new•generation

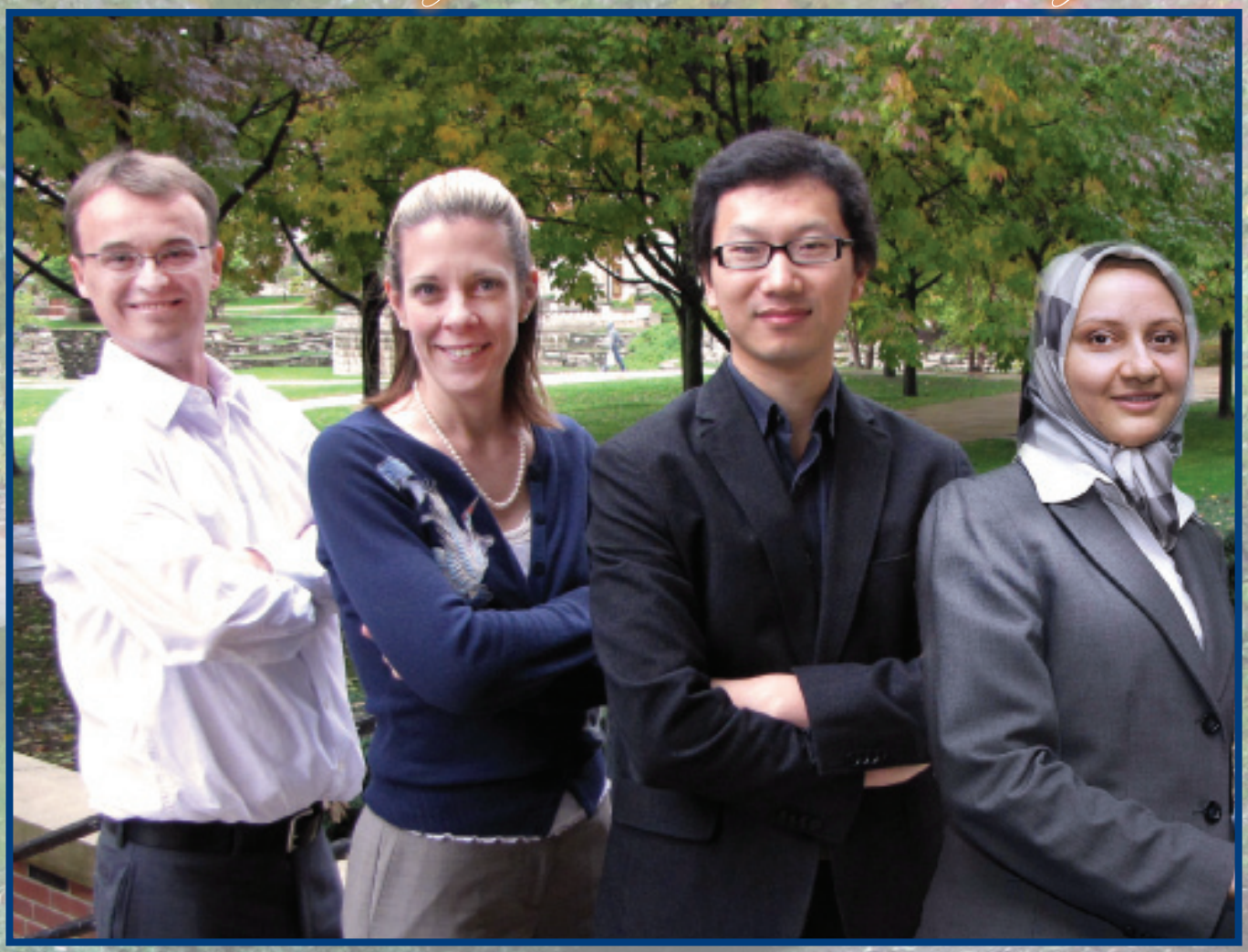
newsletter for alumni and friends

Nuclear, Plasma, and Radiological Engineering

University of IL at Urbana-Champaign

fall 2012

introducing our New Faculty



NPRE: new faculty, new funding, new facilities

The people of NPRE

faculty

James F. Stubbins, *department head*
Roy A. Axford
Brent J. Heuser
Tomasz Kozlowski
Ling Jian Meng
Zahra Mohaghegh
Magdi Ragheb
David N. Ruzic
Clifford E. Singer
Clair J. Sullivan
Rizwan Uddin
Yang Zhang

other faculty

Daniel Andruczyk, *postdoctoral research associate*
Michael Aref, *adjunct assistant professor*
Robert S. Averback, *affiliate faculty*
Ion Baianu, *affiliate faculty*
Marco Beghini, *lecturer*
Stephen A. Boppart, *affiliate faculty*
Tae S. Cho, *postdoctoral research associate*
David E. Curreli, *postdoctoral research associate*
Thomas J. Dolan, *adjunct professor*
James G. Eden, *affiliate faculty*
Masab H. Garada, *adjunct assistant professor*
Daniel F. Hang, *professor emeritus*
Barclay G. Jones, *professor emeritus*
Brian E. Jurczyk, *adjunct research assistant professor*
Micahel K. Kaminski, *adjunct associate professor*
Kyu Jung Kim, *visiting research assistant professor*
Susan M. Larson, *affiliate faculty*
Nie Luo, *visiting research assistant professor*
Charles P. Marsh, *adjunct professor*
David W. Miller, *adjunct assistant professor*
George H. Miley, *professor emeritus*
Richard F. Nelson, *adjunct assistant professor*
Martin J. Neumann,
adjunct research assistant professor
William K. Roy, *adjunct professor*
Robert A. Stubbers,
adjunct research assistant professor
Brian G. Thomas, *affiliate faculty*
Dallas R. Trinkle, *affiliate faculty*
Surya P. Vanka, *affiliate faculty*
Jinhong Wang, *postdoctoral research associate*
Xiaoling Yang, *postdoctoral research associate*
He Yu, *visiting research scholar*
Jian Chuan Zhang, *postdoctoral research associate*

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Idelle D. Dollison, *office administrator*
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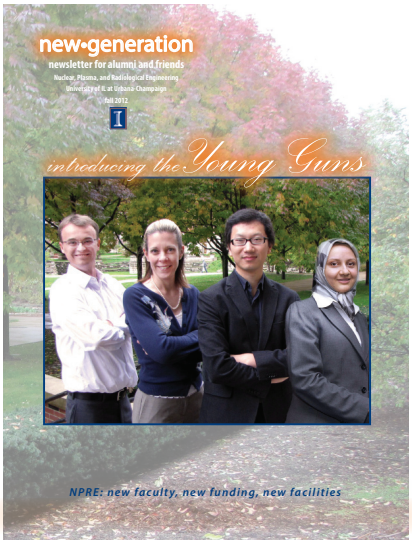
INSIDE



This issue of New Generation *features our newest faculty members, Tomasz Kozlowski, Clair Sullivan, Yang Zhang and Zahra Mohaghegh.*

NPRE Teachers Ranked Excellent by Their Students

Fall 2011:
Roy A. Axford
David N. Ruzic
Rizwan Uddin

Spring 2012:
Roy A. Axford
William K. Roy
David N. Ruzic
Clifford E. Singer

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James F. Stubbins

What an extraordinary year it's been!

You have seen the cover - we are thrilled to add four new faculty members this year! They have already added a new level of vitality to the Department and we are looking forward to great things to come. Please take the time to get to know them in the next few pages. They all come to NPRE with extraordinary backgrounds in diverse fields. You will be impressed by the strength they add to our academic, research and service mission.

In addition to the four new faculty members, NPRE has two more faculty positions we will fill this year. The search for candidates for these positions is currently underway and we hope to be able to announce two more new faculty members by this time next year.

The new faculty members are not the only major developments this past year. NPRE celebrated the largest graduating class of BS students ever. In the last newsletter, we commented on the large numbers of students in the classrooms – they are again a record-sized group this year and this trend is continuing. Our incoming Freshman class is also large this year, as is the overall undergraduate enrollments across the College of Engineering. We also now are seeing the impact of roughly one-third of the entering Freshman class coming from outside the United States. The international student population in Engineering has brought a new level of cultural diversity to our programs.

We are planning now for the review of our undergraduate degree program next year. ABET (formerly the Accreditation Board for Engineering and Technology) will review our program next Fall on the normal six-year review cycle. We will spend much of the Spring semester preparing for this visit and developing our Self Evaluation report. We welcome your help with this important review.

We celebrated the promotion of two of our faculty members this year: Brent Heuser to full Professor, and Ling Jian Meng to Associate Professor. This is also a major step forward for the Department. We are very pleased to see both of these promotions – they are the University's most important recognition of the stature and impact of these two faculty members. You also will see other honors bestowed on our faculty members this year in the coming pages.

This has been a very productive year for our research and graduate programs. We have won some interesting new research awards. Two of the awards are large, collaborative programs aimed at addressing critical technical challenges in the nuclear field. David Ruzic's group has conducted a technical breakthrough in the fusion-plasma field this year, and Ling Jian Meng's group has developed a successful device for medical imaging. You will be excited to read about these accomplishments in the following pages.

Financial challenges are still a major issue on Campus, but strong enrollments and strong research funding have been helpful. Despite financial constraints, Chancellor Phyllis Wise and the Campus have been directing a more aggressive hiring program to rebuild faculty losses that accrued over the past few years. Adding leadership to these efforts has been our new Provost, Ilesanmi Adesida (Ade), who was promoted this year to the chief academic position on Campus from his former position as Dean of the College of Engineering. He was selected in part because of his strength in STEM – Science, Technology, Engineering and Mathematics education, now a major Campus initiative.

In conclusion, this has been an extraordinary year for engaging with our alumni. Your contributions to our program over the past year – both financially and in interactions with our students and faculty - have given us a tremendous lift. We sincerely appreciate those of you who have given generously of your time, energy and resources. We continue to value your support and engagement in the future. Please come to Campus and meet our new faculty when you have the chance. We always value your support to maintain an excellent academic program.

Sincerely,

James F. Stubbins, *Professor and Head*

New Faculty

NPRE Grows Its Faculty;
Receives Funding from the NRC to Help

Tomasz Kozlowski, an expert in nuclear reactor simulations, joined the NPRE faculty in Fall 2011.

This past fall, Kozlowski was joined by Clair Sullivan, an expert in radiation detection, and Yang Zhang, a materials physicist. Zahra Mohaghegh, a socio-techinncal risk analyst, will join NPRE in the spring.

The addition of these assistant professors and the promise of more faculty to come have been terrific developments for NPRE.

"We are extremely fortunate to have attracted these new faculty members who will vastly strengthen and broaden our research and teaching missions," said NPRE Department Head Jim Stubbins. "Our plans are to grow the faculty even more in the near future."

Even better, the federal Nuclear Regulatory Commission is helping to cover the costs of establishing the new faculty. Recently receiving a second round of NRC funding, NPRE has gained a total of $1.2 million from the agency's program since 2011 for new faculty support.

Over the summer the Department learned NRC will supply $450,000 toward the effort, to be matched by the Department, the University of Illinois, and the College of Engineering for a total of $600,000 over a three-year period. The NRC funded a similar three-year proposal for the Department in 2011, so the two awards will overlap.

Tomasz Kozlowski

The new hires bring to 11 the number of tenure-track faculty in NPRE, and the Department has plans to increase that number by even more, Stubbins said.

Filling NPRE's teaching mission has become more challenging as the Department's undergraduate enrollment has grown tremendously over the past several years. The Fall 2011 undergraduate enrollment, with just over 200 students, was the largest in NPRE's history. This fall NPRE has 190 undergraduates.

Kozlowski came to NPRE from Sweden's Royal Institute of Technology Division of Nuclear Power Safety. His background and research interests were featured in the 2011 edition of NPRE's *New Generation* newsletter.

Sullivan has most recently worked for the Central Intelligence Agency in Washington, D.C. Zhang comes to NPRE as a Clifford G. Shull Fellow at Oak Ridge National Laboratory in Tennessee.

Clair Sullivan

Sullivan has acquired nearly a decade of experience as both a researcher and practitioner, applying her background to the fields of nuclear emergency response, intelligence, and homeland security.

In her position with the CIA, where she has been responsible managing a scientific advisory group, a multi-million dollar research portfolio, and a new laboratory facility among other duties, "I don't get to spend as much time as I would like to doing real research. I want to get back to working with students again, and producing work that I can publish."

She hopes to develop improved algorithms for detector devices as part of her research.

Before working for the CIA, Sullivan worked at Los Alamos National Laboratory where she was a member of on-call deployable nuclear emergency response teams that used radiation detectors in the field for homeland security and emergency response situations. The detectors would indicate a suspicious material's presence, but were often inaccurate in identifying the source. "Was it plutonium or something benign?" Sullivan said the team would wonder. "A lot of detec-

tors were getting very wrong answers. We were spending thousands of dollars on equipment that was kind of worthless."

She believes the work she's doing with algorithms shows promise. "I want to take that to the next level."

Sullivan will establish a small lab in NPRE for her research work, and this fall will teach NPRE 451 (radiation detection and instrumentation; radiation dosimetry and shielding; basic measurements in nuclear engineering; engineering applications; micro computer data acquisition and experimental control). She looks forward to her career's new direction.

"What drew me to Illinois is how collaborative the atmosphere is. There are 60 multidisciplinary centers; I'm impressed by how much people are encouraged to collaborate with each other," she said.

Among the researchers with whom Sullivan could potentially work is Associate Prof. Ling Jian Meng, an NPRE faculty member since 2006. Meng, who also studies radiation detection and measurement as well as biomedical imaging, knew Sullivan previously when he was an assistant research scientist at the University of Michigan and she was a student there.

"He and I shared a lab together back at Michigan," Sullivan said of Meng.

Having grown up near Detroit, Sullivan earned four degrees from the University of Michigan: bachelor's degrees in astronomy and physics in 1997, a master's in nuclear engineering in 1998, and a PhD in nuclear engineering in 2002. She was named the "Graduate Student of the Year" at the time she earned her doctorate.

She also received the 2004 Distinguished Performance Award from Los Alamos, and the 2010 Exceptional Performance Award from the CIA. The Los Alamos honor recognized Sullivan's work with the Port Authority New York/New Jersey Police to secure New York City from nuclear terrorism. The CIA award noted Sullivan's research.

In addition to those honors, Sullivan shares ownership of three patents:

- One on a semiconductor neutron detector (2011)
- Another on a method and system for high-speed, 3D imaging of optically-invisible radiation (2004)
- And the third on an augmented reality radiation display system and in situ spectrometry method for determining the depth distribution of radionuclides (1999).

She also served as a professional service associate editor for the Institute of Electrical and Electronics Engineers Transactions on Nuclear Science journal.

Clair Sullivan

Yang Zhang

The principle focus of Zhang's research is to understand the physics of disordered materials through integrated microscopic experimental probes and predictive computational modeling.

"The structure and dynamics of these materials are either inherently complex or driven far from equilibrium by extreme conditions – rapid change of temperature or pressure, intense irradiation, high mechanical load, and so on," Zhang said. "Because of the harsh nurturing conditions, there is a hope for these disordered materials to survive under extreme environments."

"Examples include some of the most popular and promising engineering materials: amorphous and high-entropy alloys, liquids and glasses, cement and asphalt concrete, and innumerable bio and soft materials," he continued. "Such studies will shed light on a class of fundamental and technical problems involving phenomena emerged from rare events, frustrations and ergodicity breaking, and lead to countless pivotal applications in nuclear systems."

Zhang points to his graduate work at the Massachusetts Institute of Technology and his continuation work at Oak Ridge National Laboratory (ORNL) as among his best achievements to date. His experiments using neutron scattering showed that water supercooled below its normal freezing point – at about minus 60 degrees Celsius and more than 2,000 bars – can transform from one liquid phase to another liquid phase with very different densities.

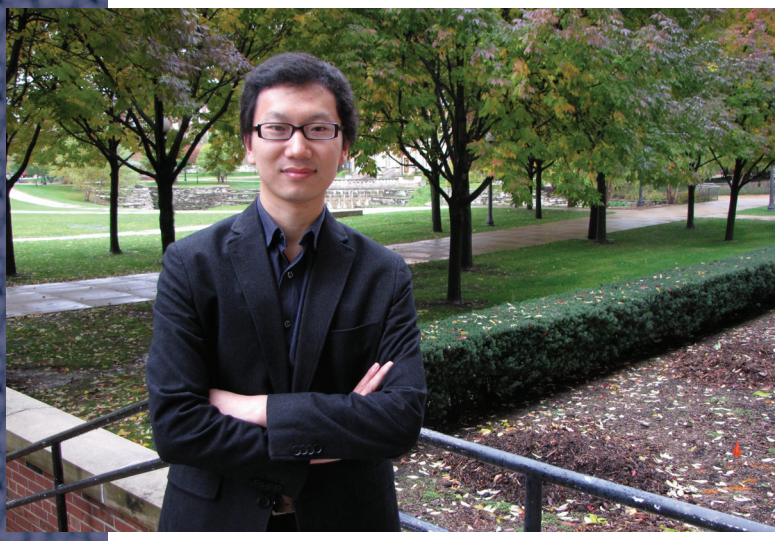
continued on page 6

New Faculty

continued from page 5

A homemade experiment of metastable supercooled water. However, the lower the temperature, the more difficult to avoid the freezing. Using the simple method demonstrated in this video, bulk water cannot be supercooled below the so-called homogenous nucleation temperature at around -38C. Zhang and his collaborators have gone beyond this limit by loading water into nanopores, and achieved deeply supercooled water.

He was able to do this by using nanometer-sized tubes of silica, in which the molecules of water were tightly confined so that they were unable to crystallize into ice. The tight confinement made it possible to maintain water in liquid form far below its normal freezing point. Zhang probed the density of the supercooled water molecules using a neutron beam from a reactor at the National Institute of Standards and Technology, and found a difference in water's density by approaching the expected transition temperature from opposite directions, proving previous theories.



Yang Zhang

In a YouTube video (http://www.youtube.com/watch?v=Bm0usEP8A10), Yang Zhang shows a homemade experiment of metastable supercooled water.

Zhang comes to Illinois from the Spallation Neutron Source at ORNL, where he was named the Clifford G. Shull Fellow in 2010. At the national lab, he investigated the physics of liquids, glasses, and soft condensed matters using both neutron scattering techniques and computer modeling and simulation.

He earned a PhD in nuclear science and engineering from MIT in 2010 and a bachelor's degree in electrical science and technology from the University of Science and Technology of China in 2004.

Zhang has more than 20 publications, including book sections and peer-reviewed articles in high impact journals.

He envisions that he will be collaborating with NPRE Profs. Jim Stubbins and Brent Heuser, as well as research groups in several other departments and labs in the College of Engineering and across campus. "I look forward to in-depth collaborations with the research groups at Illinois. With the collective effort, we may be able to make a huge impact in the understanding of materials performance under extreme environments," Zhang said.

Zahra Mohaghegh

Scientists need to consider how social and technological elements interact when searching for ways to ensure nuclear power safety, Mohaghegh said.

Beginning in January 2013, Mohaghegh will join NPRE with "a desire to enhance safety of nuclear power plants and, to benefit society by reducing the probability of accidents and incidents in complex, high-risk engineered systems." She hopes "to make scientific contributions to the fields of risk and reliability, in general, and more specifically, to develop advanced methodologies and techniques for Probabilistic Risk Analysis (PRA)."

PRA has grown since its beginnings with the landmark Reactor Safety Study (RSS) published in 1975. "PRA can provide input for risk-informed decision making for the design, operation, and regulatory oversight of complex systems," Mohaghegh said.

Risk-informed activities include new reactor licensing, life extension and power upgrade decisions for the current generation of plants, operational decisions regarding maintenance, system upgrades, inspections, and assessment of operational events. Even traditionally deterministic disciplines, such as Thermal Hydraulic (TH) and accident phenomenology modeling, have found value in incorporating probabilistic thinking.

Zahra Mohaghegh, left, receiving the George Apostolakis Fellowship Award from the International Association of Probabilistic Safety Assessment and Management (PSAM).

Despite significant methodological advancements, new methods for PRA are needed, Mohaghegh said. "If we want to preclude catastrophes, we need to more formally and comprehensively integrate the interactions of social and technical systems in risk assessment. We need to incorporate the underlying failure mechanisms of both physical and social elements of risk scenarios into a socio-technical risk analysis framework."

Her background in Mechanical and Reliability Engineering and expertise in social sciences provide Mohaghegh with the foundation to advance the state of the art in socio-technical risk analysis of complex systems, with an emphasis on nuclear power safety. Through new research, she intends to "bridge the gap between engineers and social scientists to more realistically model risk."

"We have witnessed the gaps in safety culture as significant risk contributors to many major accidents such as Three Mile Island and Chernobyl and, the recent disasters at Fukushima and the Gulf of Mexico," Mohaghegh said. "However, there has not yet been any consensus among industry, academia, and regulatory organizations regarding the best approaches to assess safety culture and how to model its impact on technical systems risk."

Mohaghegh earned her B.Sc. in mechanical engineering from Sharif University of Technology in Tehran. She then worked as a research engineer in the largest power plant research institute in Tehran, and came to understand how organizational factors influence the performance of complex technological systems. This experience motivated her to pursue graduate studies (master's and PhD) in reliability engineering at the University of Maryland. She also completed graduate courses in industrial and organizational psychology, business and public policy.

She developed a multi-level framework, called SoTeRiA (Socio-Technical Risk Analysis), as a theoretical foundation for the integration of technical system PRA models with both the social features (e.g., safety culture) and the structural aspects (e.g., safety practices) of the organization operating the system. She pioneered the integration of Bayesian Belief Network, (a probabilistic tool), and System Dynamics, (a deterministic method), with the classical PRA techniques. The work earned for her the Zonta International Amelia Earhart Award.

In 2010, Mohaghegh founded Soteria Consultants, a risk management consulting enterprise supporting proactive decisions involving complex systems. One of her current projects, funded by the South Texas Project Nuclear Operating Company (STPNOC), focuses on the risk-informed resolution of the Nuclear Regulatory Commission's Generic Safety Issue 191 (GSI-191).

Earlier this year, the International Association of Probabilistic Safety Assessment and Management (IAPSAM) presented Mohaghegh with the George Apostolakis Fellowship, recognizing her "early career" contributions in Risk Assessment.

Mohaghegh will establish a Socio-Technical Risk Analysis (SoTeRiA) research lab in NPRE and, with her students, will continue this line of research. "I welcome students who are passionate about multidisciplinary research. I look forward to collaborating with faculty in NPRE, with other departments at Illinois, and with other universities. NPRE has been a most welcoming nuclear engineering department regarding multidisciplinary research," says Mohaghegh who has published a book, *Socio-Technical Risk Analysis*, and has written many journal and conference papers on the subject.

Mohaghegh plans to design new courses on the subject, and promote risk/reliability analysis as an area of concentration in NPRE. "A selective set of these courses can create a potential for risk analysis certificates for those students in this department or other engineering departments who want to join the industry as risk or reliability analysts." says Mohaghegh, who serves as the Technical Program Chair for the 2013 American Nuclear Society Risk Management Topical Meeting.

Mohaghegh is a member of the Society for Risk Analysis, American Nuclear Society, Society of Women Engineers, and American Society of Mechanical Engineers.

New Funding

NPRE Leads in $5 Million Accident-Tolerant Nuclear Fuel Project

NPRE researchers are taking the lead in a $5 million project to fabricate and test modified nuclear reactor cladding. The goal of the project is to develop an accident tolerant nuclear fuel cladding for commercial power applications.

The U.S. Department of Energy has awarded a Nuclear Energy University Programs (NEUP) grant of $3.5 million for the work to NPRE to explore advanced nuclear fuel cladding concepts for greater accident tolerance of light water nuclear reactors. The United Kingdom's Research Council Energy Programme will provide an additional $1.5 million toward collaborative activities directly related to the project, leading to a total investment of $5 million. This international research effort represents a proactive response of the DOE, the U.S. nuclear industry, and the United Kingdom following the March 2011 events in Fukushima, Japan, when an earthquake and tsunami hit the northern part of the country, leading to the eventual destruction of reactors at the Daiichi site.

Lead investigator for the three-year project is NPRE Prof. Brent J. Heuser. Joining him from NPRE will be Department Head James F. Stubbins, Prof. Rizwan Uddin and Assistant Prof. Tomasz Kozlowski. Heuser will lead the work on reactor cladding performance and Kozlowski will take the lead on reactor systems.

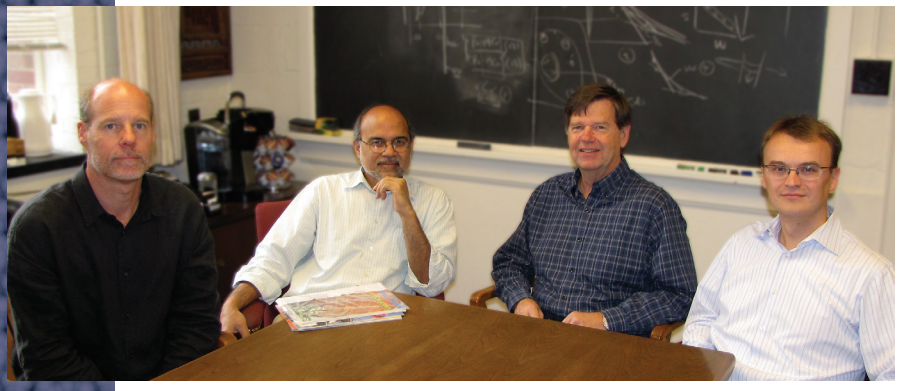
Also from Illinois, Materials Science and Engineering Department faculty Associate Prof. Dallas Trinkle and Prof. Robert S. Averback will participate in the work. Fifteen additional principal investigators from the University of Florida, the University of Michigan, Idaho National Laboratory, the University of Manchester in the United Kingdom, and industrial partner ATI Wah Chang, an Albany, Oregon-based nuclear cladding fabricator, will be involved.

Heuser said the scientists will examine two concepts to develop accident tolerance during off-normal event scenarios: 1) the application of a coating to the cladding and 2) bulk composition changes that promote self-healing in the cladding.

Nuclear fuel cladding separates the water coolant and fuel, representing the first engineering barrier for the reactor. The reactor pressure vessel and the reactor containment structure are additional engineering barriers. The material used in cladding is Zircaloy, a zirconium-rich alloy containing small amounts of tin, iron, nickel, and chromium.

In the case of the Fukushima accident, the Zircaloy cladding reacted with steam to form thick oxide scale. This oxidation reaction adds additional heat to the fuel during the transition and releases hydrogen gas.

Heuser and his group believe that applying a coating to the cladding will inhibit oxide formation, thus preventing hydrogen release and additional fuel heating. With the self-healing option, an additive is included in the cladding material. During an off-normal event, the additive will migrate to the surface and form a coating. This change in the surface composition is anticipated to inhibit oxide formation.



Profs. Brent Heuser, Rizwan Uddin, and Jim Stubbins and Assistant Prof. Tomasz Kozlowski.

The NPRE scientists' work in this project is related to existing research, also funded by the DOE, to study used nuclear fuel in storage. The new project is anticipated to leverage the technical expertise and facilities at the Urbana campus and the other partner institutions to further promote nuclear reactor safety.

Six new graduate students will be needed within NPRE to participate in the project, Heuser said, with more students supported at the partner academic institutions both in the United States and overseas.

Materials Funding Round-up

NPRE has had considerable success recently in securing federal funding for nuclear power research and education. Here is a round-up of recent grants:

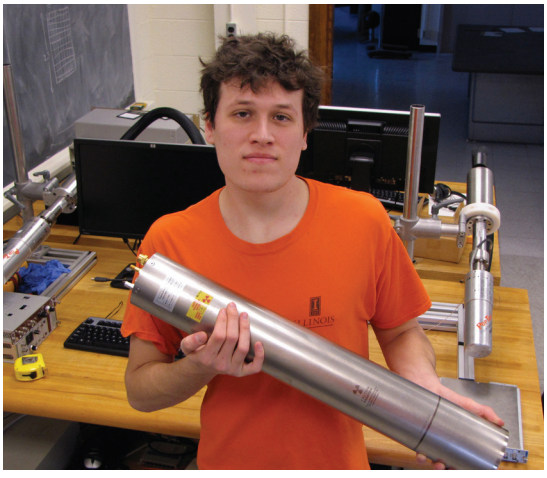
- The U.S. Department of Energy (DOE) Nuclear Energy Universities Programs (NEUP) has provided $3.5 million toward a project to explore advanced nuclear fuel cladding concepts for greater accident tolerance of light water reactors.
- The Nuclear Regulatory Commission (NRC) has provided a total of $1.2 million since 2011 to help support new faculty.
- The DOE NEUP has provided $876,332 for work to determine how materials stand up to radiation.
- The DOE NEUP has provided $160,000 for modeling work to determine the performance of concrete used in casks that store spent fuel.
- Department Head Jim Stubbins and Prof. Brent Heuser share in a $4.5 million DOE NEUP award to research the aging of stored, used nuclear fuel. With Texas A&M University leading this project, Stubbins and Heuser have been awarded $720,000 over three years to support the study of used fuel cladding and canister properties for long-term dry storage.
- Stubbins received $125,000 in additional DOE NEUP funds to update materials testing equipment to study the aging of nuclear fuel cladding under extreme environmental conditions.
- Stubbins has further received from DOE $100,000 to support an experiment he performed on Argonne National Laboratory's Advanced Photon Source accerlator. The project evaluated the changes steel experiences under radiation. Ensuring that steel can withstand radiation at high temperatures is critical to moving forward with advanced reactors.

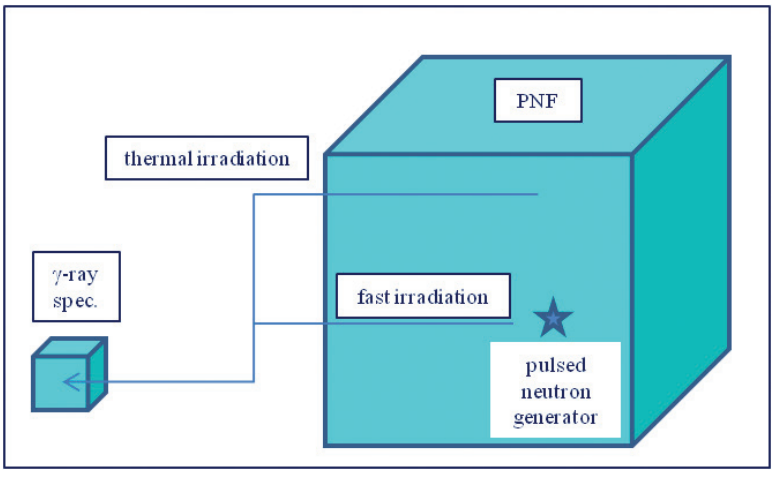
Stubbins has Role in I2CNER

The University of Illinois is now the home of the satellite campus of the Japan World Premier Institute: International Institute on Carbon Neutral Energy Research, I2CNER. Petros Sofronis, professor in the Mechanical Sciences and Engineering Department, serves as the institute's director.

The Institute is developing technology in several directions to address carbon neutral energy production distribution. NPRE Department Head Jim Stubbins is working with I2CNER to help develop a plan for the energy future that will lead Japan to a carbon neutral energy portfolio.

Stubbins is part of the Energy Analysis Division of I2CNER which is assessing the economic, policy and environmental issues associated with the development and implantation of Japan's new energy technologies.





Left, NPRE graduate student Richard Kustra with equipment from NPRE's new neutron generating facility. The pulsed neutron facility (PNF) will enable an wide range of educational and research activities related to neutron transport, neutron activation analysis, and special nuclear material interrogation. Funding from UIUC COE, US DOE NEUP, and the US NRC is being used to develop the PNF. This development work supports three graduate students and primarily uses MCNP to determine the optimized configuration.

New Funding

NPRE Gains $1 Million from DOE universities program

NEUP Nuclear Energy University Programs
U.S. Department of Energy

NPRE faculty have secured over $1 million in funding from the U.S. Department of Energy's Nuclear Energy Universities Program (NEUP).

The largest portion of the NEUP grant, $876,332 over three years, will support the work of NPRE Department Head Jim Stubbins and his group in learning how various materials stand up to radiation. Researchers will perform post-radiation analysis and develop tools for future development and application of the Fe-Cr class of alloys. The results of this research will lead to better modeling of performance and development of alloys of choice for reactor fuel cladding and structural applications in advanced nuclear systems.

For the past five years Stubbins and his group have been studying radiation effects on materials ranging from pure iron to complicated ferritic steels composed mostly of iron and chromium. Studies have been conducted using the reactor irradiation facilities at the Advanced Test Reactor (ATR) at Idaho National Laboratory.

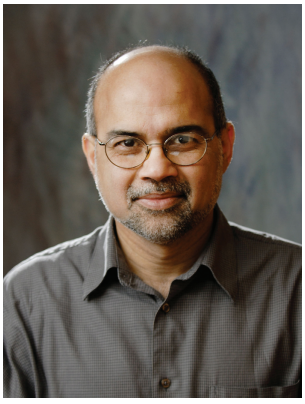
NPRE's materials researchers were the first to use ATR's "rabbit" facility with an experiment conducted in September 2011. The facility offers a pneumatic tube researchers can use to shoot specimens into the INL's reactor to irradiate specimens. That way, the reactor doesn't need to be shut down to load specimens. In addition to the rabbit irradiations, a larger irradiation program was carried out with specimens loaded directly into the reactor for longer irradiation exposures.

Also from the NEUP program, $160,000 was awarded NPRE Prof. Rizwan Uddin to perform modeling studies to characterize the performance of concrete used in the casks that store spent fuel. Uddin's work is part of a University of Houston proposal aimed at investigating the performance of dry cask storage systems under multiple hazard systems (earthquake, tornados, combined with aging effects) using a probabilistic multi-hazard framework. This framework will be validated based on experimental research and will provide improved models for safety and reliability of spent nuclear fuels during storage and transportation.

Altogether, the DOE awarded $47.2 million in scholarships, fellowships, research projects and university research reactor upgrades to train and educate the next generation of leaders in America's nuclear industry. The NEUP awards announced this week will support nuclear energy R&D and student investment at 46 colleges and universities around the country.

"We must invest in the next generation of American leaders in science, technology, engineering and math in order to fulfill our commitment to restarting America's nuclear industry and making sure that the United States stays competitive in the 21st," said Secretary of Energy Steven Chu. "The awards will help train and educate these future leaders while strengthening our competitive edge and developing the innovations we need to create new jobs and export opportunities for American-made nuclear technologies."

Jim Stubbins



Rizwan Uddin

NPRE Projects Picked among College's Research Initiatives

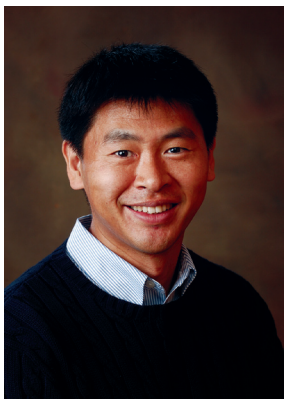
The College of Engineering has identified two NPRE projects— one aimed at special nuclear material detection and the other, at nuclear security—among the first six projects the new Strategic Research Initiatives (SRI) program will support.

The intent of SRI, which grew out of discussions at the College Leadership Retreat, is to place Illinois in a clear leadership position in promising new and growing areas of engineering research. SRI will support early stage research—the initiation and exploration of new research—through strategic investment in the form of seed funding. Late-stage funding will support projects that develop engineering leadership by collecting and building on existing capabilities in units or groups to form new interdisciplinary focus areas or centers.

Selected for early-stage funding is the work of Prof. Brent Heuser and Associate Prof. Ling Jian Meng, collaborating with Physics Associate Prof. Matthias Grosse Perdekamp, on the project, "Interrogation of Special Nuclear Material Using the UIUC Pulsed Neutron Facility."

According to the College, "Nuclear security has become very important both domestically and internationally. The ability to monitor port-of-entry, to track fissile material across international borders, to properly safeguard the nation's nuclear weapon stockpile, and to develop nuclear counterterrorism measures all require the development of innovative technology and technical expertise in special nuclear material (SNM) detection."

Brent Heuser



Ling Jian Meng

This proposal is aimed at developing the technical infrastructure and expertise within NPRE for studying SNM. The initiative brings together three faculty members with contrasting expertise spanning nuclear materials and neutron transport simulation, radiological imaging, and particle physics. It also makes use of the new pulsed neutron generator and specialized gamma-ray detectors that are being established this summer within Talbot Laboratory.

In addition to helping researchers pursue the SNM investigation, the new equipment also is expected to allow NPRE to develop new curriculum.

Receiving SRI late-stage funding is Prof. Rizwan Uddin's work with William Sanders, professor of electrical and computer engineering and the Coordinated Science Laboratory, on "Digital/Cyber Security and Nuclear Security."

"The nuclear industry and homeland security establishments have an urgent need to continuously push the state of the art to develop new, advanced, and nuclear-grade digital control and cyber security technologies," according to the College. "Because of its existing expertise in nuclear engineering, and in digital and cyber security, the University of Illinois is uniquely positioned to develop a national center for digital instrumentation and control, and for cyber security for nuclear-specific applications."

Work is already underway in NPRE on the development of a test bed to simulate cyber attacks at a nuclear power plant, and CSL has recently acquired a state-of -the-art fault tolerant controller based on a Triple-Modular Redundant (TMR) architecture. The goal is to marry the expertise available at NPRE and CSL (and in other parts of the college and campus) to develop a center for digital (control) and cyber security for nuclear-specific applications. In addition to integrating the available expertise, the project will include an international workshop on campus in spring 2013 to present Illinois' leadership in this area.

New Technology

Expanding the "LiMITS" of Fusion Reactors

Innovation May Impact Feasibility

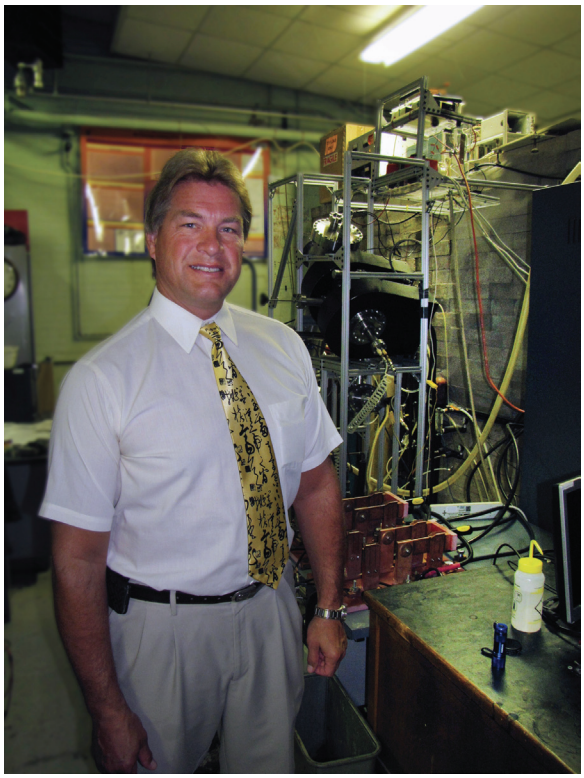
Scientists in an international fusion energy conference on October 12 proclaimed the success of an experiment NPRE researchers conducted on a Chinese tokamak fusion reactor.

Prof. David Ruzic presented results on "Lithium-Metal Infused Trenches: A New Way to Remove Diverter Heat Flux," at the 24th International Atomic Energy Agency (IAEA) Fusion Energy Conference held in San Diego, California. Ruzic's paper reflected success from an experiment conducted earlier that week on an HT-7 Tokamak reactor in Hefei, China.

Later, selected to summarize the conference's fusion technology and power plant designs contributions, Dr. Stanley Milora of Oak Ridge National Laboratory noted that the Illinois group's experiment "is installed on HT-7 in China and is working very, very satisfactorily."

The success in China is the culmination of a decade of work aimed at making fusion reactors more economical.

Ruzic and his students in the Center for Plasma Material Interactions (CPMI) have designed a method for molten lithium to self-circulate along the surface of a fusion reactor's diverter, where excess heat is collected and removed. Such an innovation, Ruzic believes, could reduce the size of a fusion reactor's radius by a third, while allowing it to produce the same volume of energy.



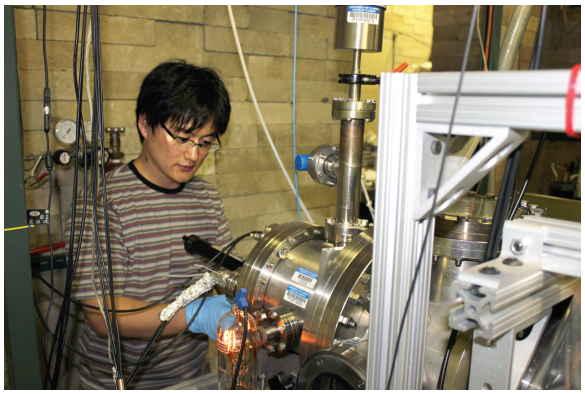
Prof. David Ruzic and the LiMIT experiment equipment.

"We're looking at a factor of 10 in cost reductions, at least," Ruzic said.

The concept, known as LiMIT (Lithium/Metal Infused Trenches), previously was successfully conducted in CPMI laboratories. "Skeptics have felt that it was something that worked in the lab, but would not work in an actual fusion device (a tokamak)," Ruzic said. "Well, our experiment in China, which was done in the HT-7 tokamak at the Chinese Academy of Sciences, Institute of Plasma Physics (ASIPP) in Hefei, on October 11, 2012, has put those doubts to rest. I showed movies of the device working. It did flow – at the rate we predicted. It did not cause any type of failure, and it even improved their energy confinement by 10 percent. Given that this was a small module and was not the main "limiter," it is very likely that a larger LiMITS closer to the plasma would have improved confinement and other parameters by an even greater degree."

This demonstration of a flowing molten lithium limiter in an actual major fusion device is a first and a major breakthrough. In addition to the Chinese, the U.S. Department of Energy has been interested in the work, and had awarded a $600,000 grant to fund experiments in the CPMI laboratories.

For decades, scientists have been dreaming of harnessing nuclear fusion, the power of the stars and sun, to provide safe, clean and virtually unlimited energy. But among deterrents, the size that a fusion reactor facility needs to be to sustain plasma so it is hot enough to fuse particles is so great (about 100 million degrees Celsius) that it is not cost-effective. According to Ruzic, an entire fission nuclear reactor and steam generator could fit inside the central core of ITER, the International Thermonuclear Experimental fusion Reactor being built in France.



CPMI researcher Soonwook Jung

In comparison, a fission reactor now costs 10 times less than a fusion reactor to build, and lasts for 50 years as opposed to a fusion reactor's few months of life.

The key to CPMI's proposed solution to reduce the facility's size lies in using molten lithium as the material in contact with the plasma in the diverter portion of a fusion reactor. Most of the heat striking the walls of a fusion reactor is collected and removed at the diverter.

While a thin shell of evaporated lithium on a major portion of the reactor's donut-shaped walls helps fusion work better, the surface temperature normally gets too high in the area of the diverter. Lithium vaporizes easily around 450 degrees Celsius, and the temperature of static lithium would rise to that degree too quickly where the diverter is located.

To counteract this, Ruzic and his students have used flowing molten lithium in the radial trenches of metal tiles lining the diverter. In this way, the lithium flows out of the high-heat zone before it gets too hot. One of the main challenges the research group encountered was getting the lithium to flow, realizing it could not be pumped through, nor would it fall by gravity because the magnetic field of the fusion device would stop it from flowing.

The key innovation was Ruzic's group's use of thermo-electric magnetohydrodynamics in which they employed the magnetic field itself and the heat from the tokamak to make the lithium flow in the direction they want it to go. "The hotter the lithium gets, the faster it flows," Ruzic said.

The work combines LiMIT with an experiment called SLiDE (Solid/Liquid Lithium Diverter Experiment). SLiDE uses an electron beam to test liquid metal plasma facing components (PFCs) under a constant heat flux similar to those found in fusion devices. It is the primary means for testing the LiMIT concept.

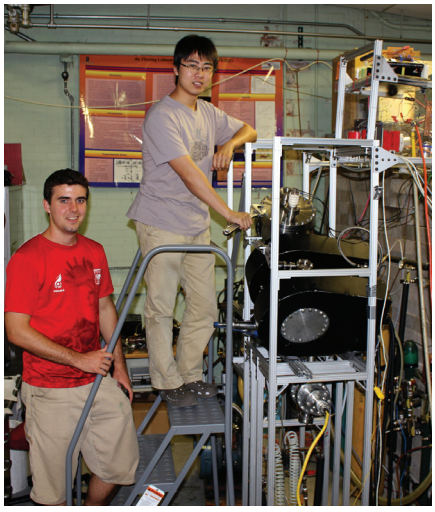
The work also involves Ruzic's group's DEVeX (Diverter Erosion and Vapor shielding eXperiment). In this work, the researchers simulate the types of plasmas that occur in a fusion reactor when there is instability. It also looks at lithium's ability to shield a surface from the power flux occurring on the surface. "DEVeX is a plasma cannon," Ruzic said.

Ruzic said of the collective work: "This general concept could be significant in getting fusion reactors to be practical. It's certainly the most significant problem that I've worked on" in this area.

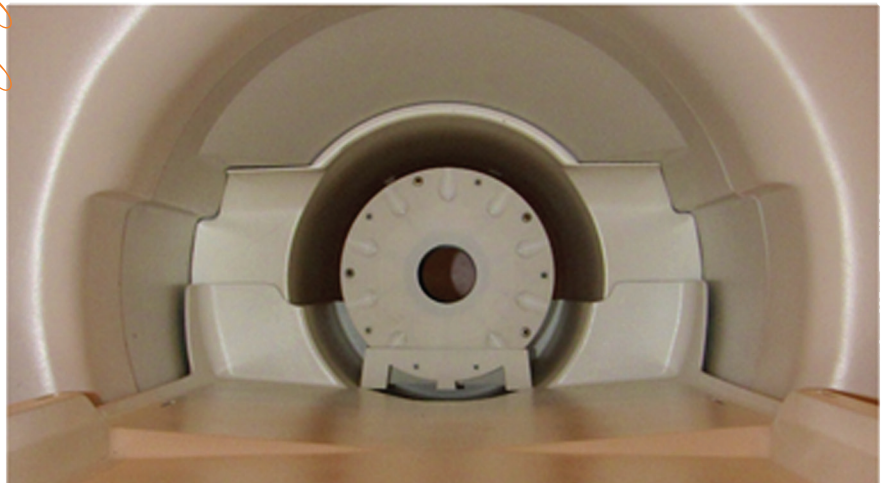
For over 10 years Ruzic has been thinking about ideas for using lithium in fusion reactors, and he recalls sketching the basics for LiMIT on a napkin in May 2010. Among students who have played a role in this work have been J.P. Allain (MS 00, PhD 01), now an associate professor of nuclear engineering at Purdue University, and Michael Jaworski (BS 02 Mechanical Engineering, MS 06, PhD 09) a researcher at the Princeton Plasma Physics Laboratory. Current graduate students working with Ruzic on the experiments are Soonwook Jung, Peter Fiflis and Wenyu Xu.

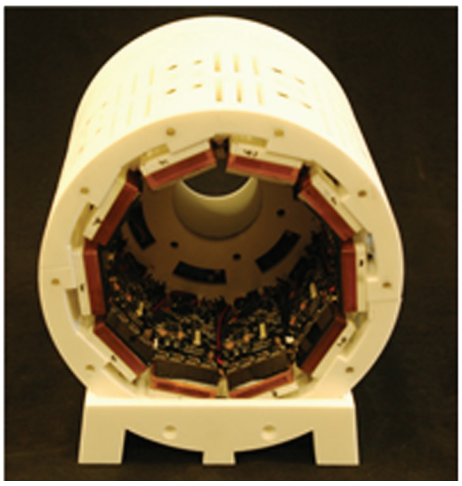
The lure of making fusion power a reality was one of the reasons Ruzic was drawn to nuclear physics as a student in the 1970s.

"When I started grad school they said fusion energy was 25 years away. Now (scientists are) saying it's 35 years away from now. If they had told me when I started that it would take 70 years I probably wouldn't have gone into the field!" Ruzic said. "I'm glad I did though. This type of concept could finally lead us to having fusion as an economically viable power source."

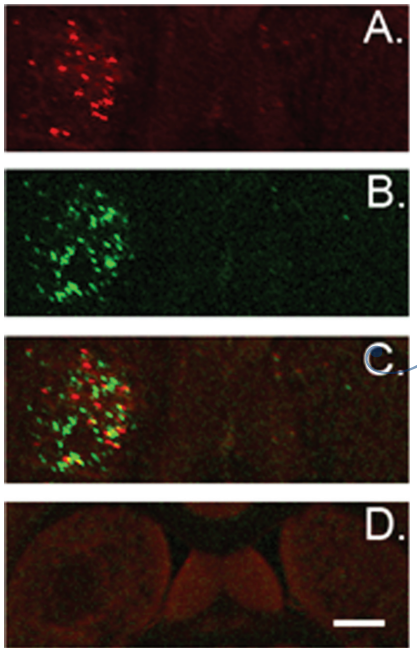


CPMI researchers Peter Fiflis (left) and Wenyu Xu.





Left: The ultrahigh resolution hybrid SPECT-MR system that Ling Jian Meng and his group have developed. This system consists of a MR-compatible SPECT system (shown at the center) installed inside a pre-existing MR scanner. Right: The figure at the upper-left corner shows the special-designed detection system structure of the MR-compatible SPECT.



LI-COR laser scanner images of NIR labeled T cells infiltrating a brain tumor. Horizontal sections of the left and right striatum. A-C are from a mouse injected with activated (red) and naïve (green) T cells labeled with CellVue Burgundy (red) and CellVue NIR815 (green). D. Section of same region from a control mouse with brain tumor but no injected T cells. Tumor is on left. Scale bar = 1 mm. These images are acquired by Dr. Roy's (Co-PI) lab.

Hybrid Nuclear Imaging Device Works within MRI

NPRE Associate Prof. Ling Jian Meng and his research group have built a nuclear imaging device that can produce an ultrahigh imaging resolution, and that can also work inside a magnetic resonance imaging (MRI) scanner.

The hybrid magnetic resonance and single photon emission-computer tomography system (MR-SPECT) provides an imaging resolution of 300 to 500 microns, Meng said. "The previous best was 2 to 3 millimeters."

Using the device within an MRI allows scientists to view two complementary images simultaneously: the MRI produces a structural image, while the MR-SPECT provides functional images, such as the spatial variation in uptake of radiolabeled drug inside a living animal.

"This has been the result of five years of research," Meng said of the device that he and his students have built from scratch.

"Supported by several grants from sources such as NCI (National Cancer Institute), DOE (Department of Energy) and NIBIB (National Institute of Biomedical Imaging and Bioengineering), we started from developing a novel gamma ray imaging detector."

Technological knowledge gained from other projects, such as the development of a focal plan detector for a National Aeronautics and Space Administration (NASA) satellite mission, also aided in the MR-SPECT device project, so Meng estimated the total investment for the development to be about $2.5 million.

"This system is unique in the sense that it leverages the state-of-art detector technology," he said. "This leads to the highest spatial resolution available with MR-compatible nuclear imaging systems."

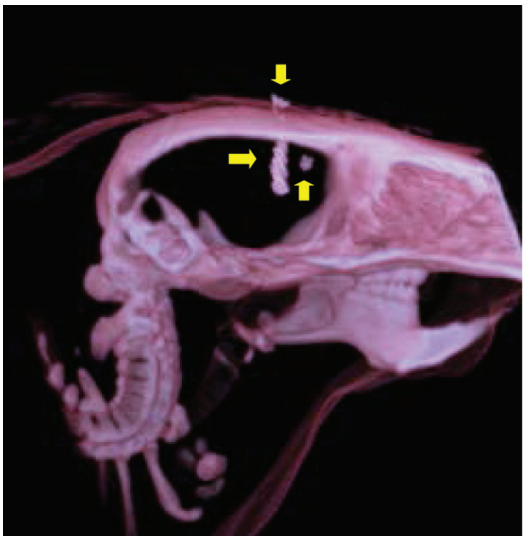
The current device is equipped with 10 gamma ray detectors arranged in a circle in a donut-shaped plastic holder designed to fit inside an MRI machine. The design enables a tomographic view of samplings without moving the imaging system, Meng said.

The device can play an important role in disease diagnosis, drug delivery and therapy monitoring. In the near term, the MR-SPECT device can be used to image pancreatic beta cells to diagnose early signs of diabetes, or track T cells – white blood cells that play a central role in cell-mediated immunity – to watch their movement in attacking cancer cells.

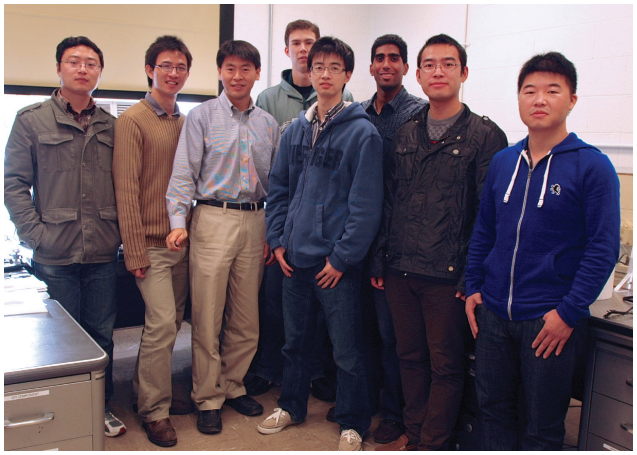
"(The MR-SPECT device) is a very sensitive technique of visualizing radiolabeled drugs, and the MRI provides an exquisite soft-tissue contrast," Meng said. "One can look at where the radiolabeled cell goes inside a small lab animal and at the same time visualize its internal tissues and organs with an exquisite soft-tissue contrast.

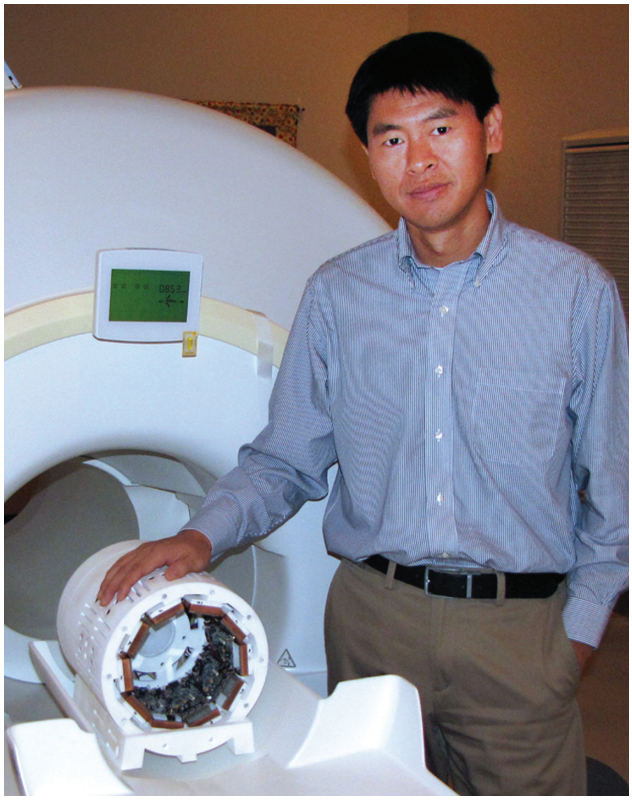
"With cutting-edge technology squeezed into an ultra-compact and user-friendly package, the system offers an unmatched imaging performance for monitoring cancer therapy and drug delivery. We would like for it to be in hospitals, as well as in biology and chemistry labs."

Meng's group has been working with colleagues at Washington University in St. Louis, as well as with researchers at the University of Chicago, the University of Michigan, and with several European scientists.



3-D rendering of a fused SPECT/CT image of a mouse's head. A small number (down to 1500) of radiolabeled cells were visible in the image (yellow arrows). The total imaging time was 1.5 hours with a dual head SPECT/CT system developed at Meng's lab.





Left: Meng with his research group. Right: Meng with the hybrid SPECT-MR system

New Technology

Stepping Up the Game

Online Technology Simulates Laboratory Experience

NPRE at Illinois Prof. Rizwan Uddin and recent graduate Imran Haddish have developed videogame technology to give students a realistic online laboratory experience.

"Nobody has used this to do labs," Uddin said of the teaching innovation. "This is three-dimensional and interactive, with full functionality. It is as though the person is inside the lab. The data is generated using real physics and will be taken from a realistic model of the experiment."

"The possibilities are endless with the tools we have available," said Haddish, a May 2012 NPRE graduate. "Virtual labs will re-create the classroom online in ways that are impossible in real life due to budgetary or safety concerns. We can develop a course where students learn to operate a reactor or refuel it."

Starting this fall, NPRE 100 students will be able to use the virtual lab hosted at https://www.scivle.com/ to conduct experiments teaching them nuclear engineering concepts such as half-life and shielding. Measurement devices present real-time data to students as the virtual experiments progress. "That was a very big challenge to display data inside the virtual model, a real computer science problem," Uddin noted. Luckily, Haddish is skilled in computer science as well as in nuclear engineering; he earned his bachelor's degree in three years. "We would not have gone this far in the way that it has gone without Imran," Uddin said.

With the data acquisition being completely automatic, students "could actually finish the lab as they acquire data," he said. They also can work with lab partners without having to be in the same place physically.

The online platform built to host these virtual labs puts everything the students need to complete their labs inside their browser. Students can process their data, write their reports, complete assessments, chat, and post questions all online using the latest technology. "The goal is to make sure students don't need to leave their browser to complete their lab," Haddish said.

For example, clicking on any lab equipment that has an identifying symbol (such as an "i") on it will cause a video to play in a pop-up window, explaining the use and function of that equipment. Videos of instructors and lab assistants explaining the lab procedures also are embedded.

And the graphics are very authentic, matching what students would experience in the live NPRE 100 lab. "People who have been in the (actual) room, it makes it better for them," Uddin said. "Even the virtual electrical sockets are modeled after the real sockets in the physical lab."

The virtual lab provides a needed venue as NPRE's undergraduate enrollment climbs. "In NPRE 100 we used to do

NPRE 2012 graduate Imran Haddish believes online simulated laboratory experiences like those he has helped develop for NPRE will be the next big thing in education.

two labs when we had 15 students or less," Uddin said. "Now we have 50 students, and not enough stations to do two labs. There's not enough time to do the labs in the actual room, but now the students can do it at home or in the computer lab."

The virtual lab also can provide more opportunity for discovery. "There's a lot more to learn if we can change the materials," Uddin said. "If we use an unnamed source (in the virtual lab), the students can do the experiment and then tell me the name of the source." Variations can be introduced in the virtual lab to complement and enhance the lab experience.

Over the past decade Uddin and his students have been working with game technology, including Unreal and Half-life, to teach students using the VisBox, a state-of-the-art, 3-D visualization system. The early efforts modeled the former TRIGA Reactor and Reactor Building on the Urbana campus. (The actual reactor was shut down in 1998 and the facility and building have since been dismantled.)

Prof. Rizwan Uddin explains to the NPRE 100 students the features of the simulated laboratory.

Virtual lab developer Imran Haddish speaks to the students in a live video chat.

Modeling NPRE 100 teaching labs in Talbot Laboratory on campus, the latest application steps up the "game" considerably. One of the biggest improvements is that the developers have switched to the Unity game platform, so that students can now use personal computers and laptops to access the program via the web. Previously, students had to install utilities onto their machines or had to be in Uddin's VisBox lab to gain access. "This is a technology that can be used conveniently wherever people are," Uddin said.

Haddish masterminded the platform switch and has been the brain behind recent developments. "In my opinion, moving away from the VisBox was the only way we would be able to reach a larger audience, and the largest audience exists on the Internet. Therefore, we needed a way for students, teaching assistants, and professors to manage their labs on the Internet," Haddish said.

"Switching to Unity made it possible to perform the virtual lab in a web browser, but that was only a fraction of the work. A content management system (CMS) was needed that is custom-tailored for virtual labs. Another important aspect to keep in mind is that the virtual labs were designed to be mobile friendly, so if we wanted to publish to a tablet we could."

This technology may be useful for in-

continued on page 18

NPRE graduate student Richard Kustra introduces undergraduates to the lab, including GUS (the graphite uranium sub-critical facility), left.

continued from page 17

dustries, including utilities such as Exelon Corporation, as well. "In talking with industry about where their interests would be for this application, they said it would be best for training of personnel," Uddin said. When utilities need to refuel nuclear plants, for example, they bring in temporary construction workers for a short period of time, and those people need training to work around a reactor. "With a room of 30 to 50 PCs, you could train 50 people in an hour" using the game technology, Uddin believes.

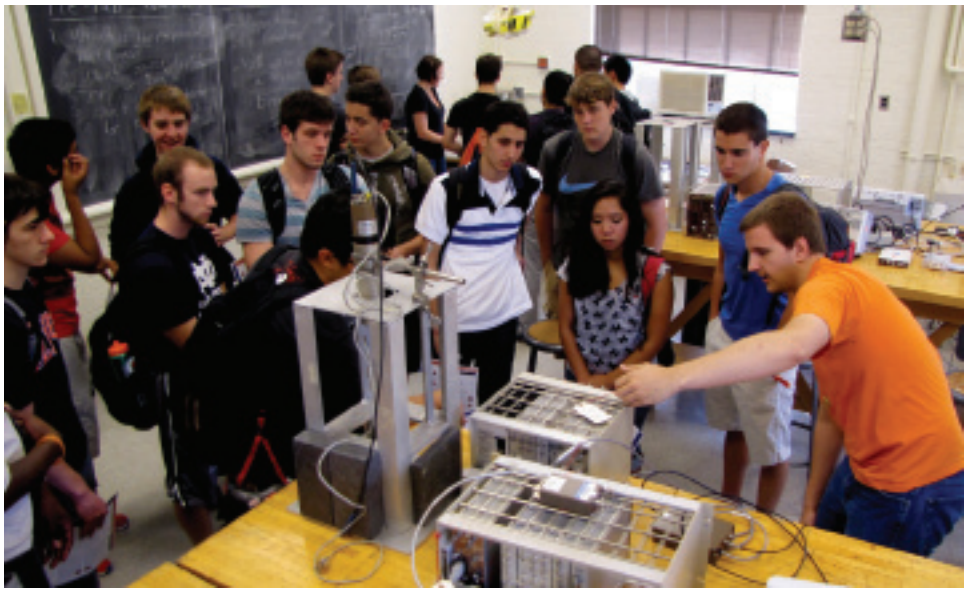
Virtual training could also be helpful for emergency personnel. "This shows the real physical environment. If a firefighter plays a game in a (virtual) reactor building, he will know where to go to handle a (real) emergency," Uddin said.

Beyond nuclear engineering, this teaching innovation may have a place in other sciences – chemistry, math or physics – or non-science, liberal arts disciplines. Medical industries also have been exploring possible uses of this technology for education and training needs.

"The technology is so new we have probably thought of only 5 percent of what it can do," Uddin said.

"This is a unique opportunity for the university to put itself at the forefront of online education," Haddish believes. "All you have to do is look around; everyone is focusing on video lectures today. Virtual labs is what they will be focusing on tomorrow."

In addition to Haddish, undergraduate students Ye (Gary) Li, Dan Roberts and Benjamin Sturm have contributed recently to the project by modeling the NPRE 100 lab environment. Current efforts have been funded by Haddish and the university. Earlier efforts in usage of 3-D, immersive and virtual game technology for education and training gained funding from the U.S. Department of Energy, the Nuclear Regulatory Commission, the College of Engineering and the university's Provost Initiative on Teaching Advancement.



Senior Peter Mouche shows NPRE 100 students how to determine the half life of a radioactive source.

Miller: Follow-up after Fukushima

David Miller

After a year of studying the Fukushima nuclear catastrophe, NPRE Adjunct Prof. David Miller concludes plant workers were "heroes," but Japanese politics interfered with the workers' efforts.

"The TEPCO (Tokyo Electric Power Company) workers during the first days after the catastrophe were real heroes in doing their best to stabilize the reactors and spent fuel pools of the Fukushima nuclear complex," Miller maintains. He added, "The Japanese government by law allowed the prime minister (Naoto Kan) to overrule the site plant manager in the early days, which created a greater dispersion of the radionuclides. He wouldn't let (workers) properly vent the reactor building or bring seawater in at a critical time."

Kan resigned his position in September 2011 amid criticism of his handling of the crisis. He has become one of Japan's most vocal opponents of nuclear power since then, and has blamed ineffective communications with Japanese nuclear officials for the disaster's severity.

Fukushima Daiichi, the largest nuclear disaster since Chernobyl in 1986, was a series of equipment failures, nuclear meltdowns and radioactive material releases following a devastating earthquake and tsunami that hit the east coast of Japan in March 2011.

As the regional director of the North American Technical Center (NATC) Information System on Occupational Exposure (ISOE), Miller has traveled the world meeting with experts and officials to monitor radiation levels and to determine what lessons can be learned.

He and his colleagues have concluded "it is very important to eventually have alternate sources of emergency power and fresh water to continue cooling" during emergency situations. Securing those resources is stressed in U.S. emergency response and operator training.

Miller also sees a need to continue monitoring food and water supplies to assure radioactive levels resulting from the disaster fall below international limits for human consumption. Since Fukushima, cesium- 134 and -137 have been detected in tuna caught off the West Coast in the United States, but Miller noted levels have been below consumption limits.

Those involved in the Japanese nuclear industry are actively pursuing remedies they hope will prevent such devastation in the future. For example, the Tohoku Electric Power Company, operating a nuclear generating station at Onagawa, is considering an alternate high pressure core injection system on high ground. The catastrophe destroyed the city of Onagawa, but the nuclear station there weathered the impact better than Fukushima did.

The Asian Technical Center ISOE requested the help of Miller and others within the first week after the Fukushima disaster. Miller joined with an expert group of nuclear utility radiation inspection managers from Canada and the United States. Some of the work involved reviewing information gathered from the 1979 Three Mile Island nuclear accident to use as a technical resource for dose management techniques. Information exchanges also resulted in a major Tokyo newspaper reporter traveling to Idaho National Laboratory to interview nuclear scientists about how TMI's damaged core was studied and ultimately buried at the Idaho lab.

NATC supplied U.S. experts to speak on the TMI accident for the Japan Society of Mechanical Engineering in late November 2011. Speakers included Miller, who told about the United States' experience with decommissioning nuclear plants and Fukushima's preliminary impact on U.S. nuclear plants; Harold Denton, special spokesman for President Jimmy Carter during the TMI crisis; and Roger Shaw, TMI accident recovery radiation protection manager.

"The conclusion was that we agreed the University of Illinois, NPRE and Tokyo University would set up centers of excellence archiving severe accident radiological engineering databases to facilitate the planning of worker activities in high radiation and contamination areas," Miller said.

On January 9, 2012, NATC sponsored the 2012 International ISOE ALARA Symposium in Fort Lauderdale, Florida. Mizumachi of the Asian Technical Center traveled to the United States with his wife to deliver the keynote speech.

Singer Tracks Options on BRC Spent Nuclear Fuel Report

BLUE RIBBON COMMISSION ON AMERICA'S NUCLEAR FUTURE

NPRE Professor Clifford Singer and his colleagues spent the summer months trying to bridge the gap between the findings of the federal Blue Ribbon Commission (BRC) on America's Nuclear Future and a final solution for the safe disposal of nuclear reactor fuel discharges.

Sponsored by a $50,000 Carnegie Corp. grant, Singer and colleagues hosted briefings in Washington, D.C., for policy-makers to offer expert analysis and facilitate discussion in the decision-making process. The researchers posed questions regarding the BRC report that was submitted in January to the U.S. Secretary of Energy and now waits Congressional and Obama Administration action.

The BRC report includes these recommendations:

- A consent-based approach should be taken to siting future nuclear waste storage and disposal facilities. Trying to force such facilities on unwilling states hasn't worked.
- A new organization, independent of the Department of Energy should be dedicated solely to assuring safe storage and ultimate disposal of spent fuel and high level radioactive waste from defense programs.
- The federal budget should ensure that the approximately $750 million paid yearly into the Nuclear Waste Fund is set aside and available for use as Congress initially intended.
- Efforts should begin immediately to develop at least one geologic disposal facility and at least one consolidated storage facility, as well as to prepare for the eventual large-scale transport of spent nuclear fuel and high-level waste from current storage sites to those facilities.

Singer posed five suggestions to bridge the gap between the BRC report and what needs to be done to implement its recommendations:

- Incentives for potential host states have not been established, and no fallback option was recommended in case incentives prove to be insufficient.

Clifford E. Singer

Possible solutions: States will need positive incentives for identifying sites, preliminary license submissions, final license submissions, initial operations and continued acceptance of fuel casks. Host states could be compensated for costs involved in the first stages and be permitted to keep funds collected that are over and above costs. States that continue to accept fuel casks can charge market price for that service.

If no states choose to participate, the federal government could circumvent the states by appealing directly to local communities or tribes without incentive compensation to the states.

- The BRC did not specify the number of repositories and monitored retrievable storage facilities that should be sited and licensed.

Possible solution: If only one state is willing to site a permanent spent fuel repository and that state will not be forced to do so, then that state will be in a monopoly position to charge whatever it wants for taking in spent nuclear fuel. To avoid this situation, at least two repositories should be licensed. To increase the likelihood of that, the target number should be three.

- A previous plan to store the spent fuel underground at Yucca Mountain in Nevada failed, and the Congress has defunded the program. The BRC implied that plan's standard to contain the fuel for a million years was both unrealistic and counterproductive. Will this standard be applied to other proposed repositories, and if not, what standards will be used?

Possible solution: The existing generic standards of 10,000 years should be applied to all repositories (including if Nevada volunteers Yucca Mountain). This default

approach still leaves an enormous discrepancy between much larger avoidable radiation exposure from other sources in terms of cost per unit exposure reduction. Each host state should be allowed to let their internal political process dictate more stringent standards, on the understanding that associated additional costs will reduce the net income to the state.

- What will be the division of responsibilities between host states and federal level authorities in siting, licensing, and overseeing the operation of spent fuel management facilities?

Possible solution: To avoid the creation of a new bureaucracy, the proposed federal corporation's role should be limited to dispersing funds to states having qualified proposals for the initial qualifying steps, and ranking the quality of proposals to determine which states can proceed to the next stage. The federal government should continue to oversee and enforce minimum standards for safety, security, environmental impact, and financial soundness. States could be responsible for performing or contracting for proposal preparation and facility construction and operation.

- How much money should be set aside for spent fuel management, where should the money go, and how should it be invested?

Possible solution: Matching an inflation-adjusted version of the revenue stream previously going to the federal Nuclear Waste Fund with a comparable amount of funding for disposing defense wastes should allow a staged process to be funded without accessing the pre-existing Nuclear Waste Fund balance. The federal corporation should distribute the money to spent fuel management projects approved by states. Annually unused funds should be held in Treasury Inflation Protected Securities (TIPS), with any eventual excess funds returned to utilities or their ratepayers.

Singer maintains that a fully functional long-term spent fuel management system can be accomplished economically, without any reprocessing for over a century if ever. He and his colleagues have produced "Plan D," which allows for most spent fuel in dry casks to be stored above ground "until it becomes clearer whether reprocessing will precede permanent disposal."

The United States could become a world leader in the fielding of standardized and well-instrumented dry storage casks, and of transporting and disposing over-packs. The resulting production volume in an internationalized market could help reduce costs of alternatives to systems incorporating spent fuel reprocessing. The United States could take a lead in demonstrating how transportation to and safe and secure maintenance of such facilities can be accomplished at large scale using dry cask storage. The United States then would be able to negotiate with countries to prevent them from indefinitely managing spent nuclear fuel and, thus, avoid the temptation to reprocess.

NPRE senior design course students have produced a manuscript giving examples of how spent fuel can be transported, stored, and eventually disposed without reprocessing. Spent fuel management is also the subject of several NPRE graduate theses.

Along with activities in Washington, D.C., Singer and colleagues gathered input at the state level, primarily in the Midwest. This had multiple purposes. One was to inform state officials and other interested parties about the BRC final draft report and its potential implications for their state. Another was to gather input regarding reasonable incentives from the positions of both exporting states and host states. NPRE nuclear waste management course instructor William Roy participated in briefings in Springfield, Illinois.

NPRE undergraduate student Robert Geringer assisted Singer on this project. Geringer received a Washington Scholar's Award, and worked at the Federation of American Scientists in Washington, D.C., over the summer.

View from campus

View from campus ... and beyond

TRIGA Dismantlement Completed

The TRIGA reactor and the former Nuclear Reactor Building dismantlement was completed this past summer.

Rich Holm, Reactor Administrator and a member of the university's Reactor Safety Committee, recorded the work's progress with a week-to-week summary and photos *(see NPRE at Illinois Facebook page)*.

NPRE is planning to establish on campus a prominent display commemorating the facility and its historical significance to the Department, the College of Engineering and the University of Illinois.

The main components of the reactor core were dismantled with the fuel removal in 2004. The $4 million dismantlement project involved taking down the remaining portions of the reactor, and tearing down the building on the campus' east side.

The reactor operated for 38 years before it was shut down in 1998. It went critical on August 16, 1960, and was used by many departments on campus as an interdisciplinary teaching and research facility.

Remains of the TRIGA reactor bioshield. The project was completed and the area was cleared over the summer.

ANS President Loewen Visits NPRE

As president of the American Nuclear Society (ANS), Eric Loewen visited NPRE March 27 to meet with faculty members and present seminars for students.

Loewen told about his career path in national laboratories and industry, including tales of fortuitous mistakes and "problems that led to patents." A proponent of fast reactors as one solution in recycling radioactive used nuclear fuel, Loewen spoke to undergraduates on "Heavy-Metal Nuclear Power: Could Reactors Burn Radioactive Waste to Produce Electric Power and Hydrogen?"

2011-12 ANS President Eric Loewen speaks to NPRE undergrads.

He also urged the students to join ANS: "You're coming here to get a degree to have a career. You need to be a member of a professional society."

At the graduate student seminar, Loewen argued for reforming the nation's ALARA regulation that requires every reasonable effort be made to maintain radiation exposures and releases of radioactive materials "as low as reasonably achievable." This standard results in costly bureaucracy and can risk thorough inspections of nuclear facilities in exchange for low dose exposures, Loewen maintained.

Speaking on his own behalf, Loewen held that enforcing exposure limits would be a preferable alternative to ALARA. He acknowledged his position is controversial.

Loewen is Chief Consulting Engineer for General Electric Hitachi Nuclear Energy (GEH) in Wilmington, North Carolina, where he leads GEH's effort to deploy the integral fast reactor, PRISM.

Alums, Employers Share Career Advice, Information at 2012 Interchange

2012 Interchange drew seven alumni and friends to interact with students and faculty on October 5.

Marking the fourth consecutive year for the event, Interchange has built a tradition of bringing alumni and friends to campus to share with students information on jobs, careers and employers in nuclear power, plasma/fusion and radiological/manufacturing fields.

Participating in the event were:

Exelon Corporation

- Gabriel Chavez, BS 07, Dry Cask Storage Program Manager, LaSalle and Clinton stations in Illinois
- Edward A. McVey, BS 83, Nuclear Fuels, Manager of Emerging Issues and Reactor Oversight
- Thomas E. Sowinski, BS 09, Qualified Nuclear Engineer
- Eric J. Stein, BS 10, Reactor Engineer, LaSalle station in Illinois

General Electric

- Christopher Holzer, Field Services Site Manager, LaSalle, Illinois, nuclear station

Sargent & Lundy^{LLC}

- Kenneth J. Green, BS 71 *Mechanical Engineering*, Vice President and Project Director

Starfire Industries^{LLC}

- Brian E. Jurczyk, BS 95 Aerospace Engineering, MS 97, PhD 01, MBA 01, President

NPRE Interchange has a two-fold purpose:

1. to give NPRE students a chance to network with the guests about industries, national laboratories and regulatory agencies that focus on nuclear power, plasma engineering, and radiological technologies;
2. to acquaint alumni with students available for internships and/or permanent positions.

NPRE alumni are encouraged to participate as representatives for their companies and organizations! If you would like to be involved in the 2013 event, please contact NPRE Student Coordinator Becky Meline at bmeline@illinois.edu, or NPRE Alumni Affairs Coordinator Susan Mumm at s-mumm@illinois.edu.

NPRE Cooperates with Swedish University on Nuclear Fuel Cycle, Waste Management

NPRE established "USA-Swedish Cooperation on Nuclear Fuel Cycle and Waste Management" with KTH (Royal Institute of Technology), a premiere technical university in Stockholm, Sweden. The cooperation is part of the INSPIRE (Illinois-Sweden Program for Educational and Research Exchange) program.

KTH Profs. Waclaw Gudowski and Mats Jonsson visited NPRE August 6 and 7 to discuss and finalize plans for the exchange. Topics of mutual interest related to education and research were discussed.

The exchange will start with nuclear waste management and geological repositories for spent nuclear fuel. The education program includes opportunities for student exchange at all levels: bachelor's, master's and PhD. A special course on geological waste disposal will be organized, including a week-long study visit and lab sessions at SKB's Äspö Hard Rock Laboratory. The lab has unique

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NPRE 2012 Student Alumni Interchange

Gabriel Chavez, left, and Ed McVey of Exelon Corporation.

In ties, left, is Brian Jurczyk of Starfire Industries^{LLC}, and right is Ken Green of Sargent & Lundy^{LLC}.

Left, Tom Sowinski and Eric Stein of Exelon Corporation; right, Christopher Holzer of General Electric..

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capability and facilities related to geological waste disposal, with lab exercises in an underground nuclear waste disposal facility.

The long-term goal is a self-sustained educational exchange of both nuclear energy engineering students and faculties. This includes short courses taught by visiting faculty, undergraduate or graduate student exchange programs, and reciprocal semester-long faculty exchanges to teach in areas of complementary expertise.

NPRE Celebrates 20-Year Exelon Partnership

Over 20 years, Exelon Corp. has invested over $1 million in NPRE students and programs, generating benefits for both parties - funding for NPRE, employees for Exelon.

"We got our return in spades in terms of the talent (of the students) we ended up getting and the relationships we've developed," said William Naughton, who retired this year as coordinator for the utility's universities program. "It was a win-win all the way around."

Annually for two decades, Exelon has provided at least $50,000 to NPRE and the nuclear engineering programs at four other universities, most recently Purdue, Wisconsin, Missouri University of Science and Technology and Pennsylvania State University. Few restrictions have been placed on the funding, provided to build university nuclear fission programs, including offering scholarships.

NPRE has used the funds predominantly to support students, and that has been key in growing the Department's undergraduate numbers. Enrollment hovering in the 30s prior to 2000 has exploded to just over 200 students in Academic Year 2011-12, and is at 190 this year. More recently, Exelon's support has helped fund new faculty start-up costs. In a little over a year, NPRE's faculty has grown from eight to 12 members. "We are eternally grateful to Exelon for their support over the years," said NPRE Department Head Jim Stubbins. "The support was one of the major reasons we came through the lean years. The funding provided the support to maintain the strength of our students and academic program in spite of other challenges."

Nationwide, many universities have grown their nuclear engineering programs. That wasn't the case 20 years ago, and was the reason Exelon chose to make a change.

In 1990, the Committee on Nuclear Engineering Education, Energy Engineering Board, Commission on Engineering and Technical Systems and the National Research Council

Participating universities including the University of Illinois at Urbana-Champaign presented Exelon representatives this plaque at the Summer 2012 American Nuclear Society meeting in recognition of Exelon's 20 years or support for nuclear engineering education.

produced a report: *U.S. Nuclear Engineering Education: Status and Prospects*. The report referenced "the widely felt concern about the downward trends in student enrollments in nuclear engineering, specifically in the nuclear fission area, in both graduate and undergraduate programs." (At that time, significant government research funds were available for fusion aspects of nuclear energy.) The report also told of declining numbers of U.S. university nuclear engineering programs, the aging of their faculties, and a decreasing availability of scholarships and research funding.

"It really was rough times then," Naughton remembers. "Nuclear fission programs at schools were closing left and right, as there were no research funds available. Yet, we (the utilities) were building plants like crazy."

Working at the time in Chicago for Commonwealth Edison, Exelon's predecessor, Naughton had served as a consultant on the report. He remembers that after it came out, Max W. Carbon, then-head of Wisconsin's nuclear engineering department, visited Commonwealth Edison Chief Executive Officer James J. O'Connor and challenged the company to get involved. O'Connor responded with the company's plan and the condition that the U.S. Department of Energy provide matching funds. The DOE agreed to a 5-Year Pilot Program and the program was born.

Said Naughton: "I was the person in charge of visiting the universities and the department heads to find out what the money should be used for." Twice a year, at each semi-annual American Nuclear Society Meeting for the five year interval, Naughton convened with university and DOE representatives to develop a comprehensive report to present to DOE to provide a solid basis for the agency to make the program permanent. The process was a success as DOE accepted the report and established the Matching Grant Program.

The utility's support has been constant even when federal funding switched from the DOE's auspices to the Nuclear Regulatory Commission. Now both DOE and NRC support all university nuclear programs, and Naughton believes Exelon's decision 20 years ago was an influence.

Italian Program Achieves 10-Year Mark

NPRE and the University of Pisa (UNIPI) are celebrating 10 years of cooperation in hosting and exchanging engineering students.

Every spring since 2003, about 15 students from Illinois travel to Pisa, then, in the fall, a similar number of UNIPI students travel to Urbana. Through this "Summer Course Exchange Program," the groups attend a class on energy systems as well as a language class of the hosting country. The students and their hosts visit industries, power plants and research laboratories as well as cities and cultural attractions. As the program has continued, the exchange has grown to include professors and researchers.

For NPRE, the seeds for the program were planted with a trip Prof. Rizwan Uddin made in February 2002 to attend a meeting of the European Commission 5th Euratom Framework Programme. At that time Uddin was aware that the Engineering at Illinois' International Programs in Engineering (IPENG) was encouraging development of cultural and scientific exchange experiences for students. When Udidn returned to Pisa in November 2002 for a technical meeting, plans for the exchange were solidified.

"Though the discussion of taking the students to Pisa had already started, many of the details were initiated and some finalized during and soon after this meeting," Uddin said. "Calogero Sollima (faculty member and exchange organizer for UNIPI) was central to all the initial arrangements. There were numerous emails back and forth to sort out the details regarding credits, classrooms and housing arrangements."

In the first year, Illinois students shared housing with Italian students and, in some cases, their families. "One or two students from the University of Illinois were placed per apartment, dispersed throughout (Pisa). It was a difficult arrangement in many ways, but it had some obvious advantages," Uddin said.

Students enrolled in the program stay in the host country for five weeks. Each class attended is part of the host department's semester program. Monday through Thursday, participants take two hours of language and two hours of technical courses. At Illinois this fall, in addition to the core exchange course, NPRE 201, Sollima and NPRE Department Head Jim Stubbins joined with University of Pisa Prof. Marco Beghini to teach the additional course, "Design Analysis for Nuclear Systems: Fundamentals of PTS Analysis."

Fridays are reserved for technical visits to factories and national research laboratories: in Italy, General Electric's Nuovo Pignone, ENEL, SOGIN and Belvedere (a biomass plant using gases from garbage to produce electricity), and, in Illinois, Exelon and Argonne National Laboratory. The weekends are devoted to cultural trips to museums and cities such as New York, Chicago, Las Vegas, San Francisco, Los Angeles and the Grand Canyon in the United States, and Rome, Florence, Naples, Capri, Pompeii, Venice and the Vatican in Italy.

Since the beginning about 160 students from Illinois and 100 from Pisa have participated. The exchange program has been beneficial for all parties, Sollima believes.

"This program gives (universities) the possibility to increase the exchange of professors, researchers and students and also provides a basis to develop common teaching and research programs," Sollima said. "For industries, the program helps to improve the professional skills of the students by increasing their ability to cooperate in a team, as well as to interact and to adjust to the different culture. SCEP allows (faculty members) to teach students with different backgrounds both technically and culturally, and to compare different methodologies of teaching and learning. For the students, SCEP opens the possibility to spend either one semester or one year or to prepare their master thesis" in one of the locations.

Left: The first group of Illinois students to travel to Pisa in 2003. Right: A group of Italian students visiting the Clinton, Illinois, nuclear power station in 2009.

Alumni

Nominations Requested for NPRE Distinguished Alumni Award

Since 2008 NPRE has been spreading the word about the outstanding contributions of our graduates by presenting the NPRE Distinguished Alumni Awards. Again this year we will be pleased to make these presentations.

We encourage you to consider NPRE alumni whom you know, and submit nominations for those you consider to be particularly deserving of recognition. For your convenience we have created an online form for this purpose: **https://illinois.edu/fb/sec/8979331**. For further information contact Susan Mumm, s-mumm@illinois.edu.

Award Criteria:

The NPRE Distinguished Alumni Awards are presented by the Department of Nuclear, Plasma, and Radiological Engineering at Illinois and by the NPRE Constituent Alumni and Industry Advisory Board to NPRE alumni who make notable advances in the field of nuclear science, and/or lasting contributions to society in general. Through their careers and voluntary service, these individuals bring honor upon themselves as well as to their fellow graduates, the Department, the College of Engineering, and the University of Illinois.

NPRE Distinguished Alumni Award Past Winners

- 2008 — Robert L. Hirsch, BS 1958 Mechanical Engineering, PhD 1964
- 2008 — William E. Burchill, MS 1965, PhD 1970
- 2009 — David D. Carlson, MS 1976
- 2009 — Nicholas Tsoulfanidis, MS 65, PhD 68
- 2010 — Barclay G. Jones, MS 60, PhD 66
- 2011 — Pratap K. Doshi, MS 63, PhD 68
- 2012 — Kenneth "Lee" Peddicord, MS 76, PhD 72

Nominations Invited for NPRE Advocate Award

The Department of Nuclear, Plasma, and Radiological Engineering wants to recognize those among our alumni who have demonstrated their loyalty to NPRE through volunteer efforts, financial contributions and/or other forms of advocacy.

Do you know NPRE alumni who have been particularly supportive and/or involved with the Department and its programs? We encourage you to nominate them both to honor them and inspire others to get involved. Please use this online form at **https://illinois.edu/fb/sec/1697152** to make your nomination.

The inaugural NPRE Advocate Award was presented to Martin J. Neumann, (*see story next page*). The next awards will be presented at the 2013 Honors Banquet on April 25, 2013.

Neumann Chosen as Inaugural NPRE Advocate

Martin J. Neumann

Martin J. Neumann, BS 99, MS 04, PhD 07 (all NPRE), has been selected as the winner of NPRE's very first Advocate Award.

Recognized at the NPRE 2012 Honors Banquet in April, Neumann exemplifies the award's intent, to recognize those among NPRE alumni who have demonstrated their loyalty to the Department through volunteer efforts, financial contributions and/or other forms of advocacy. He was cited for "dedicated leadership in supporting NPRE's goals to provide outstanding service for our students, alumni, faculty and staff, and in enhancing the Department's reputation as a world leader in nuclear, plasma and radiological engineering."

From his undergraduate days as one of the leaders of the Orange Crush student cheering section, to his leadership as acting director of the Center for Plasma Material Interactions, to his current membership on NPRE's alumni board, Neumann has enthusiastically promoted NPRE and has worked diligently toward the Department's objectives.

As a graduate student his involvement in academic professional societies showed Illinois in its most positive light. As an adjunct faculty member, Neumann's promotion of Illinois took on an international character when he organized an open house in April 2009 to draw businesses to join CPMI. Over 40 researchers from five different countries came to the Urbana campus and the Center received over $150,000 of funding in the process, as well as a five-year grant from the National Science Foundation.

Neumann also has been very supportive in his personal financial contributions. His giving started while he was a student and continues today as he works with the NPRE Department to develop and encourage giving among other alumni.

In addition, Neumann has participated in NPRE Interchanges, events designed to bring alumni back to campus to network and interact with students and faculty. Alumni attend as representatives of their employers.

In his capacity as a senior engineer, Neumann has represented San Jose, California-based Soladigm, a developer of next-generation green building solutions designed to improve energy efficiency.

Pratap K. Doshi, MS 63, PhD 68, left, with NPRE Department Head Jim Stubbins, and Kenneth "Lee" Peddicord, MS 67, PhD 72, right, were awarded the 2011 and 2012 NPRE Distinguished Alumni Awards, respectively, at the April 2012 Honors Banquet. More on their careers and contributions can be gained from the 2011 New Generation Newsletter.

Alumni Distinction

Bernard H. "Bud" Cherry

Engineering at Illinois Honors Bud Cherry

The College of Engineering at Illinois has recognized NPRE alumnus Bernard H. "Bud" Cherry with the 2012 Alumni Award for Distinguished Service.

Cherry, BS 62 Chemistry, MS 63 NPRE, is Chief Executive Officer of Eagle Creek Renewable Energy^{LLC} in Morristown, New Jersey, and Founder and Chair of Energy 5.0^{LLC} in West Palm Beach, Florida.

He was recognized at the College of Engineering Awards Convocation April 21 "for decades of leadership and responsibility in directing power generation companies that have supplied the world with traditional and renewable sources of energy." In addition to attending the ceremony, Cherry also spent time in the NPRE Department meeting with students and faculty.

During his extensive career as a senior executive in the energy business, Cherry has held top leadership positions in several energy firms, including major energy providers and suppliers such as the Oxbow Group and Foster Wheeler^{LTD}.

Under his leadership as President and CEO of the Oxbow Energy and Minerals Group, Cherry played a key leadership role in the successful creation and growth of Oxbow's global energy activities. Oxbow financed, constructed, operated, and profitably sold seven power generation facilities located in the United States, Asia, and Latin America.

Cherry was also responsible for the leadership of the development and operation of major coal and natural gas supply facilities in the Western United States.

Cherry joined Foster Wheeler's Global Power Group in 2002, serving as CEO as a member of the successful turnaround management team. He also led the successful recapitalization of Northern Power Systems and its predecessor parent company, Distributed Energy Systems, Inc. Northern Power designs and supplies advanced technology wind turbines.

In perhaps his most high-profile contribution, as a vice president for General Public Utilities Corporation, Cherry led the successful $1 billion funding effort for cleanup of the damaged nuclear reactor system at Three Mile Island Unit 2. The cleanup and storage of the damaged reactor core was an endeavor that took nearly 12 years and cost approximately $973 million.

In February 1991, the National Society of Professional Engineers named the TMI-2 Cleanup Program as one of the top engineering achievements in the United States.

More recently, Cherry has led efforts to promote renewable, green energy sources of hydroelectricity, wind power, and solar power. He is CEO of Eagle Creek Renewable Energy and founder and chair of Energy 5.0^{LLC}. Eagle Creek, a Hudson Clean Energy Partners Portfolio Company, is an owner/operator and developer of hydroelectric and other renewable power projects that provide clean energy to North American electricity consumers. Energy 5.0 develops, finances, constructs, and operates complex renewable energy production facilities.

An influential advocate and generous financial supporter of NPRE, and of nuclear engineering in general, Cherry has served on NPRE's Constituent Alumni and Industry Advisory Board for 11 years.

He has also served as a panelist during the College of Engineering's Higgerson Forum on Entrepreneurship in Engineering.

Classes

Left, with Prof. Emeritus George Miley, alumnus Bud Cherry visited NPRE in April while on campus to accept the Engineering at Illnois Distinguished Alumni Award. Right, Cherry tells NPRE students about the crises he weathered during the Three Mile Island nuclear accident.

1960s

Harold A. Kurstedt, Jr., MS 63, PhD 68, has recently published a book, *Taking the Reins: Leadership, Supervision, and Management Lessons from a Horse.* Kurstedt has 30 years of experience teaching strategic thinking, management systems engineering, and relationship competence to practicing professionals. Recently retired as the Hal G. Prillaman Professor Emeritus of Industrial and Systems Engineering from Virginia Polytechnic Institute and State Univeristy, Blacksburg, Virigina, Kurstedt is an award-winning professor. He is the founder and managing member of Newport Group^{LLC}, a leadership consulting firm that works with industry and government organizations and people. Kurstedt served as National President of the American Society for Engineering Management in 2004. Trained in traditional leadership at the Virginia Military Institute, he now focuses on new approaches in leadership oriented toward human relationships in an information-based society.

Kenneth L. "Lee" Peddicord, MS 67, PhD 72, has been appointed by President Barack Obama as a member of the Nuclear Waste Technical Review Board. Peddicord has served as the Director of the Nuclear Power Institute at Texas A&M University since 2007, where he has been a professor of Nuclear Engineering since 1983. From 2007 to 2009, he served as the Senior Associate Dean for Research at Texas A&M's Dwight Look College of Engineering, and from 2003 to 2007, he was Texas A&M's Vice Chancellor for Research and Federal Relations. Peddicord served as the Associate Director for Educational Outreach at NASA's Commercial Space Center for Engineering from 1999 to 2000 and as the Director of the National Emergency Response and Rescue Training Center in Texas from 1998 to 2000. Peddicord is a member of the American Nuclear Society, the American Society for Engineering Education, and the American Society of Mechanical Engineers.

1970s

Jeffrey S. Philbin, PhD 70, is a technical consultant at Nuclear Safety Associates in Albuquerque, New Mexico. Philbin consults on nuclear criticality safety technical support and evaluations. He previously worked 34 years for Sandia National Laboratories in areas including nuclear facilities design, operation, and safety analysis; experiments; risk analysis; weapon response; and nuclear criticality safety.

Daniel T. Ingersoll, MS 74, PhD 77, has joined NuScale Power^{LLC} as Director of Resarch Collaborations with responsibility for establishing and managing the Research Office in the Office of Technology. Ingersoll's responsibilities include identifying new advanced reactor research opportunities, establishing collaborative research projects with external organizations, and promoting opportunities for internal R&D. Ingersoll joins NuScale from Oak Ridge National Laboratory (ORNL) where he was senior program manager. During the past 10 years at ORNL, Ingersoll focused on the development and deployment of small modular reactors for commercial power applications. He led the Grid-Appropriate Reactor program within the Department of Energy (DOE) Global Nuclear Energy Partnership program. Ingersoll has served as National Technical Director for the anticipated DOE Small Modular Reactor program during the past two years.

Peter K. Mast, BS 73, *Engineering Physics* MS 74, PhD 79, is Midwest Operations Manager for ENERCON Services, an engineering, environmental, technical and management services firm that is an industry leader in the resurgence of U.S. nuclear power plants. Mast returned to campus in February to present a seminar examining safety initiative arising in the United States following the nuclear disaster in Fukushima, Japan.

Steven W. Hatch, BS 78, MS 80, has retired after 32 years at Sandia National Laboratories in Albuquerque, New Mexico. Steve was a distinguished staff member and manager spending most of his career performing studies supporting the nation's nuclear weapons program.

Glenn A. Carlson, BS 79, MS 83, MS 83 Mechanical Engineering, has been awarded a PhD in physics through a cooperative program of the Missouri University of Science and Technology and the University of Missouri-St. Louis. Carlson is a principal engineer for Westinghouse Electric Company in Pennsylvania. He also has a law degree from St. Louis University, and is a licensed Professional Engineer.

1980s

Timothy J. Polich, BS 81, MS 83, is QC Engineering Supervisor for ITAAC at The Shaw Group in Columbia, South Carolina. He is responsible for supporting the development and providing independent review and verification of the Inspection, Tests, Analysis, and Acceptance Criteria (ITAAC) program / process. Polich supervises a staff of qualified QC Engineers and coordinates with QA/QC Management, Engineering, Licensing and Construction Organizations, and Nuclear Regulatory Commission on matters pertaining to the preparation, review, approval and closure / completeness of ITAAC Packages. He also provides support to the ITAAC Owner in developing the Performance and Documentation Plan for a given ITAAC; participates with the ITAAC Review Team to assess the acceptability of each Performance and Documentation Plan; participates with the ITAAC Closure Package Review Team to assess the acceptability of each ITAAC Closure Package; and monitors that the ITAAC processes are being

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Alumni

Classes

NPRE faculty, students and alumni in a visit to Oak Ridge National Laboratory in October.

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followed. Up until November 2011, Polich had spent 29 years in the U.S. Navy Reserve, holding leadership positions including Commanding Officer, Executive Officer, and Department Head.

Yousry Y. Azmy, MS 82, PhD 85, professor and head of the Nuclear Engineering Department at North Carolina State University, has been elected to the Nuclear Energy Institute Board of Directors.

Robert G. Knudson, BS 83, is Vice President of ARES Corporation, an engineering, project management, reliability and mission assurance, IT architecture and security, and software solutions company in the San Franciso Bay area.

Craig S. Wepprecht, BS 83, MS 85, is a programmer analyst at Pactiv, a leading provider of food service and food packaging in North America.

Jeffrey L. Binder, BS 85, MS 87, PhD 91, has been appointed Associate Laboratory Director for Nuclear Science and Engineering at the Oak Ridge National Laboratory. Binder had held the position on an interim basis since November 2011. Binder came to ORNL in 2003 after 13 years at Argonne National Laboratory. He primarily has been interested in developing nuclear technology for energy and isotope production, and as a general scientific tool. Binder has presided over the renewal of ORNL's isotope program. In 2011, he led the formation of a new research division at ORNL, the Fuel Cycle and Isotopes Division, and served as its director. Binder has authored and co-authored more than 100 technical articles, reports, and book chapters. He has been recognized with several awards, including ORNL's R&D Director of the Year and the U.S. Secretary of Energy's Significant Achievement Award, both in 2011.

Timothy M. Hickernell, BS 85, is Director of Research, Applications at Info-Tech Research Group in the Chicago area. He is responsible for overseeing analysts and research agendas in the applications domain, including application development/maintenance, systems integration, enterprise applications, collaboration and productivity applications.

Diane M. Cato, BS 88, is manager of nuclear safety at Washington River Protection Solutions, the prime contractor for the U.S. Department of Energy Office of River Protection in the cleanup of the former Hanford, Washington, weapons production facility.

1990s

Douglas B. Hayden, BS 93, MS 95, PhD 99, is Senior Director for Program Management in the Semiconductor Systems Group of Applied Materials Inc., in Santa Clara, California. Applied Materials is the global leader in providing innovative equipment, services and software to enable the manufacture of advanced semiconductor, flat panel display and solar photovoltaic industries.

David Thompson, BS 93, is manager of fleet radiation protection for Duke Energy Corporation in Charlotte, North Carolina. Thompson previously had worked for Exelon Nuclear's Byron Station.

Brett A. Booth, BS 96, is National Sales Director for Instrumentation at Alere, Inc., a global leader in rapid point-of-care diagnostics. He manages all sales aspects of Alere's Clincal Products Group Instrumentation program.

Jeffrey S. Kasalko, BS 98, is Research & Development Manager for Endologix Inc., an Irvine, California- based developer and manufacturer of minimally invasive treatments for aortic disorders. Endologix is focusing on the development and marketing of its patented technology for the treatment of Abdominal Aortic Aneurysms.

Richard S. Weil, BS 98, is a Partner at Oliver Wyman, a leading global management consulting firm that specializes in strategy, operations, risk management and organization transformation.

2000s

Giovanna Danagoulian, MS 01, MS 01 Physics, PhD 07, is a senior scientist for Buckler Biomedical SciencesLLC in the greater Boston area.

Daniel S. Bradley, BS 05 Physics, MS 11, is a project engineer for the U.S. Nuclear Regulatory Commission in Arlington, Texas.

Steven A. Weiss, BS 07, MS 08, is an MBA candidate at Harvard Business School in Cambridge, Massachusetts.

Xiang (Frank) Chen, MS 08, PhD 12, is a postdoctoral research associate at Oak Ridge National Laboratory in Knoxville, Tennessee. Since May 2010, Chen has worked cooperatively with Oak Ridge.

Harrison K. Pappas, BS 08, MS 09, MBA 11, is a senior consultant for Clerestory Consulting in Chicago.

Eric B. Reside, BS 08, MS 11 Industrial Engineering, MBA 11 Finance, is an associate with the Huron Consulting Group in Chicago. Huron helps clients in diverse industries improve performance, comply with complex regulations, resolve disputes, recover from distress, leverage technology, and stimulate growth.

2010s

Eric M. Becker, BS 10, is a graduate research assistant at Oregon State University, Corvallis. He is pursuing a degree in radiation health physics.

Richard A. Boettcher, BS 10, is a PET Systems Test Engineer at GE Healthcare in Waukesha, Wisconsin. Boettcher also serves the U.S. Navy Reserve as a Navy diver and engineering duty officer, providing salvage and diving undersea research support. Boettcher also is pursuing his master's degree at Purdue University.

Matthew S. Duchene, BS 10, MS 12, is an NGP Fellow for Pacific Northwest National Laboratory in Washington, D.C.

Brian Kleinfeldt, BS 10, MS 12, is an engineer at ENERCON Services in Oswego, Illinois. Enercon is an engineering, environmental, technical and management services firm providing a broad range of professional services to private, public, and government sector clients throughout the United States.

Alexander W. Rehn, BS 10, is an Engineer II at ERIN Engineering, a nuclear safety and reliability consulting firm, in West Chester, Pennsylvania.

Aaron M. Ellis, BS 11, is an auxiliary operator for Exelon Nuclear.

Peter R. Fiflis, BS 11, is an NPRE graduate student.

Geng Fu, PhD 11, is a detector scientist for GE Global

Classes

Research, focusing on the development of medical imaging instruments.

Katelyn N. Kelly, BS 11, is a reactor engineer for Entergy Nuclear Operations, Inc., in Plymouth, Massachusetts.

Lizette Sanchez, BS 11, is the North American-Young Generation in Nuclear Site Director for the Exelon Nuclear Limerich Generating Station in the greater Philadelphia area. Among her responsibilities is to inform the general public about nuclear science and technology.

Valentyn Bykov, BS 12, is a graduate student in the EPF Lausanne and ETH Zurich joint program.

Xiang Chen, PhD 12, is a postdoctoral research associate at Oak Ridge National Laboratory.

Andrew N. Groll, BS 12, is an NPRE graduate student.

Jon B. Hansen, BS 12, is a graduate student at Texas A&M University.

Matthew J. Jasica, BS 12, is a research assistant for Prof. Gerald Kulcinski, investigating fusion and inertial electrostatic confinement plasmas at the University of Madison.

Michael J. Karich, BS 12, is working for Enercon, Inc., in Naperville, Illinois.

Leigh A. Kesler, BS 12, worked on NIF shot analysis over the summer as an Student Intern at Lawrence Livermore National Laboratory. She also ran diagnostics on the LWFA experiment currently running on the Callisto laser in the Jupiter Laser Facility. Kesler currently is attending graduate school at the Massachusetts Institute of Technology.

Seung-Jun Kim, PhD 12, is a post-doctoral fellow at the University of New Mexico in Albuquerque.

Kyle A. Linquist, BS 12, is an NPRE graduate student.

Brooke L. McClure, BS 12, is an associate reactor engineer at Exelon Corp.'s Dresden Generating Station.

Michael C. McGuire, BS 12, is working as an equipment operator at Exelon's Clinton, Illinois, Power Station.

Cody A. Morrow, BS 12, is a business analyst associate at Underwriters Laboratories in Urbana-Champaign.

Sujay S. Patel, BS 12, is an associate consultant at the Clarity Soution Group in Schaumburg, Illinois.

Jason A. Peck, BS 12, is an NPRE graduate student.

Mona H. Raithatha, BS 12, is a graduate student at University of California-Berkeley.

Ryan A. Switts, BS 12, is an NPRE graduate student.

Jiawei Tan, PhD 12, is a research and development scientist at Olympus IMS, an electrical/electronic manufacturing firm in the Greater Boston area.

Deaths

William E. Dunn, MS 74, PhD 77, died Dec. 31, 2011, at Carle Foundation Hospital, Urbana. He was 61.

Dunn had studied under the late Bei Tse Chao, mechanical engineering professor at Illinois, and had earned a bachelor's degree in engineering mechanics at Northwestern in 1972.

Dunn joined the Mechanical and Industrial Engineering faculty at Illinois in 1977. He was perhaps best known for his research with Argonne National Laboratory on the dispersal of pollutants, particularly aerosol contaminants, in the atmosphere. With his students he modeled, for example, the dispersion of smokestack emissions in turbulent flows over complex terrain and the dispersal of bio-agents in subway systems.

To conduct his research, he and a colleague successfully purchased the first minicomputer on the UIUC campus. At the time, all campus computing was done on a central CDC Cyber machine, which had limited memory and tightly regulated access. Furthermore, all computer purchases had to be approved by the director of the university's Computing Services Office, and the answer was invariably "no." By scrounging up the resources independently, however, Dunn and his colleague broke the campus barrier on individual purchases and opened the floodgate for other investigators at Illinois.

John D. Metzger, MS 77, Director of the Nuclear Engineering Program and Associate Professor in the Department of Mechanical Engineering and Materials Science in the University of Pittsburgh's Swanson School of Engineering, died Oct. 12 in Atlanta, Georgia, while traveling for work. He was 59.

Metzger helped build and develop the curriculum for Pitt's nuclear engineering program, launched in 2007 as part of the Department of Mechanical Engineering and Materials Science. It is the first and only nuclear track in Western Pennsylvania.

Prior to working at Pitt, Metzger served as a research associate professor at the State University of New York at Stony Brook (1998-2005), a senior technical specialist for the Space Nuclear Thermal Propulsion Program at Northrop Grumman (1991-98), a research engineer at the Westinghouse Savannah River Company (1990-91), and a staff member at the Los Alamos National Lab (1984-90).

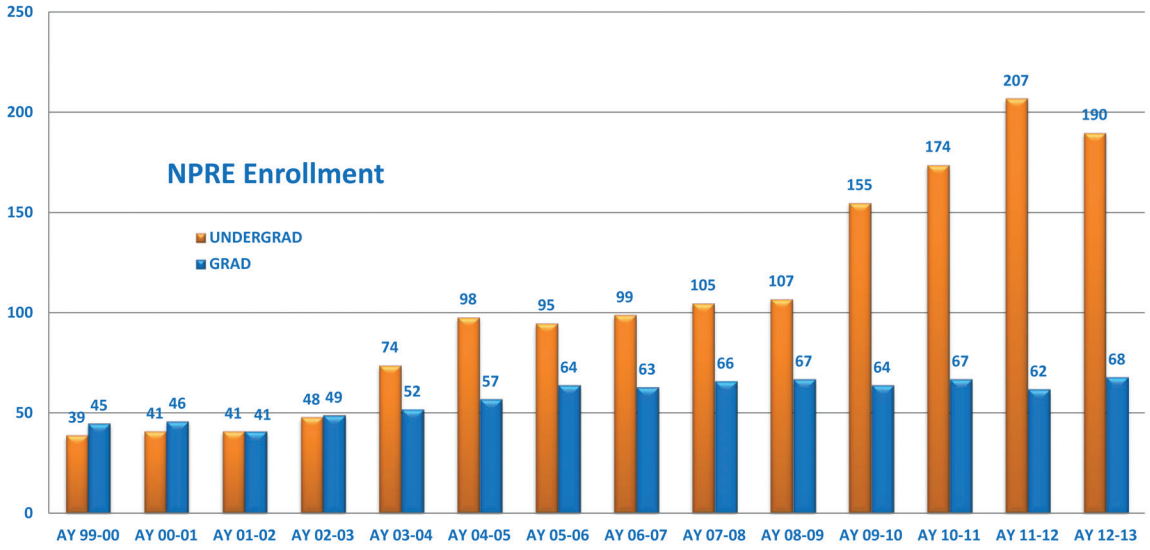
Metzger's research involved nuclear power and propulsion system designs, analysis and modeling, and thermal-hydraulic designs. Most recently, he helped secure funding to support computer-modeling research into future generations of high-temperature reactors, a new radiation detection and measurement laboratory, and a fellowship for a student pursuing a career in a nuclear field.

Metzger held several patents and was a member of numerous associations, including the National Society of Professional Engineers, the American Institute for Aeronautics and Astronautics, and the National Heat Transfer Conference.

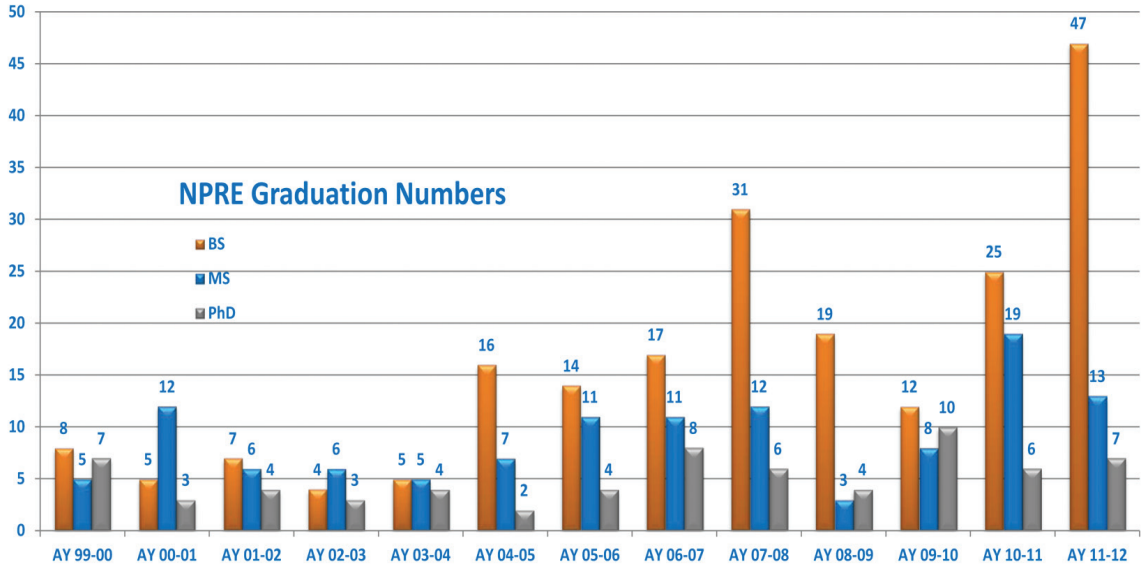
Metzger earned a bachelor's in nuclear engineering from the University of Tennessee in 1975, and his PhD in nuclear engineering from the University of New Mexico in 1989.

Several NPRE graduates attended a brunch the Department hosted on their behalf on Graduation Day in May.

Enrollment, graduation trends



The chart above gives a clear picture of how undergraduate enrollment in NPRE has expanded over the past decade. The total number for the current academic year is down slightly from the AY2011-12 year, but also to be considered in the chart below is the AY2011-12 number of graduates from the program (47), the largest number in over a dozen years.



Welcome New Alums!

The following is a listing of NPRE graduates earning degrees from August 2011 to May 2012, and their latest known employer.

Bachelor's of Science Degrees

August 2011

Nick S. Tolooi

December 2011

Aaron M. Ellis: Exelon, Equipment Operator, Braidwood

Peter R. Fiflis: NPRE graduate school

Derek A. Hultquist: Radiological Solutions Inc., Project Engineer

Ronald D. Orndorff: Nexus Technical Services Corp., Staff Engineer

Avel A. Patel

Sharvil V. Patel

Piyum S. Zonooz: NPRE graduate school; Starfire Industries[LLC]

May 2012

Carlos A. Altamirano

Gregory J. Anderson

Harry W. Arnold, IV

Jordan R. Baczynski: NPRE graduate school

Valentyn Bykov: Graduate school, EPF Lausanne and ETH Zurich joint program

Talisa R. Chambers

Michael T. Cunningham

John R. Frauenheim

Michael J. Giganti

Andrew N. Groll: NPRE graduate school
Imran J. Haddish: Working with Prof. Rizwan Uddin on NPRE virtual laboratory
Jon B. Hansen: Graduate school, Texas A&M
Ivory H. Hill
Ryan D. Holstein: Exelon, Equipment Operator, Braidwood
George J. Isaac: U.S. Navy
Brian M. Jaros: Exelon, Equipment Operator, Braidwood
Matthew J. Jasica: Graduate school, University of Wisconsin
Christopher Kallapodi: Systems Integration Analyst, Accenture
Michael J. Karich: Enercon Services Inc.
Ryan L. Kent
Leigh A. Kesler: Graduate school, Massachusetts Institute of Technology
Yeldos Kultayev: Graduate school, University of Tokyo Nuclear Engineering
Jordann A. Lee: U.S. Navy
Leigh Lin: Defense Nuclear Facilities Safety Board, General Engineer, Washington, D.C.
Kyle A. Linquist: NPRE graduate school
Brooke L. McClure: Associate reactor engineer, Exelon Dresden Generating Station
Michael C. McGuire: Equipment operator, Exleon, Clinton
Cody A. Morrow: Business analyst associate, Underwriters Laboratories
Sujay S. Patel: Associate consultant, Clarity Solution Group
Jason A. Peck: NPRE graduate school
Matthew C. Peterson
Mona H. Raithatha: Graduate school, UC-Berkeley
Anthony M. Ravnic
Jeffrey M. Schappaugh: Erin Engineering & Research, Inc.
Daniel J. Sheehan
Ryan A. Switts: NPRE graduate school
Andrew C. Taylor: U.S. Navy
Christopher L. Thompson
Jason A. Vincent: Exelon, Oyster Creek

August 2012
Chi Gyun Kim
Richard Kustra: NPRE graduate school
Timothy Noffke
Cesar Vasquez

Master's of Science Degrees

August 2011
Nabeel G. Ahmed: Epic, Technical Services
December 2011
Laith M. Al-Barakat: Texas A&M, Lead Software Applications Developer, Marketing & Communications
Wei-Ying Chen: NPRE PhD program
Xiaochun Han: NPRE PhD program
Zebo Li: NPRE PhD program
Yinbin Miao: NPRE PhD program
Rabie Abu Saleem: NPRE PhD program
May 2012
Matthew Duchene: National Nuclear Security Administration Nonproliferation Graduate Fellowship Program, Washington, D.C.
Brian Kleinfeldt: Enercon Services Inc.
David Lartonoix: Sandia National Laboratory
Tim Milligan
Rijan Shrestha: NPRE PhD program
August 2012
Yang Zhao: PhD program, Purdue University

Doctor of Philosophy Degrees

August 2011
Geng Fu: Detector scientist, GE Global Research
Kai Huang
Kun Mo: China Nuclear Power Technology Research Institute
Bei Ye: Argonne National Laboratory
December 2011
Yizhou Yan: The Shaw Group, Nuclear System Engineer
May 2012
Xiang Chen: Postdoc, Oak Ridge National Laboratory
Jiawei Tan: R&D scientist, Olympus NDT
August 2012
Seung Jun Kim: Post-doctoral Fellow, University of New Mexico
Hsiao-Ming Tung

Welcome New Students!

NPRE welcomed classes of 49 new undergraduates and 15 new graduate students in Fall 2012.

AY 12-13 Undergrads
Sanchita Agrawal, Vernon Hills, IL
Waleed Ahmed, Tracy, CA
Ryan P. Balder, Springfield, IL
Benjamin R. Blecha, Coal City, IL
Shanna M. Bobbins, Bedford, NH
Joseph L. Bottini, Framingham, MA
Kristopher T. Burge, Matteson, IL
Kevin J. Chowaniec, Willowbrook, IL
Brittany A. Daley, Algonquin, IL
Denis Doci, Hoffman Estates, IL
Chase D. Duncan, Chicago, IL
Elizabeth M. Edwardson, Gurnee, IL
Nicholas J. Ezyk, Round Lake, IL
Aaron R. Gerhardt, Algonquin, IL
Robert G. Getty, Niles, IL
Michael P. Golden, Oak Lawn, IL
Cameron Graves, Saint Charles, IL
Holly Hernandez, Glendale Heights, IL
Mark R. Hirsbrunner, Bloomingdale, IL
Malik B. Howard, Chicago, IL
Steven J. Jensen, Mount Prospect, IL
Kirsten E. Johnson, Plainfield, IL
Aveek S. Kapat, Oviedo, FL
John D. Karahalios, Gurnee, IL
Patrick F. Keane, Champaign, IL
Christopher T. Keckler, Naperville, IL
Ari M. Krause, Gurnee, IL
Brandon T. Lee, Hermosa Beach, CA
Phillip Y. Louie, Hong Kong
Paula-Angela R. Mariano, Lake in the Hills, IL
Matthew R. Miller, Gurnee, IL
Samuel M. Oprondek, Alsip, IL
Hardik D. Parikh, Mumbai
Simone P. Pensabene, Sherman, IL
Kyle T. Perfect, Brookfield, IL
Jetti-Paul Pifer, Seneca, IL
Eric J. Rash, Plainfield, IL
James J. Riccio, Bolingbrook, IL
Ariel Rio Sanchez, Aurora, IL
Andrew N. Saucedo, Chicago, IL
Nirali P. Shah, Skokie, IL
Andrzej A. Skubis, Schiller Park, IL
Alexander L. Spring, Long Grove, IL
Dan G. Strat, Lincolnwood, IL
Jeff T. Tablerion, Orland Park, IL
Ryan M. Thompson, Kewanee, IL
Ravi H. Trivedi, West Chicago, IL
Justin D. Weberski, Saint Charles, IL
Ty K. Williams, Peoria Heights, IL

AY 12-13 Graduate Students
Jordan R. Baczynski, Willow Springs, IL
Michael P. Christensen, Urbana, IL
Andrew N. Groll, Champaign, IL
Min-Tsung Kao, Kaohsiung, Taiwan
Rinat Khaziev, Urbana, IL
Xianliang Kong, Shanghai, Peoples Republic of China
Richard J. Kustra, Chicago, IL
Kuan-Che Lan, Taoyuan County, Taiwan
Kyle A. Lindquist, Lisle, IL
Kyuhak Oh, Savoy, IL
Hardik Parikh, Mumbai, India
Jason A. Peck, Urbana, IL
Honghui Shi, Beijing, Peoples Republic of China
Jacob B. Stinnett, Piedmont, OK
Ryan A. Switts, O'Fallon, IL
Weicheng Zhong, Urbana, IL
Piyum S. Zonooz, Carol Stream, IL

Jim Stubbins, Michael Karich and Peter Fiflis

Jim Stubbins, Richard Kustra and Peter Fiflis

Jim Stubbins, Molly Bilderback and Robert Geringer

Students

2012 Award Winners, Student Recognitions

Peter R. Fiflis and **Michael J. Karich** are winners of the NPRE **Outstanding Academic Achievement Award to a Graduating Senior.**
The award recognizes the graduating seniors with the highest cumulative GPA. Fiflis, of Indian Head Park, Illinois, and Karich, of Libertyville, Illinois, were also recognized as **Bronze Tablet** members, a select group of undergraduate students whose names are inscribed on bronze tablets displayed on the first floor of the University of Illinois Main Library. Only the top 3 percent of undergraduate students across campus receive this highly coveted award, taking note of continuous high academic achievement.

Fiflis and Karich were among 105 students NPRE recognized in April during the Department's 2012 Honors Banquet. 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, AB 85, Political Science, MBA 87, established the fund to honor their father.

Following is a list of students honored and their awards:

NPRE Departmental Awards

NPRE Outstanding Undergraduate Research Award

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

Peter R. Fiflis of Indian Head Park, IL
Richard J. Kustra of Chicago, IL

Catherine Pritchard Undergraduate Scholarship

The Catherine Pritchard Undergraduate Scholarship, 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.

Molly R. Bilderback of Kankakee, IL
Robert J. Geringer of Palatine, 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.

Jessica C. Hsu of Aurora, IL
Ben L. Magolan of Plainfield, IL

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.

Leo E. Kirsch of Frankfort, IL
Kathleen J. Weichman of Albuquerque, NM

American Nuclear Society Student Chapter Awards

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 program throughout the academic year is honored.

Valentyn Bykov of Prague, Czech Republic

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 program throughout the academic year is honored.

Brian R. Kleinfeldt of Flossmoor, IL

American Nuclear Society, National Recognitions

Sophomore Undergraduate Scholarship

Undergraduate scholarships are awarded to students who are entering the field of nuclear science and engineering..

Louis J. Chapdelaine of Eagan, MN

Robert G. Lacy Memorial Scholarship

Robert G. Lacy chaired the ANS San Diego Local Section and was instrumental in the formation of the ANS San Onofre Plant Branch. He was a longstanding contributor to ANS and was active in the national ANS, chairing the Executive Conference Review Committee, serving as Treasurer-Elect of the Power Division, and receiving the ANS Leadership Award.

Leo E. Kirsch of Frankfort, IL

2012-2013 Nuclear Criticality Safety Pioneers Scholarship Award

Administered by the NCS Division, this scholarship recognizes individuals who identified as being "Pioneers" in the industry, and who have made major contributions to nuclear criticality safety. One scholarship is awarded to a graduate nuclear science/engineering major, with the desired emphasis on areas supporting nuclear criticality safety. These areas include, but are not limited to, computer code development for neutron transport calculations, critical or subcritical experiments, and neutron cross section evaluation.

Hsingtzu Wu, Taiwan

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Jim Stubbins, Roy Axford, Jessica Hsu and Ben Magolan

Jim Stubbins, Kathleen Weichman and Leo Kirsch

Jim Stubbins, Valentyn Bykov and Brian Kleinfeldt

Jim Stubbins, Magdalena Rzepecka, Tom Sowinski, Bill Green, and Quinn Vandermeersch

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University of Illinois at Urbana-Champaign Nuclear Engineering Education Scholarship Program (funded by the Nuclear Regulatory Commission)

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:
Carlos A. Altamirano
Harry W. Arnold IV of McHenry, IL
Cem Bagdatlioglu of Istanbul, Turkey
Molly R. Bilderback of Kankakee, IL
Wesley N. Cowan of Lexington, KY
Peter R. Fiflis of Indian Head Park, IL
Jon B. Hansen of O'Fallon, IL
Ryan D. Holstein of Farmer City, IL
George J. Isaac
Brian M. Jaros of Naperville, IL
Matthew J. Jasica
Christopher Kallapodi of Glen Ellyn, IL
Michael J. Karich of Libertyville, IL
Ryan L. Kent of the Woodlands, TX
Leigh A. Kesler of Rantoul, IL
Leo E. Kirsch of Frankfort, IL
Stephen M. Kleppinger of Lake Zurich, IL
Leigh Lin of Buffalo Grove, IL
James V. Madrigal of Oak Lawn, IL
Ben L. Magolan of Plainfield, IL
Brooke L. McClure
Cody A. Morrow of Virden, IL
Peter A. Mouche of Naperville, IL
Nicholas W. O'Shea of Chicago, IL
Jason A. Peck of Fairview Heights, IL
Brian P. Pekron of Elmhurst, IL
David J. Peterson of Orland Park, IL
Jonathan B. Pfingsten of Harvard, IL
Richard S. Piantini of Kissimmee, FL
Collin R. Rahrig of Bourbonnais, IL
Anthony M. Ravnic of Arlington Heights, IL
Jaspreet S. Rehal of Naperville, IL
Jeffrey M. Schappaugh of Petersburg, IL
Joseph A. Serio of West Chicago, IL
Daniel J. Sheehan of Chicago, IL
Matthew M. Szott of Orland Park, IL
Andrew C. Taylor of Champaign, IL
Quinn T. Vandermeersch of Knoxville, TN
Nathan P. Walter of Evanston, IL
Kathleen J. Weichman of Albuquerque, NM
Bennett T. Williams of Robinson, IL
Jeffrey L. Zhou of Geneva, IL
Jo A. Zoril of Toulon, IL
Fellowships:
Neal E. Davis of Champaign, IL
Brian R. Kleinfeldt of Flossmoor, IL
Aaron J. Oaks of Brea, CA
Carolyn A. Tomchik of Urbana, IL

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.

Quinn T. Vandermeersch
Margot M. Wilson

Sargent & Lundy Fellowship

Sargent & Lundy, based out of Chicago, is a worldwide leader in services for the electric power industry. The firm provides consulting and project services for fossil-fuel and nuclear power plants and power delivery systems. Their competitive fellowship is awarded to a graduate student who shows promise of making substantial research contributions in the power design areas and who has demonstrated a strong academic performance.

Matthew J. Weberski of Spring Valley, IL

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 (2011-12):
Leigh A. Kesler of Rantoul, IL
Brooke L. McClure of Bourbonnais, IL
Fellowship
Joseph R. Bernhardt of Bloomington, IL

U.S. Department of Energy Nuclear Energy Universities Programs

The Department of Energy Nuclear Energy Universities Programs (NEUP) awarded scholarships to 39 undergraduates across the country as part

of a $47.2 million nuclear education, research and upgrades. One scholarship was awarded to an NPRE student.

Scholarships:
Louis J. Chapdelaine of Eagan, MN

College of Engineering SURGE Fellowships

The Support for Under-Represented Groups in Engineering (SURGE) Fellowship Program was established to meet the University of IL and College of Engineering goals of increasing the number of highly qualified persons for engineering faculty and research positions from groups currently underrepresented in engineering.

Fellowship:
Joanne N. Li
Continuing Fellowships:
Carolina T. Fineman-Sotomayor of Lafayette, CA

College of Engineering

Harold and Ruth Hayward/Tau Beta Pi Scholarships

The Hayward Fund was established in 1995 to confirm the commitment of the Haywards to their alma mater the University of Illinois at Urbana-Champaign. Through the generosity of Ruth and Harold Hayward and the Tau Beta Pi, honorary engineering society, these scholarships are awarded to outstanding Illinois engineering students on the basis of academic achievement, service, leadership, and initiative.

Continuing Scholarship:
Jon B. Hansen

Emeritus Prof. Dan Hang with the Spring 2012 Alpha Nu Sigma initiates

Boeing Engineering Diversity and Women in Engineering Scholarships

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

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 2012 Initiates:
Cem Bagdatlioglu of Istanbul, Turkey
Louis J. Chapdelaine of Eagan, MN
Michael T. Cunningham of Chicago, IL
Kevin T. Egan of Joliet, IL
Jessica C. Hsu of Aurora, IL
Abhishek Jaiswal of Kathmandu, Nepal
Brian M. Jaros of Naperville, IL
Ye Li of Beijing, People's Republic of China
Amanda M. Lietz of Cincinnati, OH
Tim A. Milligan of Benton, IL
Peter A. Mouche of Naperville, IL
Jonathan B. Pfingsten of Harvard, IL
Mona H. Raithatha of Kuwait
Priya Raman of Chennai, India
Jaspreet S. Rehal of Naperville, IL
Jonathan D. Rolland of Sayville, NY
Joseph A. Serio of West Chicago, IL
Bennett T. Williams of Dearborn, MI
Yang Zhao of Changzhi, People's Republic of China
Continuing Members:
Rabie A. Abu Saleem of Al Salt, Jordan
Joseph R. Bernhardt of Bloomington, IL
Valentyn Bykov of Prague, Czech Republic
Liang Cai
Wei-Ying Chen of Champaign, IL
Xiang Chen of Changzhou, China
Wesley N. Cowan of Lexington, KY
Joshua A. Dotson of Urbana, IL
Peter R. Fiflis of Indian Head Park, IL
Manas R. Gartia of Attabira, India
Jonathan George of Bolingbrook, IL
Jon B. Hansen of O'Fallon, IL
Matthew J. Jasica of Broomfield, Colorado
Christopher Kallapodi of Glen Ellyn, IL
Michael J. Karich of Libertyville, IL
Leigh A. Kesler of Rantoul, IL
Seung Jun Kim of Seoul, Korea
Leo E. Kirsch of Frankfort, IL
Brian Kleinfeldt of Flossmoor, IL
Yeldos Kultayev of Kyzylorda, Kazakhstan
David K. Lartonoix of
Nan Li of Champaign, IL
Leigh Lin of Buffalo Grove, IL
Ben L. Magolan of Plainfield, IL
Benjamin C. Masters of Urbana, IL
Liang Meng of Suzhou Anhui, China
Yinbin Miao of Shanghai, People's Republic of China
Aaron J. Oaks of Brea, CA

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Nicholas W. O'Shea of Chicago, IL
Zihao Ouyang of Liuyang, China
Jason A. Peck of Fairview Heights, IL
Ian M. Percel of Chicago, IL
Jeffrey M. Schappaugh of Petersburg, IL
Daniel J. Sheehan of Chicago, IL
Ryan A. Switts of O'Fallon, IL
Matthew M. Szott of Orland Park, IL
Carolyn A. Tomchik of Urbana, IL
Hsiao-Ming Tung of Taipei, Taiwan
Kathleen J. Weichman of Albuquerque, NM
Jeffrey L. Zhou of Geneva, IL

University of Illinois, Urbana Campus

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.

Peter R. Fiflis of Indian Head Park, IL
Jon B. Hansen of O'Fallon, IL
Matthew J. Jasica of Broomfield, Colorado
Leigh A. Kesler of Rantoul, IL
Joseph A. Serio of West Chicago, IL
Matthew M. Szott of Orland Park, IL
Jeffrey L. Zhou of Geneva, IL

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' international reputation.

Singh Adhiraj of Gurgaon, India
Omar F. Almasri of Chicago Ridge, IL
Jordan R. Baczynski of Willow Springs, IL
Luke W. Barry of Morrison, IL
Valentyn Bykov of Prague, Czech Republic
Louis J. Chapdelaine of Eagan, MN
Nathaniel T. Chapman of Naperville, IL
Kevin C. D'Souza of Inverness, IL
Eric C. Gillum of Lake Villa, IL
Jon B. Hansen of O'Fallon, IL
Jessica C. Hsu of Aurora, IL
Matthew J. Jasica of Broomfield, Colorado
William M. Karlov of Mount Prospect, IL
Leo E. Kirsch of Frankfort, IL
Stephen M. Kleppinger of Lake Zurich, IL
Matthew S. Kremske of Elmhurst, IL
Christopher A. Kuprianczyk of Chicago, IL
Amanda M. Lietz of Cincinnati, OH
Kyle A. Lindquist of Lisle, IL
Ben L. Magolan of Plainfield, IL
Peter A. Mouche of Naperville, IL
Travis C. Mui of Arlington Heights, IL
Anthony Park of Bolingbrook, IL
Benjamin N. Parker of Northbrook, IL
Gianluca A. Panici of New Lenox, IL
Jonathan B. Pfingsten of Harvard, IL
Vishnu Raveendran of Westmont, IL
Jaspreet S. Rehal of Naperville, IL
Daniel J. Roberts of West Chicago, IL
Jonathan D. Rolland of Sayville, NY
Daniel J. Sheehan of Chicago, IL
Molly Sullivan of Champaign, IL
Ryan A. Switts of O'Fallon, IL
Matthew M. Szott of Orland Park, IL
Riu Lin Tan of WHERE
Kathleen J. Weichman of Albuquerque, New Mexico
Yuhui Zhao of Chicago, IL
Jeffrey L. Zhou of Geneva, IL

2012-13 American Nuclear Society Student Chapter Officers
Front row, from left: Kathleen J. Weichman, Engineering Open House/Outreach Chair; Molly R. Bilderback, President; Kristin E. Schoemaker, Social Chair. Back row, from left: Brian P. Pekron, Treasurer; Robert J. Geringer, Vice President; Michael M. Cheng, Webmaster.

Fiflis Gains Plasma/ Fusion DOE Fellowship

Peter Fiflis

NPRE at Illinois graduate student Peter R. Fiflis has been awarded an Office of Science Graduate Fellowship from the U.S. Department of Energy.

The fellowship will provide living expenses, tuition and a research allowance, and is renewable for up to three years. The Oak Ridge Institute for Science and Education administers the program.

Fiflis conducts research with his advisor, NPRE Prof. David N. Ruzic, in the Center for Plasma Materials Interaction.

In one area of his work, Fiflis helps to investigate the wetting properties of lithium on various surfaces. Lithium, the lightest metal and least dense solid element, is highly reactive and also may play an important role in the future of nuclear fusion. Fusion devices using liquid-lithium plasma-facing components might provide a viable track toward building fusion reactors that are affordable and commercial. Fiflis participates in testing lithium's wetting properties on stainless steel and molybdenum. He and the Center's other scientists also test whether various treatments, such as diamond-like carbon films, plasma cleaning and/or heat treatments, increase the contact angle of lithium on surfaces.

He also is examining the thermoelectric power of lithium, tin and lithium-tin alloys. While the high temperatures of a fusion reactor may cause evaporation in pure lithium, a tin alloyed with lithium suppresses evaporation, allowing the combined material to withstand higher temperatures.

A native of Indian Head Park, Illinois, Fiflis earned a bachelor's degree in NPRE in December 2011. He recently was honored with the Department's Outstanding Academic Achievement Award to a Graduating Senior, and was named a University of Illinois Bronze Tablet winner. Each year the Urbana campus recognizes the high academic achievement of the top 3 percent of undergraduate students by inscribing their names on on bronze tablets displayed on the first floor of the Main Library.

American Nuclear Society student chapters members hosted a booth during the 2012 Engineering Open House in March to give visitors general information about the three paths of study available through an NPRE degree. ANS members also gave demonstrations of mousetraps to model a nuclear reaction and plasma materials glowing in the dark.

David Ruzic

Ruzic Wins AVS Plasma Prize

NPRE Prof. David N. Ruzic is the 2012 winner of The Plasma Prize of the American Vacuum Society (AVS) Plasma Science and Technology Division.

Ruzic, Abel Bliss Professor in the College of Engineering at Illinois and Director of the Center for Plasma Material Interactions, was cited "for his pioneering contributions to the science of processing plasmas and the societal benefits of plasma technology." The AVS division created the award to recognize sustained contributions by an individual to the science and technology of plasma processing.

A member of NPRE's faculty since 1984, Ruzic has made tremendous contributions to the international store of knowledge on experimental fusion research and plasma technology. The center he founded studies particle-surface interactions relevant to fusion, semiconductors, and plasma manufacturing through a combination of computational and experimental means.

Ruzic is a Fellow of both AVS and the American Nuclear Society, and is the Scientific Director of the International Union for Vacuum Science, Technique and Applications. He has written two book chapters and 130 refereed publications, and has been granted several patents. His plasma research has been featured on the Discovery Science Channel's "Weird Connections" program, bringing international attention to the University of Illinois at Urbana-Champaign.

Ruzic also has won many teaching awards across the Department, College of Engineering and campus.

Ruzic earned a bachelor's degree in physics and applied mathematics from Purdue University in 1979, then earned a master's and PhD in physics from Princeton University in 1981 and 1984, respectively. He is an affiliate in the Engineering at Illinois' Micro and Nanotechnology Laboratory and Electrical and Computer Engineering Department.

Faculty, Staff

Heuser, Meng Promoted

NPRE faculty members Brent J. Heuser and Ling Jian Meng have been promoted to Professor and Associate Professor, respectively.

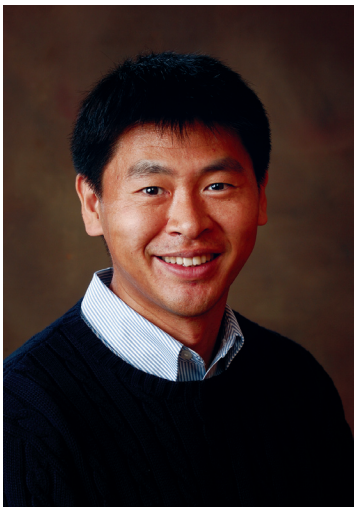
A faculty member since 1994, Heuser's research interests include nuclear materials (fuel and cladding), hydrogen behavior in metals, applications of scattering techniques to materials, and interrogation of special nuclear material.

His awards include the Engineering Council Award for Excellence in Advising and the 2006 American Nuclear Society student chapter Excellence in Undergraduate Teaching Award.

Heuser earned three nuclear engineering degrees from the University of Michigan: a bachelor's in 1983, a master's in 1989 and a PhD in 1990.

Meng joined the NPRE faculty in 2006. His research focuses on ultra-high resolution imaging systems for biomedical/molecular imaging applications.

Brent Heuser



Ling Jian Meng

Meng earned a bachelor's degree in modern physics from the University of Science and Technology of China in 1995, and a PhD in detector physics from the University of Southampton in the United Kingdom in 2001.

Uddin Continues Streak of Excellent Teaching

Ruzic, Meline Honored for Advising

For the eighth time, NPRE students have shown their appreciation of Prof. Rizwan Uddin by honoring him with the 2012 American Nuclear Society Student Chapter Award for Excellence in Undergraduate Teaching.

Prof. David N. Ruzic and Admissions and Records Officer Becky J. Meline have been honored with the Engineering Council Award for Excellence in Advising.

An NPRE alumnus (MS 83, PhD 87), Uddin has been on faculty in the department since 1996, with research interests in advanced theoretical and CFD computational methods; radiation transport and reactor physics; reactor engineering; multiphase flow; reliability and risk analysis; and virtual reactor simulation.

Teaching courses including NPRE 100, Orientation to Nuclear, Plasma, and Radiological Engineering; NPRE 455, Neutron Diffusion & Transport; NPRE 498, Special Topics; and NPRE 501, Fundamentals of Nuclear Engineering, Uddin has been included on the List of Teachers Ranked Excellent for over a decade.

The top 10 percent of engineering advisors are chosen for the Engineering Council's advising award, recognizing the important role that advisors play in the academic planning process of every engineering student on campus. Students nominate the candidates.

Ruzic, a Abel Bliss Professor in Engineering at Illinois, has been on faculty in the department since 1994. In addition to many awards for research, Ruzic has been widely recognized for his interactions with students and teaching abilities, including the All-Campus Charles and Harriet Luckman Award for Distinguished Teaching (1996); the Graduate College Award for Outstanding Mentoring of Graduate Students finalist (1999); and the Campus Award for Excellence in Guiding Undergraduate Research (2009).

Meline, who joined NPRE in 2000, advises all NPRE incoming freshmen and transfer students on course registration and works with inter-college transfers. She also was recognized for her advising work in 2010.

NPRE Department Head Jim Stubbins, left, and 2011-12 American Nuclear Society President Valentyn Bykov, middle, present Prof. Rizwan Uddin with the 2012 ANS Excellence in Undergraduate Teaching Award.

Becky Meline

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Giving is a very personal decision. Whether we give our time or our money, we sacrifice something every time we give. In thinking about Why We Give, we kept coming back to the fact that we really are not giving. We are not sacrificing anything. Every time we "give," we actually are getting something much more in return. We view our donations to the University of Illinois as investments. Our investments in the University provide us benefits in two ways.

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Craig and Charlotte Laughton, left, and Debbie and Terrill Laughton, right, have generously supported NPRE's programs since the days they graduated. Brothers Craig and Terrill are NPRE alumni, as is Terrill's wife, Debbie. Craig's wife, Charlotte, earned a degree in secondary education from Illinois.

Most importantly, we give to promote the education and development of tomorrow's generation. Fundamentally, we believe this is our most important responsibility as a society because it forms the foundation for our continued growth and prosperity. Helping to promote and support the University's mission to "…transform lives and serve society…" is one of the best ways to maximize the value of our investment. By supporting the education of premier students and groundbreaking research at the University of Illinois our investments in scholarships, fellowships, and endowments will pay dividends for decades to come. This is why we give.

GO ILLINI! Terrill & Deborah Laughton

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Kelley Back to Lead NPRE Advancement Efforts

John Kelley, Director of Operations for Engineering at Illinois' Advancement Office, is no stranger to NPRE, having led the Department's fundraising efforts from 2004-06.

John Kelley

He's thrilled to work with NPRE alumni and friends once again! You can contact Kelley by calling 217- 333-5120 (office) or 217-621-6589 (cell), or by emailing him at jekelley@illinois.edu.

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New in 2013 will be NPRE's E-Newsletter, to be distributed to our alumni and friends several times a year. Stay tuned and make sure we have your email!

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