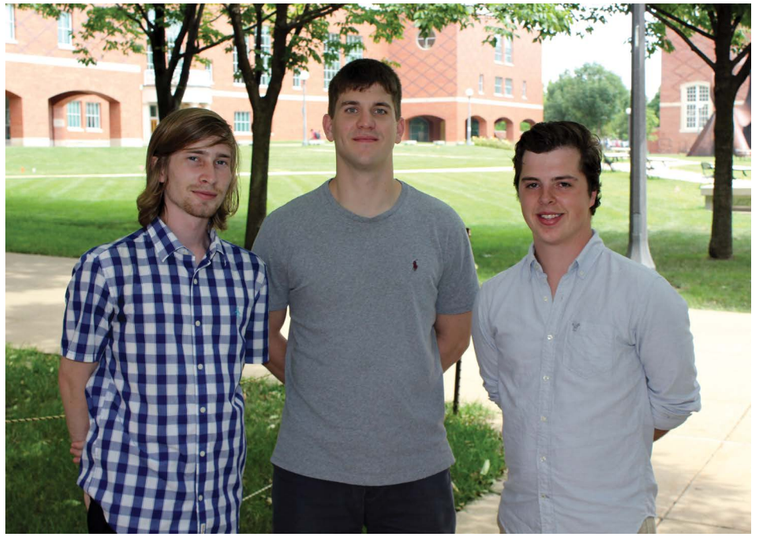
"My research approach, which blends probabilistic risk assessment, deterministic physics of failure analysis, and data analytics, can advance the state of knowledge in understanding risk and improving nuclear power safety," O'Shea said. "It concentrates on modeling location-specific loss-of-coolant accident (LOCA) frequency for both piping and non-piping components in the primary reactor coolant system of nuclear power plants. This research is providing input for the Risk-informed Resolution of Generic Safety Issue 191 (GSI-191), an ongoing academia-industry collaborative project, sponsored by the South Texas Nuclear Operating Company (STPNOC).

"Being part of this large-scale project has given me significant opportunity to interact with a diverse group of scientists in academia and also gain practical perspective from industry," he continued.

The Risk-Informed GSI-191 project addresses sump performance issues due to debris generation in pressurized water reactors (PWRs). Failure of components in the reactor coolant system (RCS) in a PWR can generate significant amounts of debris (e.g. fibrous insulation). This debris then travels to the containment floor where it can accumulate on the sump strainer once the emergency core cooling system (ECCS) pumps switch to recirculation. This accumulation can lead to heat loss as well as the formulation of chemical precipitates. Fine debris can pass through the strainer and lead to degradation or significant blockage of downstream components such as the blockage of the fuel channels inside the core.

Concern regarding such phenomena led to the identification of Generic Safety Issue 191 (GSI-191) in the early 1990s and has yet to reach total resolution. STPNOC's project utilizes a new resolution approach, a Risk-Informed methodology, which includes the simulation of deterministic physical phenomena in a module called CASA Grande, propagation of potential uncertainties, and their integration into the plant-specific PRA.

Keckler and Rolland, both seniors who are pursuing NPRE's nuclear power track, receive $5,000 each for their awards. Keckler is from Naperville, Illinois, and Rolland is from West Sayville, New York.



From left: Christopher Keckler, Nicholas O'Shea, Jonathan Rolland

Rivera chosen for Knights of St. Pat

NPRE undergraduate Nicholas Rivera joined an elite group of Engineering at Illinois student leaders when he became a Knight of St. Patrick this past spring.

Nicholas Rivera

Students chosen for the honor are recognized for leadership, excellence in character, and exceptional contributions to the College and its students. While majoring in nuclear engineering and minoring in the highly selective Hoeft Technology and Management program, Rivera has been a leader on campus, both through the Society of Hispanic Professional Engineers (SHPE) and the Morrill Engineering Program (MEP).

The College also recognized Rivera in Spring 2013 when he was selected for the William R. Schowalter Award. Rivera was the 2013-14 president for the American Nuclear Society (ANS) student chapter, and received NPRE's 2013 Catherine Pritchard Undergraduate Scholarship, and the Exelon Corporation Energy for Education Scholarship. He has garnered several other scholarship awards, including the Nuclear Regulatory Commission Scholarship and the Johnson & Johnson Corporate Readiness Scholarship. Rivera has served as a PWR core design intern and reactor engineering intern for Exelon Generation and as undergraduate researcher for the Center for Plasma Materials Interactions.

Rivera also served as the co-corporate director for the Engineering Open House, where he was responsible for uniting the corporate committee, obtaining sponsorship, and planning logistics for this event, which attracts over 20,000 visitors annually.

Over 100 students recognized at 2014 Honors Banquet

Held in April in conjunction with the American Nuclear Society Student Chapter, the Honors Banquet recognizes students for earning awards from NPRE, the College of Engineering, national organzations and corporate partners. The event is sponsored in part by the Edward E. Mineman Memorial Endowment Fund. NPRE alumnus Edward F. Mineman, BS 84, and his brother Blaine A. Mineman, BA Political Science 85, MBA 87, established the fund to honor their father.

NPRE Outstanding Undergraduate Research Award

The NPRE Outstanding Undergraduate Research Award is presented to undergraduate students who have performed exemplary research in the Department.

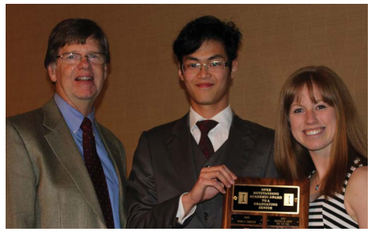
Amanda M. Lietz
Cincinnati, OH
Pawel A. Piotrowicz
Chicago, IL

From left: Jim Stubbins, Amanda Lietz, Pawel Piotrowicz

NPRE Outstanding Academic Achievement Awards to a Graduating Senior

The NPRE Outstanding Academic Achievement Awards to a Graduating Senior are presented to graduating seniors with the highest cumulative grade point averages.

Amanda M. Lietz
Cincinnati, OH
Rui Lin Tan
Singapore



From left: Jim Stubbins, Rui Lin Tan, Amanda Lietz

Catherine Pritchard Undergraduate Scholarship

The Catherine Pritchard Undergraduate Scholarships, honoring former NPRE secretary Catherine Pritchard, are presented to students who have shown academic ability and activities leadership during his or her first three years, to be used during the senior year of study.

Michael M. Cheng
Chicago, IL
Nicholas Rivera
Chicago, IL

From left: Jim Stubbins, Nicholas Rivera, Michael Cheng

American Nuclear Society Student Chapter - Graduate Outstanding Service Award

The Student Chapter of the American Nuclear Society selects the ANS Graduate Outstanding Service Award recipient. The graduate student who has most actively supported the ANS Student Chapter and its programs throughout the academic year is honored.

Andrew N. Groll
Champaign, IL

American Nuclear Society Student Chapter - Undergraduate Outstanding Service Award

The Student Chapter of the American Nuclear Society selects the ANS Undergraduate Outstanding Service Award recipient. The undergraduate student who has most actively supported the ANS Student Chapter and its programs throughout the academic year is honored.

Nicholas Rivera
Chicago, IL

From left: Jim Stubbins and Nicholas Rivera

George H. Miley/LENR Undergraduate Scholarship

The Low Energy Nuclear Reactions (LENR) Undergraduate Scholarship, honoring NPRE Prof. George H. Miley, is presented to a highly motivated, continuing undergraduate student in the Department.

Mikhail S. Finko
Clarendon Hills, IL
Jan P. Uhlig
Chicago, IL

From left: Jim Stubbins, George Miley, Jan Uhlig, Mikhail Finko

Barclay G. Jones Endowed Fellow

The Barclay G. Jones Endowed Fellowship, the first fellowship held entirely within the Department, was established by NPRE alumni to honor long-time faculty member and Department Head Barclay Jones. Rijan P. Shrestha, a graduate student advised by Assistant Prof. Tomasz Kozlowski, has been named the 2014 Fellow, and is working on uncertainty quantification of physical closure correlations used in two-phase flow reactor safety models.

Rijan P. Shrestha
Urbana, IL

From left: Jim Stubbins, Barclay Jones, Rijan Shrestha

Nuclear Regulatory Commission - University of Illinois at Urbana-Champaign Nuclear Engineering Scholarship and Fellowship Program

The Nuclear Regulatory Commission directs this program that includes support for education in nuclear science and engineering, to develop a workforce capable of supporting the design, construction, operation, and regulation of nuclear facilities and the safe handling of nuclear materials.

SCHOLARSHIPS:

Louis J. Chapdelaine
Eagan, MN
Mikhail S. Finko
Clarendon Hills, IL
Christopher A. Kuprianczyk
Chicago, IL
Amanda M. Lietz
Cincinnati, OH
April J. Novak
Downers Grove, IL
Anthony H. Park
Bolingbrook, IL
Jonathan B. Pfingsten
Harvard, IL
Pawel A. Piotrowicz
Chicago, IL
Nicholas Rivera
Chicago, IL
Jonathan D. Rolland
West Sayville, NY
Bennett T. Williams
Robinson, IL

FELLOWSHIPS:

Peter A. Mouche
Naperville, IL
Jacob B. Stinnett
Piedmont, OK
Nathan P. Walter
Evanston, IL

CONTINUING FELLOWSHIPS:

Aaron J. Oaks
Brea, CA
Carolyn A. Tomchik
Buffalo Grove, IL

Chancellor's Scholars

Chancellor's Scholars are strongly motivated, academically gifted students who excel in leadership. Students participate in honors seminars, attend Scholar Adventurers presentations, and participate in social, intellectual and cultural activities, plus maintain a minimum cumulative GPA of 3.25.

Quincy R. Crawford
Mahomet, IL
Kyle T. Perfect
Brookfield, IL
Matthew M. Szott
Orland Park, IL

Alpha Nu Sigma Society

ANS established Alpha Nu Sigma as a national honor society with the objective to recognize high scholarship, integrity, and potential achievement in nuclear science and engineering.

SPRING 2014 INITIATES:

Michael P. Christenson
Champaign, IL
Mikhail S. Finko
Clarendon Hills, IL
Steven J. Jensen
Mount Prospect, IL
Daniel C. Martin
Glencoe, MO
Justin D. Weberski
Saint Charles, IL
Weicheng Zhong
Champaign, IL

CONTINUING MEMBERS:

Rabie Abu Saleem
Al Salt, Jordan
Louis J. Chapdelaine
Eagan, MN
Wei-Ying Chen
Champaign, IL
Daniel T. Elg
Wheaton, IL
Peter R. Fiflis
Indian Head Park, IL
Jonathan George
Bolingbrook, IL
Abhishek Jaiswal
Kathmandu, Nepal
Aveek S. Kapat
Oviedo, FL
Christopher A. Kuprianczyk
Chicago, IL
Xiaochun Lai
Shanghang, People's Republic China
Amanda M. Lietz
Cincinnati, OH
Benjamin C. Masters
Urbana, IL
Yinbin Miao
Shanghai, People's Republic of China
Peter A. Mouche
Naperville, IL
Aaron J. Oaks
Brea, CA
Nicholas W. O'Shea
Chicago, IL
Jason A. Peck
Fairview Heights, IL
Ian M. Percel
Chicago, IL
Jonathan B. Pfingsten
Harvard, IL
Pawel A. Piotrowicz
Chicago, IL
Priya Raman
Chennai, India
Jonathan D. Rolland
West Sayville, NY
Joseph A. Serio
West Chicago, IL
Ryan A. Switts
O'Fallon, IL
Matthew M. Szott
Orland Park, IL
Rui Lin Tan
Singapore
Carolyn A. Tomchik
Urbana, IL
Jan P. Uhlig
Chicago, IL
Bennett T. Williams
Robinson, IL
Xu Wu
Urbana, IL

Roy A. Axford Undergraduate Scholarship

The Roy A. Axford Undergraduate Scholarship, honoring NPRE Professor Roy A. Axford, is presented to a continuing student of high academic ability and achievement.

Louis J. Chapdelaine
Eagan, MN
Jonathan D. Rolland
West Sayville, NY

From left: Jonathan Rolland, Jim Stubbins, Louis Chapdelaine

National Academy for Nuclear Training Institute of Nuclear Power Operations

In 1980, INPO decided to help provide a supply of entry-level engineers to fill future nuclear industry employment needs. With utilities' support, the National Academy for Nuclear Training was established to award scholarships and fellowships to engineering students demonstrating academic achievement and interest in nuclear power careers.

SCHOLARSHIPS:

Kirsten E. Johnson
Plainfield, IL
April J. Novak
Downers Grove, IL
Matthew M. Szott
Orland Park, IL

FELLOWSHIP:

Amy E. Hill
Warsaw, IN

Exelon Corporation - Energy for Education Scholarship

This scholarship program was established to encourage talented students interested in a career with Exelon Corporation. Exelon has been honored as the "Top Utility in the World" by *Platt's Publication*, the nation's leading utility and energy services company by *Business Week*, and "Best of Breed" by *Forbes*.

April J. Novak
Downers Grove, IL
Nicholas Rivera
Chicago, IL

From left: Ed McVey, Bruce Rash, April Novak, Nicholas Rivera

College of Engineering Boeing Engineering Diversity

The Boeing Engineering Diversity and Women in Engineering Scholarships are funded by The Boeing Company to help with the recruitment and retention of underrepresented groups in the College of Engineering. For Boeing, the ability to hire diverse university graduates is vital to creating products and services for their diverse customers around the world.

CONTINUING SCHOLARSHIP:

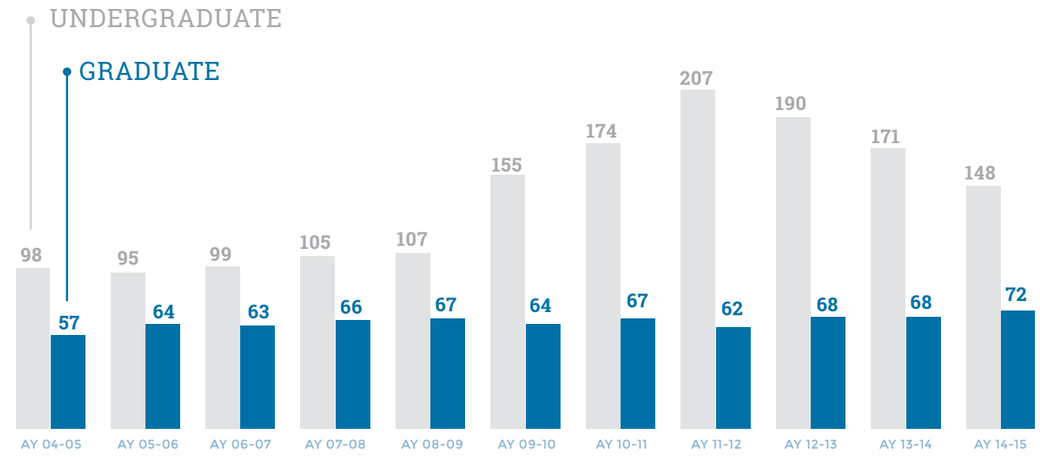
Amanda M. Lietz
Cincinnati, OH

James Scholars

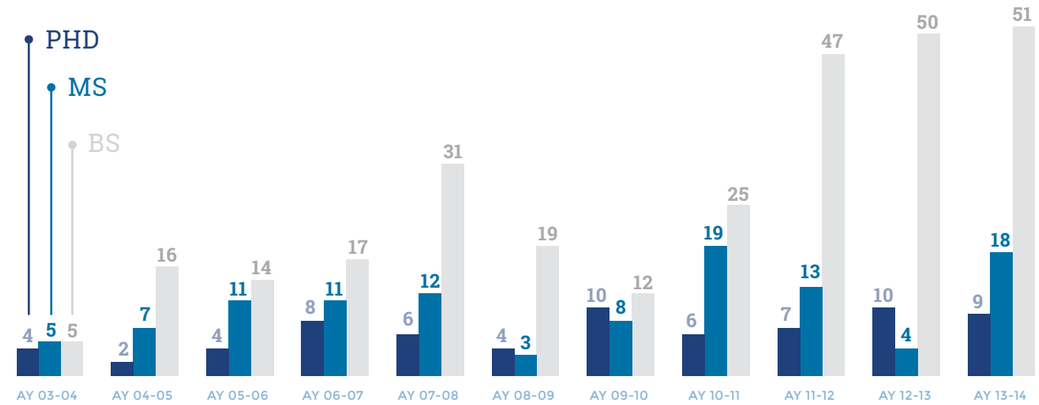
This honors program is named for the fourth president of the university, Edmund J. James who believed that scholarship and research are fundamental to human progress. During his presidency, from 1904-1920, he brought world-class scholars to campus, developed graduate programs, and fostered community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

Peter B. Bachar
Des Plaines, IL
Michael J. Benedict
Darien, IL
Joseph L. Bottini
Framingham, MA
Louis J. Chapdelaine
Eagan, MN
Kevin J. Chowaniec
Willowbrook, IL
Peter M. Conway
Lemont, IL
Quincy R. Crawford
Mahomet, IL
Elizabeth M. Edwardson
Gurnee, IL
Nicholas J. Ezyk
Round Lake, IL
Greer M. Faber
Wilmette, IL
Emily M. Gordon
Paducah, KY
Daniel G. Hirschi
Bloomington, IL
Steven J. Jensen
Mount Prospect, IL
Aveek S. Kapat
Oviedo, FL
Brandon T. Lee
Hermosa Beach, CA
Ye Li
Beijing, People's Republic of China
Amanda M. Lietz
Cincinnati, OH
Emily R. Lindgren
Batavia, IL
Daniel C. Martin
Glencoe, MO
Matthew R. Miller
Gurnee, IL
Matthew M. Moukheiber
Wheaton, IL
Kathryn A. Mummah
Wheaton, IL
April J. Novak
Downers Grove, IL
Daniel J. O'Grady
Evergreen Park, IL
Hardik D. Parikh
Mumbai, India
Anthony H. Park
Bolingbrook, IL
Kyle T. Perfect
Brookfield, IL
Joseph N. Rajchwald
Glenview, IL
Amanda P. Rychtanek
Elgin, IL
Xia Sang
Shanghai, People's Republic of China
Parth Singhal
Saharanpur, India
Matthew W. Szott
Orland Park, IL
Justin D. Weberski
Saint Charles, IL

NPRE ENROLLMENT



NPRE GRADUATION



Binder chosen as 2014 Distinguished Alumnus

Returning to Illinois this past fall as the new director of the University of Illinois Applied Research Institute (ARI), Binder is being recognized for advancing national priorities in nuclear technology development, and for dedicated service to the programs and mission of NPRE.

"My NPRE degrees were the launch point for my career."

Jeff Binder

Beginning in 2003, Binder was at Oak Ridge National Laboratory (ORNL), where he served most recently as associate laboratory director for nuclear science and engineering. He led efforts within Oak Ridge and the greater Department of Energy system to advance national priorities in nuclear technology development.

Some of the projects he led included the development of spent nuclear fuel recycling technologies, the revival of an isotope research program, and the formation of ORNL's Fuel Cycle and Isotopes Division, where he served as director.

In his new role, Binder leads ARI, which he said, "integrates the knowledge, science, and capabilities of the University of Illinois and creates a model for translational research that will lead to greater economic opportunities for the State of Illinois, the region, and the nation."

Binder serves on NPRE's alumni group, the Constituent Alumni and Industry Advisory Board (CAIAB), and has provided valuable contributions through CAIAB's Research and Funding Committee. He has helped recruit NPRE graduate students as interns at ORNL; has participated in NPRE's Interchange events, in which alumni return to campus to talk with students about companies and employers; and hosted an Engineering at Illinois tour of ORNL's facilities in 2012.

"Jeff's leadership and expertise in developing technology, knowledge of national funding agencies, and willingness to reach out to NPRE have been a great service to us as we provide for our students and make plans for future impact," said NPRE Department Head Jim Stubbins.

Previous to his tenure at ORNL, Binder worked from 1990 to 2003 at Argonne National Laboratory in a number of research roles centered on nuclear reactor safety issues, including service as director of the US International Nuclear Safety Center.

Binder earned his bachelor's (1985), master's (1987), and PhD (1990) in NPRE. He also earned an MBA from the University of Chicago.

"My NPRE degrees were the launch point for my career in three ways," Binder said. "First an Illinois Engineering education prepared me well for a career in a highly technical field. Secondly, my academic research experiences with Drs. [Barclay] Jones (NPRE) and [Thomas] Hanratty (chemical and biomolecular engineering) provided me with the ability to develop, recognize and promote technology innovation and leadership. Lastly, the relationships and friendships I developed at Illinois have been a source of strength and resource throughout my career because of the great reach and impact of Illinois Engineering."

Binder with family and friends as he claimed his Distinguished Alumnus award

NPRE seeks industry speakers for undergrad seminars

In an effort to strengthen connections with industries and research laboratories, NPRE is recruiting more outside speakers for the undergrad seminar series.

The series allows off-campus presenters to give overviews of their organizations and discuss career opportunities for the approximately 50 students enrolled in the seminar course, as well as other students who attend to hear specific speakers. "[The presenters] can tell what their organization does and how that fits into the overall disciplines of NPRE," said Becky Meline, Coordinator of Academic Programs.

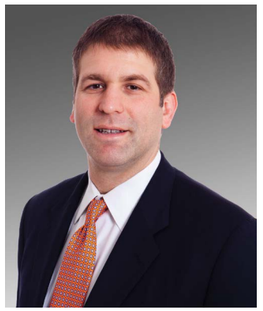
Presenters also meet with students enrolled in NPRE's senior design class and give presentations for the student chapter of the American Nuclear Society (ANS). Presenters this past spring represented industries and laboratories including LAM Research Corporation; ERIN Engineering and Research, Inc.; Exelon Generation; Applied Materials; Sargent & Lundy; Bechtel; Argonne National Laboratory; and ENERCON.

The seminars are intended to benefit the presenters as well as the students, Meline said. "The speakers can make of [the campus visit] what they want it to be. We can arrange for tours of labs, they can meet with individual faculty members, they can meet with students outside of the seminar for informational sessions on their companies, and can conduct resume reviews or mock or actual interviews for internships and jobs – whatever makes the best use of their time in the Department."

Prospective speakers can contact bmeline@illinois.edu for information on speaking opportunities in NPRE.

Giacobbe chosen as 2014 Advocate Award Winner

Just two years after earning his PhD, NPRE alumnus Michael J. Giacobbe III looked for ways to give back to his home department. He's been doing so ever since.



Michael J. Giacobbe III

"I felt I could do a small part in helping sustain and even enhance this type of educational experience."

Cited for dedicated leadership in the grassroots efforts to build NPRE endowments, thereby promoting NPRE programs, honoring NPRE's faculty and staff, inspiring fellow alumni, and rewarding outstanding students, Giacobbe, BS 91, MS 95, PhD 99, is the 2014 winner of the NPRE Advocate Award.

"Mike and several of his friends from his student days have paved the way for many of our endowed funds, and it's a real plus having these awards to recognize our excellent students," said Department Head Jim Stubbins. "I am proud of Mike and am grateful for the way he's giving back to NPRE."

In 2000, Giacobbe, Head of Analytics and Consulting for JLT Specialty US in Chicago, led an alumni effort to establish and build support for NPRE's Catherine Pritchard Scholarship Fund. He followed that endeavor by raising funds – along with fellow alumni Terrill and Debbie Laughton – for the Barclay G. Jones Endowed Fellowship Fund, the first fellowship held entirely within NPRE. A member for many years of NPRE's alumni group, the Constituent Alumni and Industry Advisory Board, Giacobbe helped rally the board to create the NPRE Leadership Speaker Series (with the Laughtons' leadership). He also is working to increase the endowment for the Roy A. Axford Scholarship Fund.

"My experience in NPRE – with my advisor, Jim Stubbins, other faculty like Roy Axford and Barclay Jones, my Argonne colleagues, and my student colleagues – had a significant impact on my development as an individual and professional," Giacobbe said. "By supporting the department in establishing NPRE specific funds, I felt I could do a small part in helping sustain and even enhance this type of educational experience for future students and researchers. The funds are important, as they elevate the profile of the department and do a small part in attracting the top talent and performers to the program."

Giacobbe was presented with the University of Illinois Alumni Association's 2008 Loyalty Award, presented to alumni who have made significant, notable and meritorious contributions, and who have consistently demonstrated exceptional loyalty, commitment, dedication and service to the University of Illinois Alumni Association.

Farmer earns award for work after Fukushima

The national American Nuclear Society has honored NPRE alumnus Mitchell T. Farmer, an expert in Reactor Safety Experimentation, for his work in the aftermath of the Fukushima accident.

Mitchell T. Farmer

Farmer, PhD 88, received the American Nuclear Society (ANS) 2014 Special Award for major, internationally recognized contributions to the understanding and modeling of severe accident phenomena in LWR (light water reactor) plants, and for technical assistance to Japan following the Fukushima accident. The award was presented to Farmer at the ANS annual meeting in Spring 2014 in Reno, Nevada.

Farmer is Safety Manager of Reactor Safety Experimentation in Argonne National Laboratory's Nuclear Engineering Division. He has 21 years of experience in various areas that include LWR severe accident analysis and experiments, in addition to analysis and experiments on advanced Generation IV reactor systems that include sodium fast reactors and high-temperature gas cooled reactors.

Farmer also manages the division's Reactor Safety Testing and Analysis section, where Argonne scientists design, build, and operate test facilities providing validation data for a variety of advanced computational tools.

The ANS Special Award recognizes an individual or individuals for especially meritorious contributions in research and/or developing understanding in important areas of current activity. The ANS Board of Directors annually determines a topic based on recommendations from the Honors and Awards Committee. Each topic is selected because of the importance to the issue with regard to the peaceful application of nuclear technology to all mankind.

Alumna earns highest honor for early career accomplishments

NPRE alumnus Meimei Li has garnered a Presidential Early Career Award for Scientists and Engineers (PECASE) for her contributions to the understanding of nuclear reactor materials.

Meimei Li

"My research seeks to understand the behavior of materials in reactor environments."

Li, MS 99, PhD 03, was one of 102 scientists and engineers from across the country President Barack Obama recognized earlier this year. PECASE Awards are the highest honor the United States government bestows on science and engineering professionals in the early stages of their independent research careers.

"My research seeks to understand the behavior of materials in reactor environments and to develop high-performance materials that can be used in a wide range of nuclear energy systems," Li said. She has worked at Argonne since 2008, but her experience with nuclear material science research predates her time at the laboratory.

"My research at [the University of Illinois at Urbana-Champaign] focused primarily on mechanical property testing and microstructural characterization of structural materials for fusion and fission energy applications," Li said. "My training and research experience at Illinois provided me with a solid background and an understanding of the nuclear materials field and the necessary skills to conduct independent research on broad topics of materials used in nuclear reactors.

"Prof. [Jim] Stubbins was my advisor and mentor," Li said. "He provided excellent guidance for my graduate studies and career development, and more importantly, his constant support, and his belief in my unrealized potential that I can do well. He is an extraordinary professor and mentor who has helped me profoundly in my career."

At Argonne, Li's research has focused mostly on materials for sodium-cooled fast reactors and very high temperature reactors, which are the next generation of nuclear reactors under development by the US Department of Energy.

"We want to use modern material science characterization and modeling tools to develop new materials that outperform traditional ones in the extreme irradiation, temperature, and corrosive environments in next-generation nuclear reactors," she said. "My goals are to use science tools to tackle complex nuclear engineering problems, and more specifically to develop new and better ways to predict the material performance in nuclear environments and to develop high performance materials for advanced nuclear energy systems."

In her time at the laboratory, Li has been able to use the intense X-rays provided by the laboratory's Advanced Photon Source and resources provided by the Electron Microscopy Center to probe the structure of the materials she studies from the atomic to mesoscale. The eventual goal of the research, she said, involves studying the dynamics of microstructural evolution in these materials in situ – in other words, in the kinds of extreme conditions they would experience within a nuclear reactor.

Sridhar honored for work in clean energy

K.R. Sridhar, MS 84 NPRE, PhD 90 Mechanical Sciences and Engineering (MechSE), received Engineering at Illinois' 2014 Alumni Award for Distinguished Service for his visionary and indelible impact on clean energy production and tremendous entrepreneurial success.

K.R. Sridhar

Sridhar founded Bloom Energy, a Sunnyvale, California, company with the mission of producing clean, reliable, affordable power from a wide range of renewable or traditional fuels. In order to accomplish this mission, Bloom Energy is changing the way that energy is generated and consumed through the production of its energy servers, also known as Bloom Boxes. These servers result in significantly lower electricity generation costs and greenhouse gas emissions.

Some of the largest firms in the world – including Apple, Wal-Mart, Google, FedEx, eBay, AT&T, Verizon, and The Coca Cola Company – have realized the potential benefits of this technology and have implemented the use of Bloom Boxes.

Sridhar's novel contributions to clean energy production are so unique that he has attracted significant media attention, including a feature on 60 *Minutes* in 2012.

Prior to founding Bloom Energy, Sridhar was director of the Space Technologies Laboratory (STL) at the University of Arizona where he was also a professor of Aerospace and Mechanical Engineering. Under his leadership, STL won several nationally competitive contracts to conduct research and development for Mars exploration and flight experiments to Mars. Sridhar has served as an advisor to NASA and has led major consortia of industry, academia, and national labs. His work for the NASA Mars program that involved conversion of Martian atmospheric gases to oxygen for propulsion and life support was recognized by *Fortune* magazine, where he was cited as "One of the Top Five Futurists Inventing Tomorrow, Today."

Sridhar was named one of *Time* magazine's "Tech Pioneers Who Will Change Your Life" in 2009, produced one of the publication's "50 Best Inventions of 2010," and earned the University of Illinois Department of Mechanical Science Engineering Distinguished Alumnus award in 2011. He is a member of the American Society of Mechanical Engineers (ASME) and the American Institute of Aeronautics and Astronautics (AIAA).

Gartia wins college's Ross Martin Award

Recent PhD Manas Gartia is the 2014 winner of the Ross J. Martin Award, recognizing outstanding research achievement by a College of Engineering graduate student.

Gartia was the Distinguished Award Winner at the XPrize: Nokia Sensing X CHALLENGE in 2013. Among his other awards and honors are:

- Cozad: EnterpriseWorks Incubator Prizes Winner, 2013
- NCIIA Stage 1 Winner, 2013
- NCIIA Stage 2 Winner, 2014
- Finalist, Lawrence Fellow, Lawrence Livermore National Laboratory, March 2013
- Best Poster, 2012 IEEE EMBS Micro-and Nanotechnology in Medicine Conference
- IEEE Travel Grant Award, December 2012
- Honorable mention, Link Foundation Energy Fellowship, 2012
- Fellow, Mavis Future Faculty Fellowship (MF3), 2011-2012
- Fellow, Mavis Future Faculty Fellowship (MF3), 2010-2011
- Fellow, Sargent & Lundy LLC., 2008-2009
- Fellow, Department of Atomic Energy, Govt. of India, 2001-2003
- Member, Tau Beta Pi, 2010-present
- Member, Alpha Nu Sigma (NPRE Honor Society), 2010-present

Manas Gartia

Gartia, who earned his PhD in December and currently is a postdoctoral research associate for the Micro and Nanotechnology Laboratory, worked with his advisor, Assistant Prof. Gang Logan Liu of Electrical and Computer Engineering, on the thesis, "Nanoplasmonics and Silicon Nanophotonics Devices for Sensing Applications." He is also continuing postdoctoral research with Prof. Dipanjan Pan at the Biomedical Research Center of Mills Breast Cancer Institute and Carle Foundation Hospital, to apply the developed sensors for point of care and clinical applications.

Through his research, Gartia has developed a unique approach to quantifying materials structures using a highly specialized substrate that enhances the imaging, particularly the vibrational, rotational, and other low-frequency characterizations, of the materials. The substrate is a unique part of the experimental technique since it permits high electro-magnetic fields to develop at the peak tips where the material for examination rests. This local high field can perturb the material's internal electron structure so researchers can obtain strong Raman signals from highly localized volumes of the material.

The technique can be applied to a large class of materials, including several of high interest to biomedical, energy, environmental, and materials science applications. Gartia has made significant impact on the areas of:

- 3D Cellular Imaging, in which, with a well-designed substrate, the internal light reflections can reconstruct 3D images of the cell, including chemical make-up information
- DNA and Protein Imaging, in which similar techniques can provide precise information about the cellular DNA or protein make-up
- Specialized Chemistry Sensors, in which the technique can provide precise information about the chemical make-up of water-base solutions for a variety of agricultural, industrial and medical applications
- Techniques to study and support nanofluidics.

Gartia has plans to extend his technique's sensitivity to precisely determine process materials' chemical and molecular makeup to advanced medical, industrial, and scientific applications. The medical work will focus on examining reactions in membrane-bound proteins, and could have revolutionary results affecting drug delivery and efficacy.

A year ago, Gartia and other members of Liu's research team were recognized for developing MoboSens, a low-cost, smartphone-based sensor that allows users to test water quality and specifically detect nitrate concentration. The device won second place out of more than 400 participant teams in the Vodafone Wireless Innovation Project competition that identifies and funds innovative wireless-related technology addressing critical social issues around the world. Gartia worked on the development of the microelectrochemical sensing chip for MoboSens.

Gartia holds one patent and has filed for two others. He has been published in numerous internationally recognized journals and in many conference proceedings.

The Martin Award is a memorial to Ross J. Martin, associate dean of the College of Engineering, who served as director of the Engineering Experiment Station for 26 years, until his death in 1984. During his tenure as director, the engineering research budget grew eightfold. Dean Martin realized how essential research is to a sound graduate engineering education and was instrumental in making this college one of the foremost research institutions in the world. This award is a tribute to his guidance and to the outstanding research conducted in this college.

Carruthers receives highest alumni award

George R. Carruthers was honored with the highest alumni award from the University of Illinois during Commencement, May 17, on the Urbana-Champaign campus.

George R. Carruthers

The University of Illinois Alumni Achievement Award is presented to those alumni who have attained outstanding success and national or international distinction in their chosen profession or life's work, and whose accomplishments reflect admirably on, or bring honor to, their alma mater.

Carruthers, BS 61 Aerospace Engineering (AE), MS 62 Nuclear, Plasma, and Radiological Engineering, PhD 64 AE, performed groundbreaking work in far ultraviolet astronomy as a Naval Research Laboratory scientist. His rocket-borne telescope of ultraviolet star radiation brought long-sought proof that hydrogen atoms are converted to molecules in dust clouds in interstellar space and catalyze the birth of stars.

In February 2013, President Barack Obama honored Carruthers by presenting him the National Medal of Technology and Innovation at the White House. Carruthers was one of seven scientists nationwide to be recognized with the medal at that ceremony.

Influenced by the Space Race of the late 1950s and 1960s, Carruthers, a scientist at the Office of Naval Research Laboratory (ONRL), performed groundbreaking work in far ultraviolet astronomy. His efforts led to a patent for pioneering instrumentation, an image convertor for detecting electromagnetic radiation, especially in short wave lengths. In 1970 he gained international attention when the photographs from his rocket-borne telescope of ultraviolet star radiation brought long-sought proof that hydrogen atoms are converted to molecules in dust clouds in interstellar space and catalyze the birth of stars. In 1972 his far ultraviolet camera spectrograph was sent to the moon with the Apollo 16 mission, allowing ONRL to take readings of and understand objects and elements in space that are unrecognizable to the naked eye. The camera, which remains on the moon, provided views of stars and solar systems millions of miles away.

CLASS NEWS

The following is a list of professional updates from NPRE alumni. To share your news, contact nuclear@illinois.edu.

1970s

Kenneth D. Lewis, MA 79 Mathematics, PhD 82, has resumed an earlier role as Dean of the College of Sciences, Mathematics and Engineering Technology at South Carolina State University. An accomplished nuclear engineer and award-winning researcher, Lewis formerly held the position from 2005 to 2011. During his initial tenure as dean, Lewis directed a team that led to ABET-EAC accreditation in 2008, making South Carolina State the only ABET-accredited nuclear engineering program at a historically black college and university. Lewis has worked in the nuclear industry for over two decades at facilities such as Oak Ridge National Laboratory, and for companies such as Lockheed Martin Energy Systems.

1980s

James P. Holloway, BS 82, MS 84, is Vice Provost for Global and Engaged Education at the University of Michigan in Ann Arbor. Holloway, associate dean for undergraduate education in the College of Engineering, focuses on university initiatives to enhance education abroad, undergraduate research, service learning and other types of engaged student learning.

1990s

Martin J. Neumann, BS 99, MS 04, PhD 07, was promoted earlier this year from technology manager to director of technology at View | Dynamic Glass, a leader in dynamic glass. Neumann, an NPRE adjunct professor, was a student of Prof. David Ruzic and was acting director of the Center for Plasma Material-Material Interactions from 2009-2010.

2000s

Hitesh Bindra, MS 07, PhD 10, is an assistant professor in the Department of Mechanical and Nuclear Engineering at Kansas State University.

John R. Sporre, BS 07, MS 10, PhD 13, is an advisory engineer for IBM.

Benjamin A. Holtzman, BS 08, MS 10, is a senior licensing engineer at Westinghouse Electric Co. in the greater Pittsburgh area. He performs a lead role in the development and submittal of licensing documentation for AP1000 certification by Indian regulation. Prior to January, he was a lead fuel rod design engineer for the company.

Harrison K. Pappas, BS 08, MS 09, MBA 11, is a management consulting professional for AlixPartners, a global business advisory firm in Chicago.

Eric B. Reside, BS 08, MS 11 Industrial Engineering, MBA 11, is an associate at AlixPartners, a global business advisory firm in Chicago.

2010s

Liang Cai, MS 10, PhD 13, is a detector scientist for Toshiba Medical Research Institute.

Michael K. Collins, BS 10, MS 14, works for Exelon Corp.

Paul A. Keutelian, BS 10 Aerospace Engineering, MS 13, is a launch engineer for Space Exploration Technologies.

Brian R. Kleinfeldt, BS 10, MS 12, is a reactor engineer at Exelon Nuclear in the greater Chicago area. He previously had worked as an engineer for Enercon Services.

Liang Meng, MS 10, PhD 13, is an electrical engineer for LAM Research.

Joseph R. Bernhardt, BS 11, MS 13, is a nuclear engineer for Bechtel Power Corp.

Peter R. Fiflis, BS 11, MS 13, is continuing his PhD studies in NPRE.

George Chen, BS 11, MS 13, is an intern for the Illinois Applied Research Institute.

Katelyn N. Kelly, BS 11, is a boiling water reactor core designer for Exelon Nuclear in the greater Chicago area.

Zihao Ouyang, MS 11, PhD 13, works for LAM Research.

Monish Singh, BS 11, MS 13, is an engineer for Bechtel Marine Propulsion Corp.'s Knolls Atomic Power Laboratory.

Matthew J. Weberski, BS 11, MS 13, is a mechanical engineer at Exelon's LaSalle County Generating Station.

Hsingtzu Wu, MS 11, PhD 13, is a postdoctoral research associate for the Japan Atomic Energy Agency.

Piyum S. Zonooz, BS 11, MS 13, is a test engineer for Starfire Industries, LLC, in Champaign, Illinois.

Seung-Jun Kim, PhD 12, is a research associate at Los Alamos National Laboratory. His research focuses on commercial nuclear reactors and advanced high temperature reactors.

Jason A. Peck, BS 12, MS 14, is continuing PhD studies in NPRE.

Cody A. Morrow, BS 12, is a software quality assurance analyst at Vodori, a hybrid consulting and SaaS product company in Chicago.

Maro Agazarian, MS 13, works for the Nuclear and Radiation Safety Center in Armenia.

Nick L. Backes, BS 13, is in the US Navy.

Christopher J. Burke, BS 13, is a research aide at Argonne National Laboratory.

Brent S. Cross, BS 13, is a graduate student at Brown University studying biomedical/medical engineering.

Mohamed S. ElBakhshwan, PhD 13, is working at Brookhaven National Laboratory.

Carolina T. Fineman-Sotomayor, MS 13, is working at Lawrence Berkeley National Laboratory.

Manas R. Gartia, PhD 13, is a postdoctoral research associate in the Micro and Nanotechnology Laboratory in Engineering at Illinois.

Syed E. Haque, BS 13, is a technical solutions associate for InStep Software, LLC.

Joanne N. Li, MS 13, is continuing PhD studies in the Department of Bioengineering at Illinois.

Ye Li, BS 13, is a graduate student at John Hopkins University.

Jie Lu, MS 13, is continuing PhD studies in NPRE.

Frederick T. Manley, BS 13, is a software engineer for NaviNet.

Christian M. Peisker, BS 13, is a systems engineer for Exelon Corp.

Benjamin R. Russell, BS 13, is a health physicist at Xcel Energy, an environmental services firm in the Minneapolis, MN, area.

Arthur K. Stefanczyk, BS 13, is a reactor engineer for Exelon Corp.'s Limerick Generating Station in Pottstown, Pennsylvania.

Matthew M. Szott, BS 13, is a graduate student in NPRE.

Nathan P. Walter, BS 13, is a graduate student in NPRE.

Nivedita A. Vaidya, BS 13, is a business analyst at Wipro EcoEnergy in St. Paul, Minnesota.

Arthur C. Talpaert, MS 13, is a research engineer and PhD candidate at CEA – French National Laboratory in Paris. Talpaert studies Direct Numerical Simulation of low-mach number bubbles with Adaptive Mesh Refinement (AMR).

Quinn T. Vandermeersch, BS 13, is an Associate Reactor Engineer for Exelon Corp.'s Three Mile Island station in Pennsylvania.

Xu Wu, MS 13, is continuing PhD studies in NPRE.

Robert J. Geringer, BS 14, BS 14 Geology, is a graduate student in NPRE.

Mark M. Kamuda, BS 14, is a graduate student in NPRE.

Shane M. Keniley, BS 14, is a graduate student in NPRE.

Jonathan B. Pfingsten, BS 14, works for the Nuclear Regulatory Commission.

Rui Lin Tan, BS 14, is a graduate student at Stanford University.

Amanda M. Lietz, BS 14, is a graduate student in nuclear engineering at the University of Michigan.

Qiyue Lu, PhD 14, works for the National Center for Supercomputing Applications at Illinois.

Steven W. Marcinko, BS 14, is a graduate student in NPRE.

Gianluca A. Panici, BS 14, is a graduate student in NPRE.

Pawel A. Piotrowicz, BS 14, is a graduate student in NPRE.

Jacob B. Stinnett, MS 14, is continuing PhD studies in NPRE.

Benjamin D. Sturm, BS 14, works for Knolls Atomic Power Laboratory.

Bennett T. Williams, BS 14, is a graduate student in nuclear engineering at the University of Michigan.

Deaths

Reynaldo Bocanegra, MS 87, died June 5, 2014. He was 59. Bocanegra was a nuclear engineer at Lawrence Livermore National Laboratory in Livermore, California, the past 14 years. He had previously worked for the Nuclear Regulatory Commission and the Department of Energy. He was a frequent speaker at local high schools, encouraging students to pursue careers in the sciences.

Dean Andreas Cangellaris, College of Engineering, with NPRE student Nicholas Rivera

The Engineering Visionary Scholarship Initiative

The Engineering Visionary Scholarship Initiative will raise a $100 million endowment to bring the nation's best students to Engineering at Illinois by making college more affordable. This endowment – started with a $30 million gift from The Grainger Foundation – will give a vibrant new generation of engineers the skills they need to improve our world in ways we can only imagine.

Scholarships work best when we offer a student $10,000 or more and when students know they can count on them every year throughout their undergraduate careers. These are the scholarships that turn elite students' heads and help them choose Illinois over a competing offer. In 2013, this initiative allowed the College of Engineering to offer large, renewable scholarship to about 50 additional students. With your help, that number will grow.

In contributing to this program, we ask that you please specify your gift is directed to the Department of Nuclear, Plasma, and Radiological Engineering. Thanks for your generosity!

To make a gift, visit NPRE.illinois.edu/giving-opportunities.

DONORS

The following alumni and friends contributed to NPRE's unrestricted and endowed funds from July 1, 2013-June 30, 2014. Thank you for your gifts.

Philanthropists
($10,000 and up)

George H. Miley and Elizabeth B.Miley
David N. Ruzic

Patrons
($5,000 t0 $9,999)

Steven V. Coggeshall, MS 82, MMUS 94 Music, PhD 84, and Theresa Coggeshall
Deborah A. Laughton, BS 95, and Terrill R. Laughton, BS 92, MS 96
John M. Pedicini, PhD 82

Dean's Club
($1,000 to $4,999)

William E. Burchill, MS 65, PhD 70
Yen-Chang Chu, MS 76, PhD 80 and Wen-Nan Wang Chu, MS 76 Home Ec
Walter L. Earley, BS 75 Engr Mechanics, MS 76
Michael J. Giacobbe III, BS 91, MS 95, PhD 99, and Catherine L. Giacobbe, BS 90 Economics
Richard D. Grady and Barbara Jean Grady
Xiaochun Han, MS 11
Craig A. Laughton, BS 90, MS 92, and Charlotte A. Laughton, BS 91 Teaching of Math
Kenneth D. Lewis, AM 79 Mathematics, PhD 82
David W. Miller and Kathleen J. Miller
William L. Myers, BS 85, MS 90, PhD 95
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