

new-generation

newsletter for alumni and friends

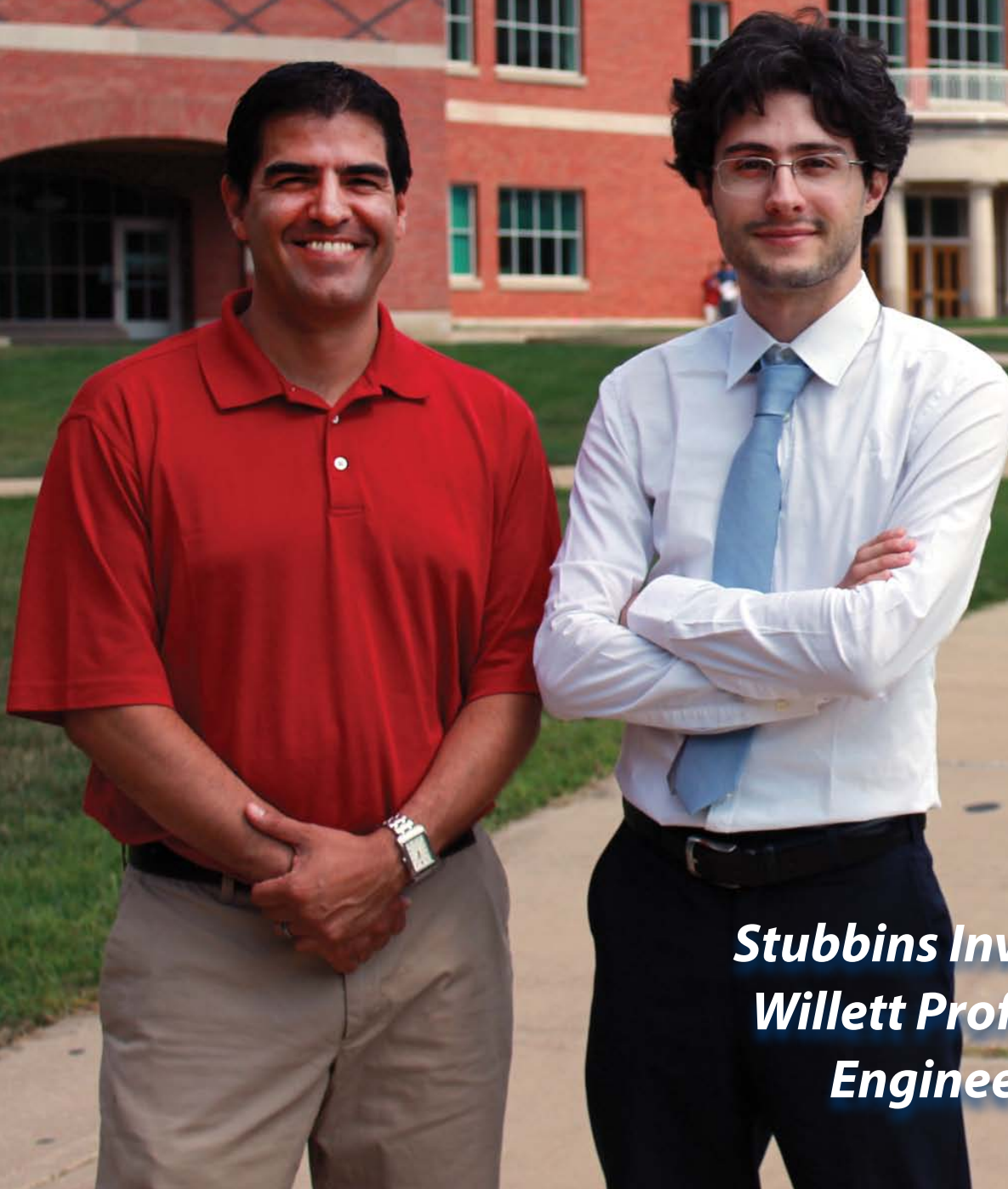
Nuclear, Plasma, and Radiological Engineering

University of Illinois at Urbana-Champaign

fall 2013



Plasma/Fusion Area Gains New Faculty



*Stubbins Invested as
Willett Professor in
Engineering*

The people of NPRE

faculty

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

other faculty

Michael Aref, *adjunct assistant professor*
Robert S. Averback, *affiliate faculty*
Stephen A. Boppert, *affiliate faculty*
Thomas J. Dolan, *adjunct professor*
J. Gary 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*
Michael K. Kaminski, *adjunct associate professor*
Susan M. Larson, *affiliate faculty*
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 assistant professor*
William K. Roy, *adjunct professor*
Robert A. Stubbins,
adjunct research assistant professor
Brian G. Thomas, *affiliate faculty*
Dallas R. Trinkle, *affiliate faculty*
Surya P. Vanka, *affiliate faculty*

staff

Daniel Andruczyk, *postdoctoral research associate*
Marco Beghini, *lecturer*
Idelle D. Dollison, *office administrator*
Richard L. Holm, *research engineer*
Kyu Jung Kim, *visiting research assistant professor*
Gail S. Krueger, *office manager*
Nie Luo, *visiting research assistant professor*
Becky J. Meline, *coordinator of academic programs*
Susan K. Mumm, *alumni, media coordinator*
Seyed A. Reihani, *research scientist*
Calogero Sollima, *visiting scholar*
Stoyan A. Toshkov, *senior research scientist*

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This issue of New Generation features our newest faculty members, Jean Paul Allain and Davide Curreli.

NPRE Teachers Ranked Excellent by Their Students

Fall 2012	Spring 2013:
Roy A. Axford	Roy A. Axford
Magdi Ragheb	William K. Roy
David N. Ruzic	David N. Ruzic
Rizwan Uddin	Clair J. Sullivan

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James F. Stubbins

NPRE Keeps Growing!

This has been another extraordinary year for NPRE!

You have seen the cover — we are thrilled to welcome two additional new faculty members! In the space of the past two years, six new individuals have joined NPRE, bringing our total faculty number to 14. The new faculty members already have brought a heightened level of vitality to the Department and we all are looking forward to great things to come.

We in NPRE anticipate growing to 15 faculty, with plans of filling at least one more open position this year. The search for candidates for this position is currently underway, and we hope to be able to announce another NPRE colleague by this time next year.

The increase in our faculty numbers is not the only major recent development in the Department. In 2012, NPRE celebrated the largest graduating class of BS students in Department history. This past academic year we sur-

passed even that record with 50 BS graduates. We are proud of all of our graduates. It is particularly gratifying to announce that one of our Senior Design groups from last year was selected as a finalist for the national undergraduate design competition at the Winter 2013 American Nuclear Society Meeting.

Earlier this Fall, we had the ABET visit. ABET (formerly the Accreditation Board for Engineering and Technology) reviewed our undergraduate degree program on the normal six-year review cycle. The visitors were impressed overall with our program, but did require that we do a more transparent job of documenting how our courses and course activities meet our expected outcomes for graduating students. We are currently in the process of preparing a response and expect that, with the response, we will be cleared for another full six-year accreditation in July of 2014 when the ABET Board next meets. I want to extend our appreciation to all of you who assisted us in this intensive review.

This has been another very productive year for our research and graduate programs. We have won some interesting new research awards and continue to be active in large on-going research activities, including two collaborative programs aimed at critical technical challenges regarding nuclear fuel cladding. We continue technical accomplishments in the fusion and plasma application fields, and expect even more impact in the coming years with the additions of Professors Allain and Curreli. We have also made strides forward with the detector development and imaging fields recently. The addition of Professor Mohaghegh has established a new foundation in risk and reliability. We invite you to share our excitement as you read about these accomplishments in the following pages.

We have a new Dean this year following the promotion of former Dean Ilesanmi Adesida to Provost. Andreas Cangellaris, former Head of the Electrical and Computer Engineering Department, became Dean in August. Dean Cangellaris has shown considerable support for NPRE, and we welcome him in his new leadership role.

Our alumni have played a tremendous part in helping us grow our programs and impact. Your contributions over the past year have given us a tremendous lift. We sincerely appreciate those of you who devote your time, energy and resources to NPRE, and particularly value your help with the recent ABET review. We encourage and welcome your commitment and engagement. Please come to Campus and meet our new faculty when you have the chance. We count our association with our alumni and friends among our greatest assets.

Sincerely,

James F. Stubbins, *Willett Professor and Head*

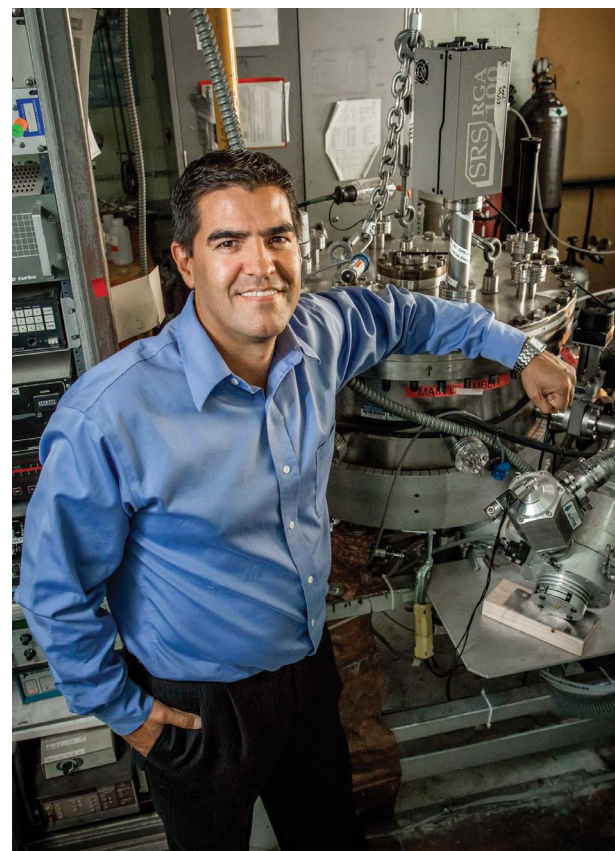
NPRE Continues to Grow New Faculty Build Plasma, Fusion Focus

Alumnus and new NPRE Associate Prof. Jean Paul Allain smiles broadly when talking about coming home to his Alma Mater.

"Knowing the engineering culture here at Illinois and the wonderful quality of our students, it's great to be back at the Orange and Blue!" said Allain, formerly on the nuclear engineering faculty at Purdue University.

His addition, along with that of new Assistant Prof. Davide Curreli, an expert in plasma modeling and computations, are greatly appreciated by veteran NPRE Prof. David Ruzic, Abel Bliss Professor of Engineering and Director of the Center for Plasma Material Interactions (CPMI). The three faculty comprise a strong backbone for NPRE's programs in plasma and fusion technology.

"Our visibility should go up dramatically," said Ruzic. "(The additional faculty) should be a great draw for graduate students. (Previously,) we have had to turn some students away and, now, when they apply, there might be more



J.P. Allain

options for them."

Said Allain, "David (Ruzic) has the Center with plasma; I bring strong coupling of materials and plasma so we complement each other well. With David and Davide (Curreli), we should be able to put together some very nice projects with plasma, materials and computations."

J.P. Allain

Serving as an Associate Director in CPMI, Allain is bringing with him to Illinois five graduate students: three in NPRE, and two in the Bioengineering Department, in which Allain is an affiliate faculty member. He also is an affiliate in the Materials Science and Engineering Department. Included among his research interests are

- Engineering design for global social impact
- Ion-driven nanostructures on metals, semiconductors and polymers
- Advanced nanostructured biointerfaces for regenerative medicine
- Multi-scale computational surface physics
- Plasma-surface and materials interactions in fusion devices
- In-situ surface characterization techniques
- Irradiation surface science

"My research is multidisciplinary; not traditional nuclear, which is one of the most multidisciplinary areas," Allain said. "I'm a product of my education here at Illinois, not just in (nuclear) power, but in radiation reactions with materials in general."

Allain earned his MS in 2000 and PhD in 2001 under Ruzic's direction, with the doctoral thesis, "Kinematic and Thermodynamics Effects on Liquid Lithium Sputtering." He earned a BS in 1996 in mechanical engineering at California State Polytechnic University.

Since his graduate student days, Allain gained experience as a researcher working on problems from nuclear fusion materials science to nanolithography at Argonne National Laboratory (2003-2007), and followed that by establishing the Radiation Surface and Interface Science Laboratory at Purdue starting in 2007. The thrust for that lab was the study of nuclear fusion and plasmas interacting with materials surfaces;

directed radiation synthesis; and advanced in-situ probing and manipulating techniques at the nanoscale.

By 2008, Allain became an associate faculty member of the Birck Nanotechnology Center at Purdue, and plans to engage with the Micro & Nanotechnology Laboratory here at Illinois.

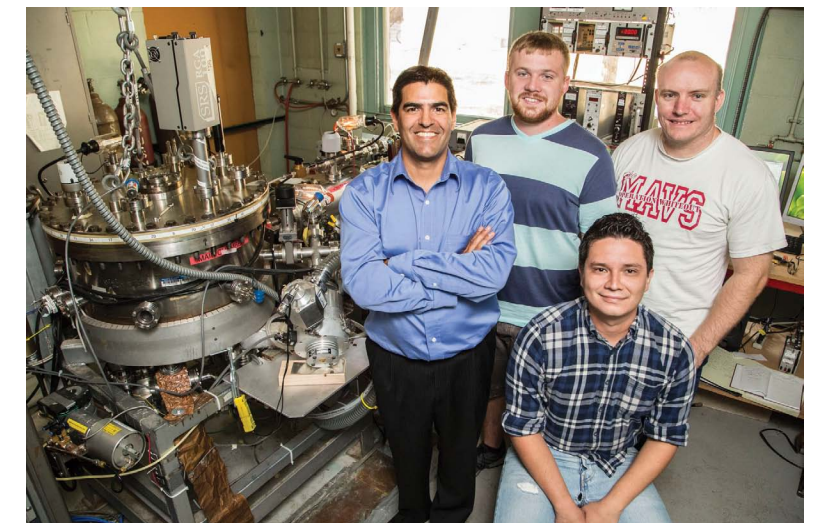
"My intention is to open up more avenues of collaboration within the College (of Engineering at Illinois)," Allain said. "I want to elevate what my group does to another level, and this is where I can do that."

He stresses that while the traditional association of nuclear engineering is with the production of power, his research is breaking new ground in novel and emerging areas. Allain's work encompasses an overlap of nanotechnology, materials science and nuclear engineering.

"I'm more interested in high-risk, high pay-off areas," Allain said. "There's a lack of fundamental understanding on the mechanisms of how radiation in the form of ion beams or other excitation source can be used to control patterning and structure at the nano-scale on surfaces. In particular developing a new class of materials through radiation-induced synthesis establishing the field of radiation surface and interface science. It's frontier-type work, looking at applications 10-15 years down the road."

In addition to applications in nuclear materials science, quantum computing and nuclear detection, radiation-modified surfaces play an integral role in the biomedical area. "We can actually use radiation to apply special surfaces that would be both biocompatible and exhibit function in ways never thought of before," said Allain. "This technology is especially useful in manufacturing stents at the nanoscale to promote arterial wall growth for patients who've suffered brain aneurysms." These novel materials would also open the door to localized imaging and detection of cancer cells.

Allain has been published in over 80 peer-reviewed journals, and his research efforts have earned him considerable recognition. Argonne presented him with the lab's highly competitive Distinguished Performance Award each year from 2003-2006, and he earned a U.S. Department of Energy Office of Science Early CAREER Award in 2010. Purdue named Allain a Paul Zmola Young Scholar from 2008-2013, nominated him for candidacy to participate in the National Academy of Engi-



New NPRE Associate Prof. J.P. Allain and his students, from left, Zak Koyne, Anton Neff, and seated, Felipe Bedoya.

neering's 2009 U.S. Frontiers of Engineering Symposium, and presented him with the 2011 Excellence in Research Award. He chairs the Institute of Electrical and Electronics Engineers (IEEE) Nuclear and Plasma Sciences Society Executive Committee for Fusion Technology.

Allain established his teaching prowess early in his career at Purdue when he was named the Best Teacher of the Year in 2008. He is teaching plasma engineering at Illinois, and looks forward to working with the students.

"The way in which (Illinois) students are trained to do materials, characterizing atomic models, is very unique," he said. "Here, people are willing to help students focus, and student training and access to advanced facilities is also very unique."

Davide Curreli

A postdoctoral research associate in the Center for Plasma-Materials Interaction (CPMI) since February 2012, Curreli joined NPRE this fall semester as an assistant professor.

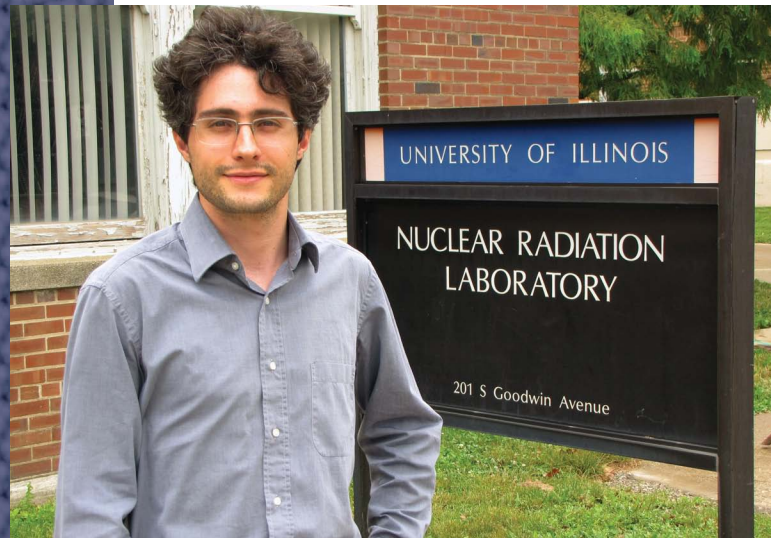
Curreli's research interests are

- Plasma modeling and plasma code development for semiconductor processing and nuclear fusion applications, using fluid models, particle-in-cells, hybrid models, particle models
- Electromagnetic propagation in plasma, plasma kinetics, transport phenomena in plasmas
- Modeling of plasma sources, helicon plasma sources, plasma thrusters, and dynamics of macroscopic systems in plasmas.

"Numerical simulations of plasmas are an indispensable tool

continued on page 6

continued from page 5



Davide Curreli

of investigation in plasma physics and plasma engineering," Curreli maintains.

"Building a plasma device is expensive, and iterations for its optimization are in many cases prohibitive or proceeding very slowly because of limited economic resources," he continued. "Furthermore, experimental diagnostic often constrains the knowledge of a plasma process to a limited amount of observables on a limited number of points of the plasma volume. Empirical methods of optimization often lead to an incomplete understanding of a process, forcing a trial and error process way too expensive for a sustainable progress.

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

However, Curreli said, computer models are often restricted by a large number of assumptions, describing only a fraction of the involved physics, and restricting the analysis to a limited scale of space and time. "The problem is that each plasma process is intrinsically a multiscale process of huge complexity, involving many interconnected physical processes acting at different spatial and temporal scales. The accuracy of the simulation is however critical, and the multiscale physics of the plasma process plays a pivotal role," Curreli said.

Among his past projects at CPMI, sponsored by the Scientific Discovery through Advanced Computing (SciDAC), is a study of plasma/surface interaction in magnetic fusion devices.

A donut-shaped fusion device uses magnetic fields to hold hot temperature ionized gas in place so nuclei can fuse together. The device is colder on the edge that faces the wall. Because the plasma is of a higher energy level than the wall material, particles from the wall can release into the plasma, decreasing the temperature and interfering with the fusion process.

Curreli also has begun discussions with Jon Freund, professor of mechanical sciences and engineering and aerospace engineering, about becoming involved in the \$16 million exascale computing center for plasma and jet combustion that the National Nuclear Security Administration (NNSA), part of the Department of Energy, has recently funded. While several Illinois faculty are working on the fluid dynamics aspects of the project, Curreli believes he could contribute to the plasma kinetics modeling and research.

The impressive computing facilities at Illinois, including Blue Waters, the National Center for Supercomputing Applications, and other computing clusters, drew Curreli to the university. "The University of Illinois and the Department of Nuclear, Plasma, and Radiological Engineering offer a unique and stimulating environment for conducting research on new numerical simulations techniques for plasmas," he said.

Curreli earned three degrees at the University of Padua in Italy: a BS in 2004 and MS in 2007, both in Aerospace Engineering; and a PhD in Science Technology and Measures for Space in 2011.



Assistant Prof. Davide Curreli with his student, Rinat Khaziev.

NPRE Alum, Faculty Member, Organize ANS Risk Management Topical Meeting

NPRE Alumnus Ron Knief and NPRE Assistant Prof. Zahra Mohaghegh organized the embedded topical meeting, Risk Management for Complex Socio-Technical Systems, as part of the 2013 American Nuclear Society Winter meeting, held November 10-14 at the Omni Shoreham Hotel in Washington, D.C.

Among the topical meeting's organizers, Knief, of Sandia National Laboratory, was General Chair, and Mohaghegh was Technical Program Chair.

Encouraged to submit papers by the summary submission deadline of June 12 were managers, safety professionals, risk analysts, researchers, and students around the world for discussions on multidisciplinary issues of risk, safety, reliability, and security of nuclear power and other complex systems.

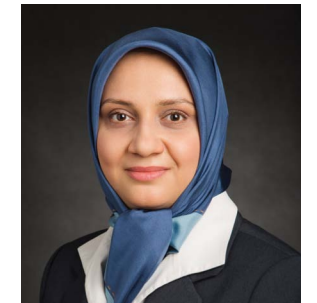
RM4CSS was the fifth in a series of meetings on risk management that were held in 1989, 1992, 2003, and 2009. According to Mohaghegh, "In order to preclude catastrophes, we need to quantitatively and more comprehensively integrate the interactions of social and technical contributing factors into risk models. The 2013 embedded topical meeting aims to facilitate addressing this challenge."

The cross-disciplinary sessions of the meeting were intended to help broaden the technical perspective and facilitate communication between industry and regulatory organizations on the best approaches for effectively managing risk. More specifically, the conference aimed to:

- Advance the state of knowledge in understanding risk management by analyzing both technical and social risk-contributing factors and the issues arising from their dynamic interactions.
- Provide a forum for creating a common risk management vocabulary for more effective communication among experts from diverse technical domains (e.g., engineering, mathematics, and physics) and social sciences (e.g., management, economics, psychology, organizational behavior, public policy).
- Discuss more formal integration of probabilistic and deterministic perspectives in risk, safety, reliability, and security analysis.



Ron Knief



Zahra Mohaghegh

- Exchange risk management theories and techniques applied in nuclear power and other complex technologies and lay the foundations for defining unifying principles.
- Exchange ideas on how to narrow the gap between the science and practice of risk management.
- Evaluate the state-of-the-art on multi-dimensional risk management, considering diverse interrelated performance metrics (e.g., safety, cost, quality) of high-risk organizations.
- Explore more comprehensive risk acceptance criteria.

Selected full-length, peer-reviewed technical papers will be published in a post-meeting book. Summaries of the papers will also be published in the ANS Transactions.



NPRE alumna Becky Romatoski, seated left, joins NPRE Assistant Prof. Zahra Mohaghegh's SoTeRia (Socio-Technical Risk Analysis) team, from left, Justin Pence, Tatsuya Sakurahara, Heather Feik, and Marzieh Abolhelm. The group gathered at the NPRE breakfast reception during the ANS 2013 Winter Meeting in Washington, D.C. in November.



Honored with one of the highest recognitions a faculty member at the University of Illinois can achieve, NPRE Prof. and Department Head Jim Stubbins was invested as a Donald Biggar Willett Professor in the College of Engineering at Illinois in a ceremony September 10.

NPRE Associate Head of Academic Programs Rizwan Uddin introduced Stubbins, and spoke of his many accomplishments on behalf of the department as well as worldwide contributions to nuclear engineering research and education. College of Engineering Dean Andreas C. Cangellaris presented Stubbins with a medal commemorating the honor. Also invested were Michael F. Insana, professor of Bioengineering, and Rakesh Nagi, professor of Industrial and Enterprise Systems Engineering.

Stubbins earned a BS in nuclear engineering in 1970 from the University of Michigan. After earning his MS in nuclear engineering and PhD in materials science and engineering from the University of Cincinnati, in 1972 and 1975, respectively, Stubbins spent one and a half years as a guest scientist in the Materials Research Institute at the Research Center, Karlsruhe, Germany. He then spent an additional one and a half years as a guest scientist in the Department of Science of Materials, Oxford University and with Harwell Labs in the United Kingdom. He later became principal investigator for the Very High Temperature Reactor Materials Program at General Electric in the U.S.

Stubbins joined NPRE in 1980, served as associate head from 1991 to 1998, and became Department Head in 1999. Stubbins led NPRE during its most tumultuous periods in the late 1990s and early 2000s, when a College of Engineering decision was made to shutter the TRIGA nuclear reactor and, later, an attempt was made to close the department. The closure was avoided thanks in large part to Stubbins' tireless work and successful rallying of alumni and industry advocates. NPRE now enjoys healthy undergraduate and graduate student enrollments, and is growing its faculty and facilities.

Stubbins has extensive experience with materials development and applications for a variety of advanced energy systems with particular emphasis on nuclear energy systems.



TOP: Jim Stubbins with NPRE Prof. Rizwan Uddin. MIDDLE: Stubbins and his wife, Sandy. BOTTOM: Stubbins with College of Engineering Dean Andreas Cangellaris

Since joining the Illinois faculty, Stubbins has held a number of visiting scientist positions at Argonne National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, and the Pacific Northwest National Laboratory. In addition, he also has held a long-term visiting scientist position with the Danish national research laboratory, Risø National Laboratory, and has a continuing appointment with the Department of Mechanical, Nuclear, and Production Engineering at the University of Pisa, Italy. Working with faculty at Pisa over the past 10 years, Stubbins has helped develop an exchange program of undergraduate and graduate students and faculty that is unique throughout the University of Illinois.

He also has led the department in building relationships for research and student exchange in Jordan, Singapore, Sweden, and Japan.

Stubbins is active in the International Institute on Carbon Neutral Energy Research, I2CNER, which has established a University of Illinois satellite campus at the Japan World Premier Institute. The Institute is developing technology in several directions to address carbon neutral energy production distribution. As part of I2CNER's Energy Analysis Division, which assesses the economic, policy, and environmental issues associated with Japan's new energy technologies, Stubbins is helping develop a plan that will lead Japan to a carbon neutral energy portfolio.

Stubbins is former co-director of the National Science Foundation Industry-University Cooperative Research Center in Multiphase Flow, and former adjunct professor of Chemical Engineering at Ohio University. A Fellow of the American Nuclear Society, Stubbins was past chair of the organization's Fusion Energy Division, the Materials Science and Technology Division, and the Nuclear Engineering Department Heads Organization. He is the co-author of more than 100 journal articles and holds one patent.

In 2004, Stubbins was named International Scientist of the Year, and was elected an ANS Fellow in 2007. The American Society for Engineering Education (ASEE) recognized his teaching contributions by awarding him the Glenn Murphy Award in 2010. In 2011, Stubbins became the first faculty recipient of the University of Illinois campus Media Relations Award, recognizing his professional and cooperative response to the media following the March 2011 nuclear reactor disaster arising from the earthquake and tsunami in Japan at that time. Also in 2011, Stubbins received the Engineering Council Award for Excellence in Advising.

NPRE now has two named professorships: David N. Ruzic was awarded a Bliss Professorship in the College of Engineering in 2011.

The Willett Research Initiatives in Engineering funds term professorships, undergraduate and graduate student research, and related research activity. It

honors the memory of Donald Biggar Willett (1897-1981) who attended the University of Illinois from 1916-1921. Mr. Willett left the University before graduation, just 6 2/3 credits short of completing his coursework in civil engineering. He started his career as a partner in the family business, Suburban Coal and Supply Company, and later, worked as a self-employed bookkeeper and tax preparer. In 1994, his widow, Elizabeth Marie Willett, willed her entire estate to the College of Engineering, which established the Willett Research Initiatives Fund.



As nuclear industries switch operations from that of buttons, dials and knobs to mice and monitors, questions arise:

Can the possibility of system failure be quantified? What protections are needed against deliberate attacks? What are the challenges for operators moving from analog to digital systems?

NPRE Prof. Rizwan Uddin has been working with Bill Sanders, Interim Head of the Electrical and Computer Engineering (ECE) Department at Illinois, to seek long-term solutions for those questions.

Most recently, Uddin has organized sessions at the 2013 American Nuclear Society Winter Meeting in November in Washington, D.C. Part of the Embedded Topical Meeting: Risk Management, the first session, Digital Instruments & Controls and Cyber Security, was to examine several papers written on the topic, and the second, Risk Management for Cyber Security and Digital I&C, was to establish a panel presentation.

Experts from the College of Engineering at Illinois and across the country also addressed the issues during a two-day symposium Uddin and Sanders organized on the Urbana campus. "Digital Instrumentation, Controls, Cyber Security and HMI in the Nuclear World: Identifying Challenges and Directions" was held in April.

Illinois faculty and representatives of national laboratories, the Department of Energy Office of Nuclear Energy; the Nuclear Regulatory Commission; Electric Power Research Institute; and major utilities will identify the challenges and future directions in digital instrumentation

and control, cyber security, and human-machine interface for nuclear engineering, Uddin said.

Nuclear and homeland security establishments have an urgent need for cutting edge expertise in nuclear, digital control, and cyber security. Rapidly evolving technologies and associated threats in these fields make it imperative that experts constantly evaluate the challenges and directions for research.

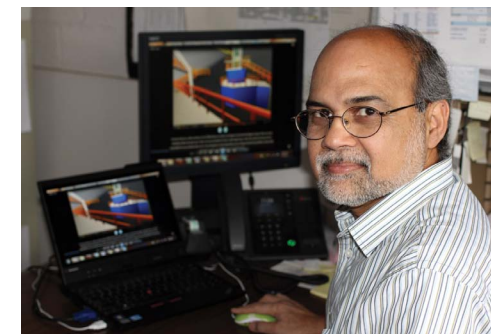
Most nuclear power plants were designed in the 1960s and built in the 1970s and 80s, Uddin said. Originally, they were designed to have a life of 40 years, but the licenses of many have been extended an additional 20 years, and operating technology has evolved considerably. Often, parts that were developed for original analog systems are no longer available.

"Transition is the most difficult thing to do right," Uddin maintained. "Replacing an analog control system with a digital one, unless done right, can cause problems."

Topics for the symposium will include:

- Digital technology in instrumentation and control
- Wireless technology, cyber security
- Safety assessment and regulatory aspects in instrumentation and control
- Human factors and instrumentation and control

The College of Engineering has supported the work of Uddin, Sanders, and other COE faculty in digital/cyber security and nuclear security with a late-stage Strategic Research Initiative grant.



Rizwan Uddin

Work has been underway by the group on the development of a test bed to simulate cyber attacks at a nuclear power plant, and the group has acquired a state-of-the-art fault tolerant controller based on a Triple-Modular



Bill Sanders

Redundant (TMR) architecture. NPRE and CSL (and other parts of the college and campus) want to combine expertise to develop a center for digital (control) and cyber security for nuclear-specific applications.

Uddin Gains Blue Waters Access

NPRE Prof. Rizwan Uddin is among scientists on the Urbana campus who have gained access to the Blue Waters supercomputer.

Uddin's team has been granted an exploratory award designed to help the team explore the use of the facility for research challenges. His team's project is Scaling up of a Highly Parallel LBM-based Simulation tool (PRATHAM) for Meso- as well as Large-Scale Laminar and Turbulent Flow and Heat Transfer.

"We propose to test and scale PRATHAM – an LBM- (Lattice Boltzmann Method) based code for 3D, time dependent, laminar and turbulent fluid flow – on Blue Waters," Uddin said. NPRE alumnus Prashant Jain, MS 06, PhD 10, currently at Oak Ridge National Laboratory, developed PRATHAM with his colleagues at ORNL. Jain is also a team member on this project.

According to Uddin, as the spatial scale of some applications of fluid mechanics and heat transfer continues to drop, researchers are finding that the classical approach of solving the Navier-Stokes equations cannot be applied to an increasing number of micro- and nano-scale applications. Limitations on the parallel scalability of codes that are based on the classical approaches are becoming evident.

While classical approaches to turbulence – such as k-eps, LES, DNS, etc. – in the context of the N-S equations continue to show slow improvement in predictive capabilities,

alternate approaches—such as LES with LBM – must be explored because they can take better advantage of advances in computer architecture.

"We propose to perform scalability tests of a laminar and turbulent flow and heat transfer simulation capability to enable high-fidelity, time-dependent, fluid flow and heat transfer analyses of meso-scale (as well as larger scale) systems," Uddin said. "The simulation tool is based on LBM, a relatively novel kinetic approach to simulate transient flow dynamics.

"Because of the LBM's excellent parallel scalability, the tool is ideally suited for multicore and hybrid GPU-based supercomputing clusters," he continued. "This tool provides us with an alternative to the existing Navier-Stokes Equation (NSE)-based Large or Very Large Eddy Simulation (LES/VLES) solvers and has been shown to surpass some of their practical limitations."

The broader sub-goals of this research are

- Implement and test the LBM code on Blue Waters
- Demonstrate the scalability of the code to tens of thousands of processors
- Apply the code to solve a challenging turbulent flow problem in a rod bundle in a nuclear power plant to demonstrate its potential
- Add new modeling capabilities to address multiphysics problems of interest to the university community and funding agencies.

View from campus ... and beyond



NRC Support for Faculty, Grad Students

For the third year in a row, the Nuclear Regulatory Commission has made \$450,000 available for NPRE to support new faculty. The award is matched with \$150,000 from the College of Engineering and the NPRE Department.

Over the past three academic years, NPRE has had available from this program a total of \$1.8 million for new faculty support. This has been extremely helpful as the Department has brought in six new faculty members since 2011.

In addition this year, the NRC has made a total of \$400,000 available over the next four years to support graduate students in NPRE. Department Head Jim Stubbins said the award should help support three graduate students each of the four years of the program.

A total of 68 students are enrolled in NPRE's graduate programs for the 2013-14 academic year.

ABET Review

NPRE thanks all the alumni and industry representatives who participated in the Department's ABET accreditation process this fall.

Among NPRE's strengths, the ABET reviewers listed the Department's overall teaching efforts, innovations in teaching methods, and student and faculty satisfaction.

Reviewers cited one weakness regarding NPRE's documentation process to show that specific coursework products satisfy the Department's educational outcomes (listed on NPRE's website: <http://npre.illinois.edu/current-students/current-undergraduate-students/student-outcomes>). Documentation must be shown not only through grades but also through specific homework, tests, quizzes and presentations, according to the review.

Making improvements to satisfy the reviewers' concern should be straightforward, said NPRE Department Head Jim Stubbins, and he believes the issue will be resolved before the final report is completed in June 2014.

2013 Interchange

NPRE welcomed to campus representatives from six industries and agencies to interact with students and faculty during the 2013 Interchange event October 18.

This marked the fifth year Interchange has given students a chance to network with visitors to become more familiar with industries, national laboratories and regulatory agencies focusing on nuclear power, plasma engineering, and radiological technologies. The event also acquaints the company and agency representatives with students available for internships and/or permanent positions, and provides information about NPRE's faculty and programs.

NPRE sponsors Interchange with the help of the American Nuclear Society student chapter. The visitors met with students in small group sessions and presented a panel discussion:



Argonne National Laboratory, a multidisciplinary science and engineering research center that strives to discover new ways to develop energy innovations through science, was represented by Michael D. Kaminski, Nuclear Forensics and Nanoscale Engineering Group Leader, Chemical Sciences and Engineering Division. Kaminski holds three degrees from NPRE: BS 95, MS 96, and PhD 98, and is an NPRE adjunct associate professor. Kaminski's responsibilities at Argonne include

- Nuclear waste minimization and stabilization technology
- Development of advanced nuclear fuel cycle radioactive waste
- Development of technologies for decontamination of nuclear facilities and urban centers following radionuclide release
- Development of medical treatment technologies

based on magnetic nanospheres

- Developing a novel radioisotope sensor based on microseparations and microfluidic platforms for nuclear forensics and medical triage



Mike Kaminski, Argonne National Laboratory

Enercon Services, Inc. (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. NPRE alumni Brian Kleinfeldt, BS 10, MS 12, Engineer IV, Power Generation Services in Enercon's Naperville, Illinois, office, and mechanical engineer-Margot Wilson, BS 13, represented the company. Kleinfeldt has supported projects for Exelon Generation and Next Era Energy. These projects have included preparing calculations and engineering change packages in addition to field engineering support and inspections at Byron Nuclear Power Station and the Duane Arnold Energy Center.



Brian Kleinfeldt and Margot Wilson, Enercon Services, Inc.

Alumnus Ed McVey, BS 83, and has made his career at **Exelon Corp.**, the nation's leading competitive energy provider. With headquarters in Chicago, Exelon participates in every stage of the energy business, from generation to competitive energy sales to transmission to delivery. McVey manages five individuals who provide gover-

nance and oversight of Reactor Engineering activities and training for the Exelon Fleet. In addition, his group provides support for various Nuclear Fuels emergent issues related to core design and operation.



Ed McVey, Stephen Kohlhase and Christopher Demetriou of Exelon Corp.

Scott D. Wollenweber, Principal Engineer, Positron Emission Tomography Clinical Science, told students about **GE Healthcare**, a \$17 billion unit of GE committed to serving healthcare professionals and their patients in more than 100 countries. GE Healthcare's divisions are Healthcare Systems, IT, Medical Diagnostics, Surgery, Life Sciences and Performance Solutions.

Wollenweber earned a BS in Engineering Physics in 1990 from Illinois, and a PhD in Engineering Physics in 1996 from the University of Iowa.



Scott Wollenweber, GE Healthcare

Sargent & Lundy was represented by Vice President and Project Director Kenneth J. Green. Based in Chicago, Sargent & Lundy provides comprehensive consulting, engineering, design, and analysis for electric power generation and power delivery projects worldwide. Nuclear power has been a primary focus of the company's business since 1954. The company's recent experience includes extensive engineering, design, analysis, and project services for PWR, BWR, and CANDU nuclear power station owners.

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Green earned a BS in 1971 in Mechanical Engineering at Illinois and a master's in mechanical engineering in 1974 from Old Dominion University. He has been with S&L for over 35 years in various positions, almost all in nuclear plant design.



Ken Green, Sargent & Lundy

NPRE alumnus and alumni board member Martin Neumann provided information on **View Inc.**, the pioneer in large-scale architectural dynamic glass. The company designs, manufactures, and sells a new generation of architectural dynamic glass that intelligently adjusts in response to external conditions and user preferences, enabling unparalleled control over the amount of light and heat that enters a building.

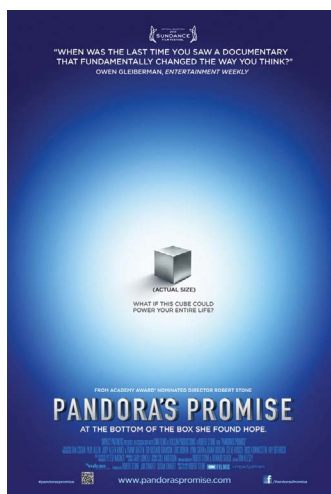
Neumann, View's Technology Manager, earned three degrees in NPPE: BS in 1999, MS in 2005, PhD in 2007. He oversees all technology aspects of production for View's manufacturing facility in Mississippi.



Martin Neumann, View, Inc.

Pandora's Promise

NPPE and the American Nuclear Society student chapter celebrated National Nuclear Science Week by hosting a screening of Pandora's Promise, a pro-nuclear power film directed by Robert Stone on November 5.



About 75 students and faculty members gathered for the screening of Pandora's Promise. NPPE and ANS hosted a panel discussion following the film.

An audience favorite at the Sundance Film Festival, Pandora's Promise asks whether nuclear power could save the planet from a climate catastrophe, while providing the energy needed to lift billions of people in the developing world out of poverty. Stone tells the personal stories of environmentalists and energy experts who have undergone a radical conversion from being fiercely anti- to strongly pro-nuclear energy, risking their careers and reputations in the process. The film has been shown on college campuses around the country.

Following the film, a panel of nuclear science experts and representatives of nuclear power industries fielded questions. Panelists were NPPE Profs. Jim Stubbins and Rizwan Uddin; Jim Nevling, Manager of Fuel Supply Projects for Exelon Corp.; and Christine Lipa, Branch Chief, Region III Division of Reactor Projects at the Nuclear Regulatory Commission.

National Nuclear Science Week, being observed October 21-25, is a national, week-long celebration to focus local, regional and national interest on all aspects of nuclear science. Emphasis is placed on learning about the contributions, innovations and opportunities that can be found by exploring nuclear science. Activities are intended to build awareness of the contributions of the nuclear science industry and those who work in it every day.



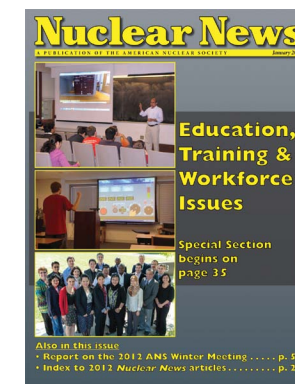
Then Chairman of the Nuclear Regulatory Commission, Dale Klein experiences the VisBox in 2008.

Visbox Moving

Prof. Rizwan Uddin's VisBox™, a state-of-the-art, 3-D visualization system, is being moved from its home in the Nuclear Engineering Laboratory to a newly refurbished space in Talbot Laboratory. Uddin expects the move to take place early in the Spring 2014 semester.

Along with the move, the VisBox technology will undergo a significant \$37,000 upgrade, with half the cost covered by NPPE and the other half by the College of Engineering. Uddin plans for the Visbox to be capable of working with motion sensing devices including Kinect and Leap Motion. The Virtual Education and Research Laboratory that Rizwan directs also will gain \$15,000 in upgrades for monitors and computers, thanks to funding from the Department of Energy.

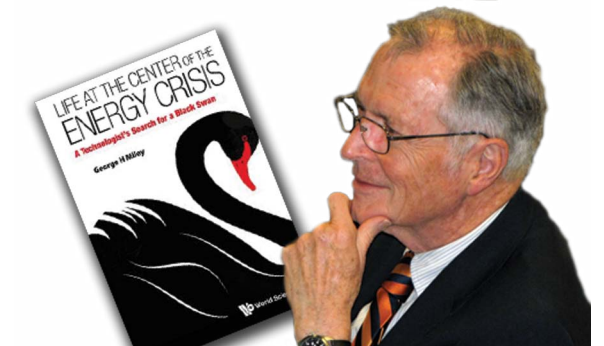
The VisBox is an immersive 3D display that models reactors to introduce nuclear power systems to groups such as students and parents, and to train nuclear power workers. The system provides large stereo 3D imagery. The VisBox is a projection-based VR system with head and wand tracking that makes use of the newest in bright digital projectors. The turn-key VR option adds the newest in PC graphics workstation hardware, a 6 DOF tracked input device (wand), and head tracking.



Virtual Lab Makes Nuclear News Cover

Nuclear News, the American Nuclear Society's magazine, featured a story on the virtual laboratory NPPE Prof. Rizwan Uddin and Imran Haddish, BS 2012, developed. The story in the magazine's January 2013

edition told how nuclear engineering educators are exploiting interactive qualities of modern video games to teach complex nuclear concepts.



New Book Tells of Miley, Energy Crisis

Life at the Center of the Energy Crisis: A Technologist's Search for a Black Swan describes the story of NPPE Emeritus Prof. George H. Miley's work and struggles in the field of energy research.

Miley's experience in the field spans from work with Admiral Rickover and the Nuclear Navy to research with NASA designing propulsion for spacecraft to travel to Mars. His autobiography provides insights into the differences between nuclear research done during the Cold War by the two superpowers, and offers a commentary on the flaws in each system with hope for change in the future.

The book also provides a look into the development of the nuclear engineering program at the University of Illinois from Miley's perspective as a professor and an administrator.

The book has been published recently by World Scientific.

Grainger Makes \$100 Million Donation

The Grainger Foundation's \$100 million gift will establish the Grainger Engineering Breakthroughs Initiative in the College of Engineering at Illinois.

The Lake Forest, Illinois, foundation has pledged the gift in memory and honor of William W. Grainger, a 1919 Illinois graduate in Electrical Engineering, and the founder of W.W. Grainger, Inc.

The Grainger Foundation, a long-term benefactor of the College of Engineering at Illinois, has made this pledge to ensure the continued global standing of the engineering program at Illinois by providing the support and infrastructure necessary for Illinois to lead the most important engineering breakthroughs of the future. With this gen-

continued on page 16

erous support, the College is well-poised to continue its national leadership and enhance its global reach far into the future.

The resources from the Grainger Engineering Breakthroughs Initiative will be used as support for the faculty, students, and facilities of the College of Engineering at Illinois. It will also allow the College of Engineering at Illinois to consistently and repeatedly create new engineering breakthroughs by investing in research areas of transformative impact to society and to attract and educate the engineering leaders of tomorrow.

A substantial portion of the Grainger Foundation gift will create an endowment for engineering chairs and professorships to attract and retain renowned scholars to lead the College's thrust for groundbreaking impact and international stature in the next wave of engineering research and education. The gift will also create an endowment to provide broad research support for high impact engineering research collaborations. Bioengineering and "Big Data" are two prime areas targeted to receive significant resources for new faculty positions and research support.

A portion of this gift will also provide the leadership gift to launch a \$100-million fundraising campaign for an endowment for scholarships for students in the College of Engineering, and provide another lead gift for the \$40 million renovation of the soon-to-be-vacated Everitt Laboratory building on the engineering campus. The increased scholarship funds resulting from the new endowment will strengthen the College's ability to attract and

retain the most exceptional engineering students. Everitt Laboratory, which currently houses the Department of Electrical and Computer Engineering, will be renovated to meet the needs for state-of-the-art facilities for engineering instructional laboratories, new engineering research centers, and the Department of Bioengineering at Illinois.



Andreas Cangellaris

Cangellaris Is New Engineering Dean

Andreas C. Cangellaris, formerly the head of Electrical and Computer Engineering at Illinois, became Dean of the College of Engineering in August.

Cangellaris is recognized for his research in applied and computational electromagnetics and its applications to the signal integrity of integrated electronic circuits and systems. His research has produced several design methods and computer tools that are used widely in the microelectronics industry. He has written or co-written more than 250 papers. He is affiliated with the Beckman Institute for Advanced Science and Technology and the Coordinated Science Laboratory.

Cangellaris earned his doctorate in electrical engineering at the University of California, Berkeley in 1985. He joined the faculty at Illinois in 1997. He is the M.E. Van Valkenburg Professor in Electrical and Computer Engineering, and he has served as the head of the department since 2008. He was an Associate Provost Fellow on the Urbana campus from 2006 to 2008, a role in which he oversaw the review and revision of guidelines for recruitment, promotion and tenure; worked on campuswide interdisciplinary initiatives; and broadened campus outreach activities.

Cangellaris is a fellow of the Institute of Electrical and Electronics Engineers. He has received a Humboldt Foundation Research Award and the U.S. Army Research Laboratory Director's Coin.

NPRE distinguished Alumni awards

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 En-

gineering 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 1965, PhD 1968
- 2010 — Barclay G. Jones, MS 1960, PhD 1966
- 2011 — Pratap K. Doshi, MS 1963, PhD 1968
- 2012 — Kenneth "Lee" Peddicord, MS 1976, PhD 1972
- 2013 — Elmer E. Lewis, BS 1960 Engineering Physics, MS 1962, PhD 1964

Nominations Invited for 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.

NPRE Advocate Award Past Winners

- 2012 — Martin J. Neumann, BS 99, MS 04, PhD 07
- 2013 — Deborah A. Laughton, BS 95; Terrill R. Laughton, BS 92, MS 96



NPRE students demonstrate nuclear power concepts during Engineering Open House in March. Looking on in the background is NPRE alumnus Ed McVey of Exelon Corp.

Distinction Lewis awarded 2013 alumni honor

Elmer E. Lewis, computational neutronics expert and author of several pivotal textbooks, was presented the 2013 NPRE Distinguished Alumnus Award.

Lewis, Professor Emeritus in Service of Mechanical Engineering at Northwestern University's McCormick School of Engineering and Applied Science, received NPRE's top alumni award during the 2013 Honors Banquet held in April. Lewis served as the banquet's guest speaker, delivering his talk, "Authoring Books - One Engineer's Misadventures," before the audience of about 130 students and their families, alumni, faculty and staff.

Lewis earned three degrees from the University of Illinois at Urbana-Champaign: a bachelor's in *Engineering Physics* in 1960, and a master's and PhD in NPRE in 1962 and 1964, respectively. He was a student of Felix Adler, one of the founders of Illinois's nuclear engineering program.

Lewis served as a Captain in the U.S. Army Ordnance Corps and as a Ford Foundation Fellow and Assistant Professor of Nuclear Engineering at MIT before joining Northwestern's faculty in 1968. In addition to chairing Northwestern's Department of Mechanical Engineering from 1987 to 1997, Lewis has held appointments as Visiting Professor at the University of Stuttgart and Guest Scientist at the Nuclear Research Center at Karlsruhe, Germany. He has been a frequent consultant to Argonne and Los Alamos National Laboratories and to a number of industrial firms. He retired from Northwestern in 2010.

Lewis's research has focused on computational neutronics, as well as on broader problems dealing with the physics, safety and reliability of nuclear systems. He is most widely recognized for his pioneering work in applying finite element methods to the solution of neutron transport problems and for leading his students in the creation of variational nodal methods. These have been implemented in the widely-used VARIANT code at Argonne National Laboratory and the ERANOS code contained in the European Union nuclear code system.

Lewis has taught a wide range of courses in mechanical



Elmer E. Lewis

and nuclear engineering, ranging from freshman seminars to graduate level offerings. He has also taught in a joint program with Northwestern's Kellogg School of Management, and for 15 years organized a week-long industrial seminar; "Safety of Light-Water Cooled Nuclear Reactors." He has made frequent presentations to academic audiences dealing with his research. His appearances on television and radio and as a quoted source to the print media have dealt with current events, such as the Fukushima accident, and he also has given numerous talks to lay groups dealing with broader issues of technology and society.

A Fellow of the American Nuclear Society (ANS), and winner of its Mathematics and Computation Distinguished Service and Arthur Holly Compton Awards, Lewis serves on the editorial boards of *Nuclear Science and Engineering* and *Transport Theory and Statistical Physics*. He has chaired the OECD/NEA Experts Group on Three-Dimensional Radiation Transport Benchmarks and currently is a member of the Science Council for the Department of Energy's Consortium for Advanced Simulation of Light Water Reactors. He has held a number of offices in ANS, including Chair of its Mathematics and Computation Division. He has supervised more than 20 PhD students, three of them winning the ANS Mark Mills Award for their doctoral research. Five books are among his more than 200 publications; his work has been cited in excess of 3,000 times in the science/engineering literature.

Lewis and his wife, Ann, a retired social worker, met as students at the University of Illinois. They live in Evanston, Illinois and have two children and two grandchildren.

Advocates: Husband, Wife Build Programs Together

For years NPRE alumni Terrill and Deborah Laughton have worked together to raise the profile of NPRE and the resources to build the Department's programs.

The diligence and loyalty of the husband and wife team are being recognized through their selections as the 2013 win-

ners of the NPRE Advocate Awards. Deborah, BS 95, and Terrill, BS 92, MS 96, are cited for "dedicated leadership in the grassroots efforts to build NPRE endowments, thereby promoting NPRE programs, honoring NPRE's faculty and staff, inspiring fellow alumni, and rewarding outstanding students."

The Laughtons, along with several other alumni, including Michael Giacobbe, BS 91, MS 95, PhD 99, and William L. Myers, BS 85, MS 90, PhD 95, were instrumental in establishing and building support for the Catherine Pritchard Scholarship Fund and the Barclay G. Jones Endowed Fellowship Fund, the first fellowship held entirely within NPRE. They have worked alongside Mike Giacobbe to fund the Alumni Constituent and Advisory Board Lecture Series. Their next goal is a campaign for building the Roy A. Axford Scholarship Fund.

Deborah and Terrill are members of NPRE's Constituent Alumni and Industry Advisory Board, and serve on the CAIAB's Advancement Committee. Terrill is Director of Federal Solutions Development for Johnson Controls, Inc., in Milwaukee, Wisconsin. Terrill received his B.S. in 1992 and his Masters in 1995 from NPRE. He also received his M.B.A. from the University of Chicago in 2001. Deborah is a partner in the intellectual property law firm of McAndrews, Held & Malloy of Chicago. She received her B.S. from NPRE in 1992 and her J.D. from Chicago-Kent College of Law in 2002.



NPRE Department Head Jim Stubbins with Debbie and Terrill Laughton.

Tsoufanidis Wins ANS Compton Award

NPRE alumnus Nicholas Tsoufanidis is the 2013 recipient of the American Nuclear Society Arthur Holly Compton Award.

Tsoufanidis, MS 1965, PhD 1968, was cited for "outstanding contributions to Nuclear Engineering Education through his teaching, research, and the writing of two very useful texts."

The latest edition of his text, *Nuclear Fuel Cycle*, was published in January 2013. Tsoufanidis is working on the 4th Edition of his text, *Measurement and Detection of Radiation*, with co-author Sheldon Landsberger, a 2007 winner of the Compton Award and former NPRE faculty member.

"I am teaching one course a semester at the University of Nevada-Reno," Tsoufanidis said. "Other than that, I am retired!"

Tsoufanidis joined the University of Missouri-Rolla's nuclear engineering faculty in 1968. He served there until 2004 as a

faculty member, department chair, Academic Affairs Interim Vice Chancellor, and Associate Dean of the School of Mines and Metallurgy for Graduate Studies and Research. For two years Tsoufanidis served as Interim Chair of the Chemical & Metallurgical Engineering Department at the University of Nevada-Reno, then was an adjunct professor.

In addition to teaching and administration, he conducted research on radiation transport, radiation protection/health physics, and the Nuclear Fuel Cycle. He has written numerous technical papers in addition to the two books.

Tsoufanidis has served as the editor of *Nuclear Technology*, the ANS international technical journal, and is an ANS Fellow. He has received many awards, including the American Society for Engineering Education's Glenn Murphy Award (1995).

Honored: Alum Earns Technology, Innovation Medal

President Barack Obama presented NPRE alumnus George R. Carruthers with the National Medal of Technology and Innovation in February at the White House.

Among the earliest African Americans to earn an NPRE degree (MS 1962, BS and PhD in Aerospace Engineering, 1961 and 1964, respectively), Carruthers was among seven scientists nationwide to be recognized.

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

A second version of the camera was sent on the 1974 Sky-Lab space flight to study comets, and was used to observe Halley's, West's and Kohoutek's comets. Carruthers' instruments were involved in capturing an image of a Leonid shower meteor entering the earth's atmosphere, the first time a meteor has been imaged in the far ultraviolet from a space-borne camera.

US Black Engineer magazine in 1993 named Carruthers among the first 100 recipients of the Black Engineer of the Year award. As the head of the Space Science Division's Ultraviolet Measurements Group, Carruthers in the year 2000 received the first Outstanding Scientist Award from the National Institute of Science, which provides for the exchange of scientific information and the presentation of scholarly research papers by science students and faculty members primarily from Historically Black Colleges and Universities. BlackEngineer.com in 2010 listed Carruthers among the 50 Most Important Blacks in Research Science <http://www.>



A young George Carruthers, right, with his far ultraviolet camera spectrographer.

blackengineer.com/artman/publish/article_283.shtml .

Carruthers received the AE Outstanding Recent Alumnus Award in 1974, and the College of Engineering at Illinois Alumni Award for Distinguished Service in 1975. Other honors Carruthers has received include:

- 1970, The George Washington University's Arthur S. Flemming Award, recognizing outstanding men and women in the federal government
- 1972, National Aeronautics and Space Administration Exceptional Achievement Scientific Award
- 1973, The American Astronomical Society's Helen B. Warner Prize for Astronomy
- 2003, induction into the National Inventors Hall of Fame.

Selected: Binder to Head Illinois Applied Research Institute

NPRE Alumnus Jeffrey L. Binder has been named the director of the Illinois Applied Research Institute (ARI) at the University of Illinois at Urbana-Champaign.

Binder comes to Illinois from Oak Ridge National Laboratory (ORNL), where he served most recently as associate laboratory director for nuclear science and engineering. Since joining ORNL in 2003, Binder has led efforts within Oak Ridge and the greater Department of Energy system to advance national priorities in nuclear technology development. Some of the projects that he has led include the development of spent nuclear fuel recycling technologies, the revival of an isotope research program, and the formation of ORNL's Fuel Cycle and Isotopes Division, where he served as director.

"Jeff is a proven leader," said Andreas Cangellaris, dean of the College of Engineering at Illinois. "His successful track record launching and leading research endeavors at the Department of Energy's National Laboratories will translate well to directing Illinois' translational research efforts at the ARI."

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

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

He believes the ARI serves to integrate "the knowledge, science, and capabilities of the University of Illinois and creates a model for translational research that will lead to greater economic opportunities for the State of Illinois, the region, and the nation."

ARI is an initiative of the College of Engineering and the Office of the Vice Chancellor for Research with the goal of partnering with organizations and industry to conduct translational research and develop products and processes for the marketplace. It is an interdisciplinary organization that calls upon all of the University's faculty and its scientific and research laboratories to execute applied research projects. Promoting economic development and business engagement in east-central Illinois is a primary pillar of ARI's mission.

"A key component of that strategy will include the development of partnerships with other universities, federal research centers such as Argonne and ORNL, and the private sector to rapidly develop and deploy technologies that enhance economic competitiveness and national security," Binder added. "What is unique about the ARI is its ability to address R&D projects that go beyond the University's traditional research boundaries, and the capacity to scale rapidly to meet new opportunities. We see the ARI as becoming a gateway for commercial and governmental customers to access the rich intellectual and technical resources available within the University of Illinois and the State."

Some of the ARI's areas of expertise include technologies for national and homeland security, advanced materials for energy applications, and computational engineering. Binder is expected to arrive at the ARI later this fall.

Over the years, Binder has retained close ties with NPRE, serving on the department's alumni group, the Constituent Alumni and Industry Advisory Board, and participating in NPRE's annual Interchange events, in which alumni are encouraged to return to campus to talk to students about companies and employers.



Classes



NPRE Emeritus Prof. George Miley and alumnus Nick Tsoulfanidis

1960s

Arthur E. Desrosiers, MS 69, has been a Principal at Third Colony^{LLC} since February. Previously, he worked as a health physicist for Perma-Fix Environmental Services. Desrosiers's background includes environmental programs, management of radiation protection programs, and nuclear reactor engineering.

1970s

Patricia L. Eng, BS 76, retired in January from the Nuclear Regulatory Commission in Washington, D.C. Eng's last position with the NRC was Senior Advisor for Knowledge Management.

1980s

Craig S. Wepprecht, BS 83, MS 85, is the Worthy Grand Patron at the Wisconsin Order of the Eastern Star.

1990s

David A. Thompson, BS 93, manages Fleet Radiation Protection at Duke Energy Corporation in Charlotte, North Carolina.

2000s

Erica M. Kinsey, BS 03, MS 05, is Chief Radiation Physicist at St. Mary's Hospital in Grand Junction, Colorado.

Peipei Chen, MS 04, PhD 07, works in the Research &

Glenn A. Carlson, BS 79, MS 83 Mechanical Engineering, MS 83, is a Methods Development Engineer for Babcock & Wilcox mPower, Inc. Joining the company in September, Carlson has more than 20 years of professional nuclear engineering experience, including 17 years in thermal hydraulic design, analysis, and testing of nuclear power reactor systems, steam generators, and other components. He has expertise in single- and two-phase thermal hydraulics, flow-induced vibration, forced and free convection, moisture separation, fluid stability, jets and plumes, and statistics. Previously he worked for Southern California Edison, Westinghouse Electric, GE Hitachi Nuclear Energy and the Union Electric Company.

Development Large Advanced PWR Project Office for State Nuclear Power Technology Corporation LTD in Beijing, China.

Daniel Bradley, BS 05 Physics, MS 11, is a Nuclear Regulatory Commission Resident Inspector for Columbia Generating Station near Richland, Washington. Bradley joined the NRC's Region IV office in Arlington, Texas in 2011. He worked as a project engineer in the Division of Reactor Projects. Prior to joining the NRC, he served in the U.S. Navy's submarine force aboard the USS Texas.

Huatan Qiu, MS 05, PhD 07, was promoted in March to Senior Manager, New Product Development, at Lam Research in San Jose, California. Previously, he was Process Development Manager at Lam. Qiu also had held several positions at Novellus Systems.

Jason Razo, BS 06, is enrolled at the University of Missouri College of Veterinary Medicine.

Hitesh Bindra, MS 07, PhD 10, is an Assistant Professor of Nuclear/Chemical Engineering for the University of Utah in Salt Lake City.

Gabriel Chavez, BS 07, was honored by Latino Leaders Magazine in June as a 2013 Latino Leader of the Future. The magazine recognized Chavez as one of Chicago's rising Latino leaders. Since 2006, Chavez has served as Membership Chair, Treasurer, Vice-President, and President of the Organization of Latinos at Exelon Corporation. He also serves as Vice-President of the Society of Hispanic Professional Engineers-Exelon Chapter, in which he has led and coordinated efforts to increase STEM (Science, Technology, Engineering and Mathematics) awareness in the Hispanic community. The chapter supports Exelon's recruitment, retention and developmental efforts for diverse talent. Chavez has been a Senior Dry Cask Storage Program Manager at Exelon since March 2012, and has worked for the company since 2006.

Luke M. Gotszling, BS 07, is Co-Founder/CEO of Finally.io, a comprehensive alerting solution for AWS infrastructure.

Li Ji, MS 07, is a Reservoir Engineer at ConocoPhillips in Bartlesville, Oklahoma.

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

Albany, New York.

Ian M. Percel, BS 08, MS 11 Mathematics, is a Data Analyst at ByteManagers in the Chicago area. Percel divides his time between analysis of product data for industrial suppliers and mathematical analysis of scattering and transport models.

John R. Tramm, BS 09, is a predoctoral appointee for the Center for Exascale Simulation of Advanced Reactors (CESAR) for the University of Chicago and Argonne National Laboratory.

2010s

Matthew S. Duchene, BS 10, MS 12, is a graduate research assistant at Oak Ridge National Laboratory.

Liang Meng, MS 10, PhD 13, is an electrical engineer for Lam Research in California.

Alexander W. Rehn, BS 10, is an Engineer III at ERIN Engineering, specializing in Probabilistic Risk Assessment modeling and Configuration Risk Management modeling for nuclear power plants using CAFTA and PARAGON software.

Galina N. Yakubova, PhD 10, is working for the U.S. Department of Agriculture National Soil Dynamics Laboratory.

Joseph R. Bernhardt, BS 11, MS 13, is a Nuclear Engineer at Bechtel Power Co. in Frederick, Maryland. Bernhardt works on the Generation mPower project, and currently is in charge of the spent fuel pool.

Neal E. Davis, MS 11, PhD 13, is a training coordinator for the University of Illinois Computational Science and Engineering Program on the Urbana campus.

Derek A. Hultquist, BS 11, is Associate Health Physicist for American Electric Power in Urbana-Champaign, Illinois.

Dana C. Miranda, BS 11, is an Edison Engineer for GE Power and Water in Wilmington, North Carolina.

Nikunj Raithatha, BS 11, is a mechanical engineer for Schlumberger in Rosharon, Texas.

Monish Singh, BS 11, MS 13, is a Plant Integration & Analysis engineer for Bechtel Marine Propulsion Corp. at the Knolls Atomic Power Laboratory in Schenectady, New York.

Matthew J. Weberski, BS 11, is working at Exelon's LaSalle Nuclear Station.

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

Classes



Attending NPRE's breakfast reception during the ANS 2013 Winter meeting held in Washington, D.C., in November were (top) alumnus Tunc Aldemir (middle) and his wife, Kristine, and alumnus Bill Horak; and (bottom) from left, Ernie Kees, a colleague of NPRE Assistant Prof. Zahra Mohaghegh, alumnus Blair Bromley, alumnus Ron Knief and Seyed Reihani, Mohaghegh's husband.

Cody A. Morrow, BS 12, is a Software Quality Assurance Analyst at Vodori in Chicago.

Alexander T. Bara, BS 13, is attending law school.

Joshua A. Dotson, BS 13, is an auxiliary operator for the Ginna Nuclear Power Plant.

Ashley E. Farnan, BS 13, is a biomedical equipment technician at Aramark healthcare Technologies in Columbus, Ohio.

Jessica C. Hsu, BS 13, is an Engineer I working on boiling water reactor core design at Exelon Generation in Cantera, Warrenville, Illinois.

Brendan P. Joyce, BS 13, is a Quality Assurance Analyst in Power Plant Software Design for InStep Software LLC in Chicago.

Min Hwan Kim, MS 13, is a design engineer for EP Puri-

fication, Inc., in Champaign, Illinois.

Stephen M. Kleppinger, BS 13, is using his degree's concentration in plasma technologies as a test engineer for Cymer.

Alexander R. Locher, BS 13, is an application engineer with the Flowserve Corporation, a power generation industry.

Benjamin L. Magolan, BS 13, is attending graduate school at the Massachusetts Institute of Technology.

Anthony J. Paneral, BS 13, is a design engineer for Giant Finishing, Inc., in Chicago.

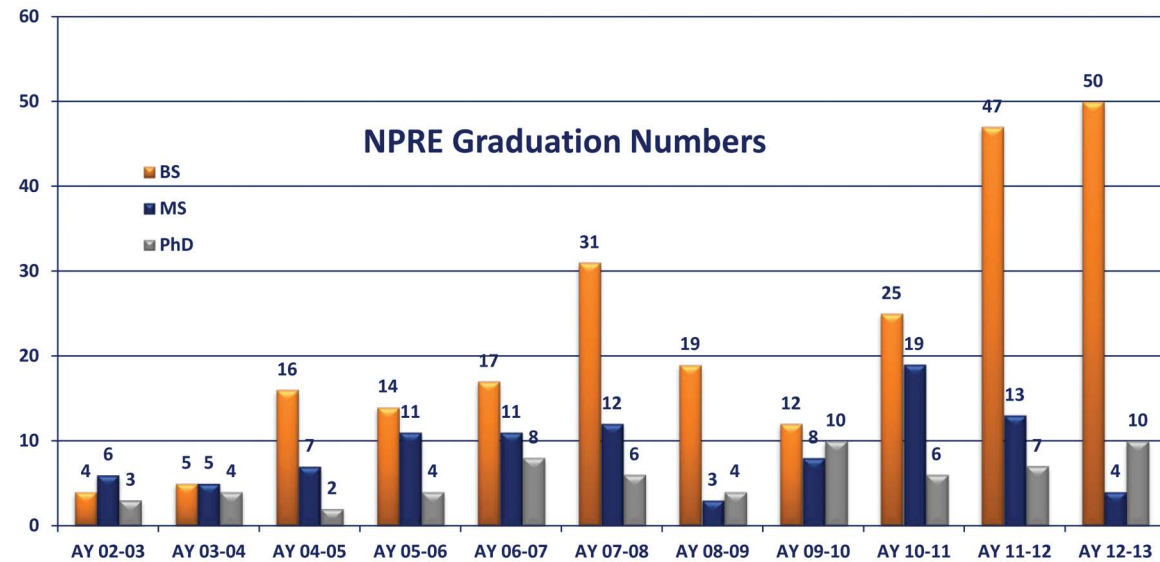
Brian P. Pekron, BS 13, is a nuclear engineering graduate student at the University of Wisconsin-Madison.

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Several alumni attended a breakfast reception NPRE sponsored during the American Nuclear Society 2013 Winter meeting held in Washington, D.C., in November. Among alumni attending were, from left, Joetta Goda, Nick Tsoulfanidis, Maria Okuniewski, Ben Holtzman and Blair Bromley.

Graduation trends



NPRE saw its largest number ever of bachelor's degree graduates in AY 12, with a total of 50 students earning their degrees between August 2012 and May 2013. Enrollment in both the undergraduate and graduate programs remain strong.

Welcome New Alumni!

The following is a listing of NPRE graduates earning degrees from December 2012 to August 2013.

Bachelor's of Science Degrees
December 2012

Yongkyu An
Rosemin Badruddin
Matthew Farrell
Leo Kirsch
Timothy Noffke
Jose Rivera

May 2013

Cem Bagdatlioglu
Alexander T. Bara
Andrew T. Barbel
Molly R. Bilderback
Joshua M. Bradley
Cody T. Carsella
Wesley N. Cowan
Daniel T. Debold
Joshua A. Dotson
Ashley E. Farnan
Robert Y. Hart
Jessica C. Hsu
Brendan P. Joyce
Stephen M. Kleppinger
Amarnath Kouta
Owen J. Kownacki
Po-Yu Kung
Alexander R. Locher
Benjamin L. Magolan

Geroge E. McKenzie
Peter A. Mouche
Travis C. Mui
Taha M. Naseem
Nicholas W. O'Shea
Anthony J. Paneral
Brian P. Pekron
David J. Peterson
Glenn R. Peterson
Robert M. Peterson
Collin R. Rahrig
Jaspreet S. Rehal
Benjamin R. Russell
Kristin E. Schoemaker
Joseph A. Serio
Zachariah F. Shukur
Nivedita A. Vaidya
Kathleen J. Weichman
Margot M. Wilson
Hyun H. Yun
Jeffrey L. Zhou
Nicholas S. Zimmer

August 2013

Brent S. Cross
Frederick Manley
Arthur Stefanczyk

Master's of Science Degrees
December 2012

Wenyu Xu
Daniel Elg
Jungmi Hong

May 2013

Abhishek Jaiswal
Xin Li
Priya Raman
Arthur Talpaert
Yuilun Wu
Tai Ni Yang

August 2013

Maro Aghazarian
Joseph Bernhardt
Peter Fifiis
Carolina Fineman-Sotomayor
Min Hwan Kim

Wei Lv
Monish Singh
Xu Wu

Doctor of Philosophy Degrees
December 2012

Nan Li

May 2013

Neal Davis

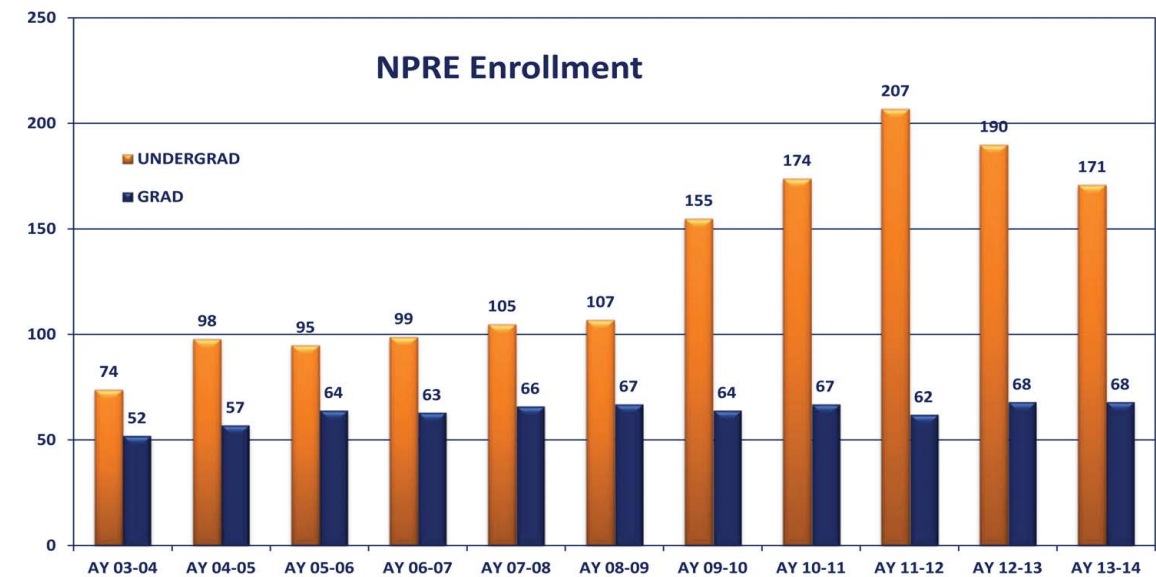
August 2013

Liang Meng
John Sporre



Several May 2013 graduates gathered for a brunch in Talbot Laboratory on Commencement Day.

Enrollment trends



Above are the enrollment trends that account for NPRE's large graduation rates over the past few years.

Welcome New Students!

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

AY 13-14 Undergrads

Ahmad J. Al-Kuwari, Champaign, IL
Oleg V. Babin, Vernon Hills, IL
Peter B. Bachar, Des Plaines, IL
Kelsey M. Bear, Crystal Lake, IL
Adam J. Blythe, Libertyville, IL
Julio C. Brito, Burbank, IL
Peter M. Conway, Lemont, IL
Quincy R. Crawford, Mahomet, IL
Nicholas J. Dadufalza, Steven Valleys, PA
Ibrahim G. Elshahawi, Franklin Lakes, NJ
Greer M. Faber, Wilmette, IL
Jiexun Fu, Shenzhen, Peoples Republic of China
Emily M. Gordon, Paducah, KY
Ethan A. Graven, Arlington Heights, IL
Maxwell L. Haynes, Mahomet, IL
Nicolette J. Kasza, Saline, MI
Hamon Leong, Chicago, IL
Emily R. Lindgren, Batavia, IL
Usepe Lozano, Elgin, IL

Andres E. Machado, Weston, FL
Daniel C. Martin, Wildwood, MO
Brian Moran, Chicago, IL
Matthew M. Moukheiber, Wheaton, IL
Kathryn A. Mummah, Wheaton, IL
Junseok Mun, Tenafly, NJ
Tadashi Murase, Arlington Heights, IL
Joseph N. Rajchwald, Glenview, IL
Lauren E. Roby, Flossmoor, IL
Xia Sang, Shanghai, Peoples Republic of China
Parth Singhal, Saharanpur, India
John B. Smith, Saint Charles, IL
Gwendolen S. Chappell, Lockport, IL
Timothy J. Kelly, Morton, IL
Zhiee Jhia Ooi, Kedah, Malaysia
Gustavo S. Pereira, Mahomet, IL
Brenden A. Yung, Naperville, IL

AY 13-14 Graduate Students

Felipe Bedoya, Purdue University
Brian Burney, University of Maine
Zhikun Cai, University of Science and Technology, Peoples Republic of China

Amy Hill, Purdue University
Brandon Holybee, Purdue University
Guojun Hu, University of Science and Technology, Peoples Republic of China
Zachariah Koyn, Purdue University
Xiang Liu, Peking University, China
Yi Liu, Tsinghua University, China
George McKenzie, University of Illinois at Urbana-Champaign
Ian Miller, University of Wisconsin-Platteville
Peter Mouche, University of Illinois at Urbana-Champaign

Travis Mui, University of Illinois at Urbana-Champaign
Anton Neff, Purdue University
Nicholas O'Shea, University of Illinois at Urbana-Champaign
Donghee Park, Seoul National University, South Korea
Tatsuya Sakurahara, University of Tokyo, Japan
Joseph Serio, University of Illinois at Urbana-Champaign
Nathan Walter, University of Illinois at Urbana-Champaign
Hao Xiong, University of Science and Technology, Peoples Republic of China



New students can expect to work in labs like this one.

2013 Award Winners, Student Recognitions

Ninety-five students were recognized during the 2013 NPRE-ANS Honors Banquet in April.

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

NPRE Awards

The **NPRE Outstanding Academic Achievement Awards to a Graduating Senior** were presented to **Benjamin L. Magolan** and **Kathleen J. Weichman**. The award recognizes the graduating seniors with the highest cumulative GPA. Magolan, of Plainfield, Illinois, and Weichman, of Albuquerque, New Mexico, 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.

NPRE Outstanding Undergraduate Research Award

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

- **Leo E. Kirsch, Frankfort, IL**
- **Ye Li, Beijing, People's Republic of China**

Catherine Pritchard Undergraduate Scholarship

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

- **Nicholas Rivera, Chicago, IL**
- **Robert J. Geringer, 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.

- **Louis J. Chapdelaine, Eagan, MN**
- **Rui Lin Tan, Singapore**

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.

- **Amanda M. Lietz, Cincinnati, OH**
- **Matthew M. Szott, Orland Park, IL**

Barclay G. Jones Endowed Fellow

The Barclay G. Jones Endowed Fellowship, the first fellowship held entirely within the Department, was established by NPRE alumni to honor long-time faculty member and Department Head Barclay Jones. Abhishek Jaiswal, a master's degree student advised by Professor Jones, has held the fellowship over the past year. Jaiswal will continue his doctoral studies with NPRE Assistant Prof. Yang Zhang.

- **Abhishek Jaiswal**

American Nuclear Society Student Chapter Awards

Undergraduate and Graduate Student Outstanding Service Awards

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

- **Molly R. Bilderback, Kankakee, IL**
- **Andrew N. Groll, Champaign, IL**

NRC Nuclear Engineering Scholarship and Fellowship Program

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

Scholarships:

- **Cem Bagdatlioglu, Akatlar, Istanbul**
- **Molly R. Bilderback, Kankakee, IL**
- **Louis J. Chapdelaine, Eagan, MN**
- **Wesley N. Cowan, Lexington, KY**
- **Mikhail S. Finko, Clarendon Hills, IL**
- **Leo E. Kirsch, Frankfort, IL**
- **Stephen M. Kleppinger, Lake Zurich, IL**
- **Christopher A. Kuprianczyk, Chicago, IL**
- **Amanda M. Lietz, Cincinnati, OH**
- **Benjamin L. Magolan, Plainfield, IL**
- **Peter A. Mouche, Naperville, IL**
- **April J. Novak, Downers Grove, IL**
- **Nicholas W. O'Shea, Chicago, IL**
- **Anthony H. Park, Bolingbrook, IL**
- **Brian P. Pekron, Elmhurst, IL**
- **David J. Peterson, Orland Park, IL**

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Jim Stubbins, Kathleen Weichman and Benjamin Magolan



Jim Stubbins, Ye Li, and Leo Kirsch



Jim Stubbins, Nicholas Rivera, and Robert Geringer



Jim Stubbins, Louis Chapdelaine, Rui Lin Tan, and Prof. Roy Axford



Jim Stubbins, Matthew Szott, Amanda Lietz, and Kyu Jung Kim (for George Miley)



Abhishek Jaiswal, seated, and his advisor, Yang Zhang



Jim Stubbins, Molly Bilderback, and Andrew Groll



Exelon Corp. representatives Ed McVey and Gabriel Chavez (back row) with Kirsten Johnson and Nicholas Rivera

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- **Jonathan B. Pfingsten, Harvard, IL**
- **Pawel A. Piotrowicz, Chicago, IL**
- **Collin R. Rahrig, Bourbonnais, IL**
- **Jaspreet S. Rehal, Naperville, IL**
- **Nicholas Rivera, Chicago, IL**
- **Jonathan D. Rolland, Sayville, IL**
- **Joseph A. Serio, West Chicago, IL**
- **Matthew M. Szott, Orland Park, IL**
- **Quinn T. Vandermeersch, Knoxville, TN**
- **Nathan P. Walter, Evanston, IL**
- **Kathleen J. Weichman, Albuquerque, NM**
- **Bennett T. Williams, Robinson, IL**
- **Yuhui Zhao, Changzhi, People's Republic of China**
- **Jeffrey L. Zhou, Geneva, IL**
- **Neal E. Davis, Champaign, IL**
- **Aaron J. Oaks, Brea, CA**
- **Carolyn A. Tomchik, Buffalo Grove, 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.

- **Kevin T. Egan, Joliet, IL**
- **Kirsten E. Johnson, Plainfield, IL**

Nicholas Rivera, Chicago, IL 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, Spring Valley, IL**

National Institutes of Health

Midwest Cancer Nanotechnology Training Center Assistantship

The NIH Midwest Cancer Nanotechnology Training Center's goal in selecting graduate students for assistantships is to produce the next generation of leaders in defining new frontiers of nanotechnology in cancer research. The program provides an interdisciplinary environment to educate and empower graduate students so they can address the challenges at the crossroads of cancer biology, physical sciences, and nanotechnology.

- **Joanne N. Li, Richland, WA**

College of Engineering

Boeing Engineering Diversity

The Boeing Engineering Diversity

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

Continuing Scholarship

- **Amanda M. Lietz, Cincinnati, OH**

Illinois Engineering Premier Scholarship

The Illinois Engineering Premier Scholarships are awarded to entering freshmen who are U.S. citizens or permanent residents and, when admitted to the College of Engineering, have shown extremely high performance in ACT or SAT examinations and high school work.

- **Brittany A. Daley, Algonquin, IL**

SURGE Fellowship

The Support for Under-Represented Groups in Engineering (SURGE) Fellowship Program was established to meet the University of Illinois 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.

Continuing Fellowship

- **Joanne N. Li, Richland, WA**

Alpha Nu Sigma Society

ANS established Alpha Nu Sigma as a national honor society with the objective to recognize high



Spring 2013 Alpha Nu Sigma initiates

scholarship, integrity, and potential achievement in nuclear science and engineering.

Spring 2013 Initiates

- **Neal E. Davis, Champaign, IL**
- **Daniel T. Debold, Chicago, IL**
- **Daniel T. Elg, Wheaton, IL**
- **Rui Lin Tan, Singapore**
- **Aveek S. Kapat, Oviedo, FL**
- **Christopher A. Kuprianczyk, Chicago, IL**
- **Xiaochun Lai, Shanghang, People's Republic of China**
- **Xin Li, Jilin, People's Republic of China**
- **Pawel A. Piotrowicz, Chicago, IL**
- **Monish Singh, Champaign, IL**
- **Jan P. Uhlig, Chicago, IL**
- **Matthew J. Weberski, Spring Valley, IL**
- **Xu Wu, Urbana, IL**

Continuing Members

- **Rabie Abu Saleem, Al Salt, Jordan**
- **Cem Bagdatlioglu, Istanbul, Turkey**
- **Joseph R. Bernhardt, Bloomington, IL**
- **Liang Cai, Urbana, IL**

- **Louis J. Chapdelaine, Eagan, MN**
- **Wei-Ying Chen, Champaign, IL**
- **Joshua A. Dotson, Urbana, IL**
- **Kevin T. Egan, Joliet, IL**
- **Peter R. Fiflis, Indian Head Park, IL**
- **Manas R. Gartia, Attabira, India**
- **Jonathan George, Bolingbrook, IL**
- **Jessica C. Hsu, Aurora, IL**
- **Abhishek Jaiswal, Kathmandu, Nepal**
- **Ye Li, Beijing, People's Republic of China**
- **Amanda M. Lietz, Cincinnati, OH**
- **Nicholas W. O'Shea, Chicago, IL**
- **Zihao Ouyang, Liuyang, People's Republic of China**
- **Jason A. Peck, Fairview Heights, IL**
- **Ian M. Percel, Chicago, IL**
- **Jonathan B. Pfingsten, Harvard, IL**
- **Priya Raman, Chennai, India**
- **Jaspreet S. Rehal, Naperville, IL**

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- **Jonathan D. Rolland, Sayville, NY**
- **Joseph A. Serio, West Chicago, IL**
- **Ryan A. Switts, O'Fallon, IL**
- **Matthew M. Szott, Orland Park, IL**
- **Carolyn A. Tomchik, Buffalo Grove, IL**
- **Kathleen J. Weichman, Albuquerque, NM**
- **Bennett T. Williams, Robinson, IL**
- **Jeffrey L. Zhou, Geneva, IL**

University of Illinois

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.

- **Kyle T. Perfect, Brookfield, IL**
- **Joseph A. Serio, West Chicago, IL**
- **Matthew M. Szott, Orland Park, IL**
- **Jeffrey L. Zhou, 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's international reputation.

- **Joseph L. Bottini, Framingham, MA**
- **Louis J. Chapdelaine, Eagan, MN**
- **Kevin J. Chowanec, Willowbrook, IL**
- **Brent S. Cross, Minier, IL**
- **Elizabeth M. Edwardson, Gurnee, IL**
- **Nicholas J. Ezyk, Round Lake, IL**
- **Eric E. Gillum, Lake Villa, IL**
- **Mark R. Hirsbrunner, Bloomingdale, IL**
- **Jessica C. Hsu, Aurora, IL**
- **Aveek S. Kapat, Oviedo, FL**
- **Ari M. Krause, Glencoe, IL**
- **Christopher A. Kuprianczyk, Chicago, IL**
- **Ye Li, Beijing, People's Republic of China**
- **Amanda M. Lietz, Cincinnati, OH**
- **Daniel A. Lyons, Lombard, IL**
- **Benjamin L. Magolan,**

- **Plainfield, IL**
- **Steven W. Marcinko, McHenry, IL**
- **Paula-Angela R. Mariano, Lake in the Hills, IL**
- **Matthew R. Miller, Gurnee, IL**
- **Hardik D. Parikh, Mumbai, India**
- **Simone P. Pensabene, Sherman, IL**
- **Kyle T. Perfect, Brookfield, IL**
- **Jonathan D. Rolland, Sayville, NY**
- **Nirali P. Shah, Skokie, IL**
- **Matthew W. Szott, Orland Park, IL**
- **Rui Lin Tan, Singapore**
- **Luke A. Toczek, Antioch, IL**
- **Jan P. Uhlig, Chicago, IL**
- **Nathan P. Walter, Evanston, IL**
- **Justin D. Weberski, Saint Charles, IL**
- **Kathleen J. Weichman, Albuquerque, NM**
- **Jeffrey L. Zhou, Geneva, IL**
- **Jo A. Zoril, Toulon, IL**



2013-14 American Nuclear Society Student Chapter Officers
From left: Pawel A. Piotrowicz, Vice President; Louis J. Chapdelaine, Treasurer; Omar F. Almasri, Outreach Chair; Nicholas Rivera, President; Simone P. Pensabene, Vice Treasurer.

Rivera, Kirsh Win College-Wide Student Awards

NPRE students garnered two of the eight highly competitive, college-wide student honors announced during the College of Engineering Awards Convocation in April.

Nicholas Rivera

Rivera won the 2013 William R. Schowalter Award, and Leo E. Kirsh was presented the 2013 Lisle Abbott Rose Memorial Award.

While majoring in nuclear engineering and minoring in the highly selective Hoeft Technology and Management program, Rivera has also been a leader on campus, both through the Society of Hispanic Professional Engineers (SHPE) and the Morrill Engineering Program (MEP).

He has been called "a well-rounded problem solver"... "not only a leader; but someone who helps groom new leaders." Outside the classroom, Rivera worked his way up the leadership ladder at SHPE, serving first as external vice president of the organization's freshman roundtable, then as external vice president of the executive board, and this year, as the group's president.

As external vice president, he launched fundraising efforts, which resulted in \$10,000 to send fellow members to the national conference. As president, he brought in several industry professionals to an SHPE executive board retreat to share insights on teamwork, financial stability, and professional demeanor.

Through MEP, Rivera has helped promote the College of Engineering to various external groups, including recruiting students from his high school. He has played a major role in MEP student visits and the President's Award Scholars Program and has been the facilitated group study leader for Calculus 1.

Rivera is the 2013-14 president for the American Nuclear Society student chapter, and received NPPE's 2013 Catherine Pritchard Undergraduate Scholarship, and the Exelon Corporation Energy for Education Scholarship. He has garnered several other scholarship awards, including the Nuclear Regulatory Commission Scholarship and the Johnson & Johnson Corporate Readiness Scholarship. Rivera has served as a PWR core design intern for Exelon Generation and as undergraduate researcher for the Center for Plasma Materials Interactions.



Nicholas Rivera



Leo E. Kirsh

Established by Engineering Council upon William R. Schowalter's retirement as Dean of the College of Engineering at Illinois in 2001, the award acknowledges Schowalter's outstanding character, creativity, and enthusiasm, as well as his dedication to students and faculty. The recipient of this annual award reflects those traits through their leadership, creativity, encouragement of others, and dedication to the college.

Leo E. Kirsh

In an age where issues of nuclear warfare, waste storage, and radiation protection continue to be at the forefront, Kirsh, who earned his BS in December 2012, is determined to make a difference by advancing nuclear fusion power research to the point where it can become a viable global energy source. While nuclear fission is the current source of most nuclear energy, Kirsh believes that fusion can be the primary future source without many of the dangers that exist today.

"Although the issues of nuclear arms control seem gloomy," writes Kirsh, "they only incite in me more passion for fusion power... I work to ensure safety for the entirety of the human race."

Kirsh earned an impressive 3.94 grade-point average while working toward his bachelor's degree. A lab technician at the Center for Plasma Material Interactions, Kirsh was lead author for a research presentation, "Seebeck Coefficient of Lithium and Lithium-Tin Alloys," at the 54th Annual Meeting of the Division of Plasma Physics in 2012.

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NPRE Students Fare Well in National ANS Competitions

NPRE student teams took home top prizes in national competitions during the American Nuclear Society Student Conference in April and the ANS 2013 Winter Meeting in November.

Undergrads Share Best Paper Award at Student ANS Conference

Four NPRE students shared a Best Undergraduate Paper Award for their presentation at the 2013 American Nuclear Society Student Conference.

Kathleen Weichman of Albuquerque, New Mexico; Kristin Schoemaker of Carpentersville, Illinois; Benjamin Russell of Olney, Illinois; and Jaspreet Rehal of Naperville, Illinois; shared the prize for the paper, "SEE RADS Platform: Social, Every Day, and Emergency Radiation Detection System," presented during the conference held April 4-6 at the Massachusetts Institute of Technology in Boston. NPRE Assistant Prof. Clair Sullivan served as the students' advisor.

SEE RADS is a platform designed to educate the general public about radiation and provide authorities with information in the event of an emergency response scenario. In the event that radioactive material is smuggled



Presenting at the ANS Student Conference were Jaspreet Rehal, Kristin Schoemaker, Kathleen Weichman and Benjamin Russell.

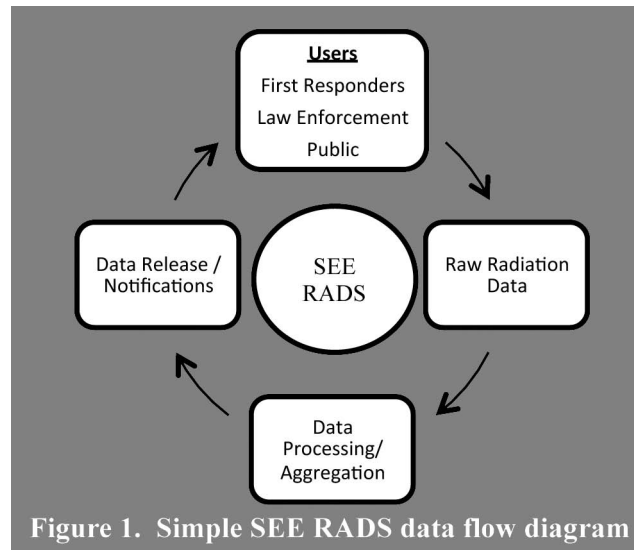


Figure 1. Simple SEE RADS data flow diagram

into a populous city or the public is exposed to radiation through a large release, authorities and the general public need a reliable source of education and networked real-time information regarding radiation levels.

SEE RADS is based on the nodal acquisition of detection data via a number of deployed radiation detectors that upload the raw detection data to a central server for processing. Results are then compiled into a simple, easy-to-understand format and returned to a mobile device such as a cell phone or a police-car-based computer and displayed along with data from other sources through an easy-to-use interface. With a network incorporating many types of detectors (both mobile and stationary), SEE RADS can deliver valuable radiation information to educate the masses and to enable intelligent response in case of emergency.

Creative Electron's iRad Geiger detector was examined as an example of a readily-available small mobile detector. Detector tests revealed, however, that this detector is not a good choice as the primary detector for the SEE RADS network.

SEE RADS was developed in conjunction with the NPRE 458 Design in Nuclear, Plasma, and Radiological Engineering senior design course.

Student Diesel Exhaust Cleaning Project Takes Second in ANS Meeting

An NPRE undergraduate design project placed second in the Student Design Competition during the 2013 American Nuclear Society Winter Meeting in November in Washington, D.C.



Members of the NPRE team that presented at the ANS 2013 Winter Meeting were, from left, Stephen M. Kleppinger, David J. Peterson, Erik P. Ziehm, Matthew M. Szott, Hyun Ho Yun (not pictured), and Zachariah F. Shukur (not pictured).

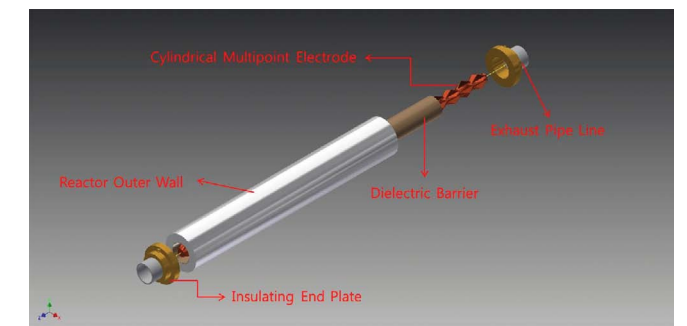
The DECAP team – Diesel Exhaust Cleaning with Atmospheric Plasma – competed with an undergrad team from the University of California-Berkeley, "Accident Tolerant Refractory Metal Based Cladding for Light Water Reactors."

The Illinois team, formed as part of NPRE's senior design program during the 2012 Academic Year, was composed of recent graduates Stephen M. Kleppinger, now working for Cymer, Inc., as a test engineer; David J. Peterson; Hyun Ho Yun; and Zachariah F. Shukur; and current students Erik P. Ziehm and Matthew M. Szott. Calogera Sollima, NPRE Visiting Scholar, and Jim Stubbins, Department Head and Willett Professor in the College of Engineering at Illinois, advised DECAP.

According to Sollima, DECAP examined the application of plasma energy in reducing pollution that commercial heavy duty diesel trucks emit. Modeling analysis shows DECAP technology results in an approximately 85 percent reduction in nitrogen oxide concentration levels, and a significant reduction in large chain hydrocarbons that diesel exhaust releases. The results overcame limitations of technology in current use: Selective Catalytic Reduction (SCR) and Enhanced Exhaust Gas Recirculation (EEGR).

In choosing DECAP for the competition, Sollima said he and Stubbins were pleased with many of the design projects produced last spring. "All of them had an original approach to the solution; deep analyses of the state of the art and constraints of the technology; design process definition; and good technical and economical demonstrations of their designs. The objectives and achievement of the designs were clearly stated," he said.

Other NPRE projects considered involved network radiation detection, deep borehole waste deposition, high temperature gas reactor to combine with hydrogen and ethanol production, and a train ran by nuclear power.



NPRE Students Receive National ANS Scholarships

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

Undergraduates Louis J. Chapdelaine of Eagan, Minnesota; Jonathan D. Rolland of Sayville, Illinois; and Rui Lin Tan of Singapore all have won ANS undergraduate scholarships. These awards are made to students who have completed one year in a course of study leading to a degree in nuclear science, nuclear engineering, or a nuclear-related field, and who will be sophomores in the upcoming academic years, and to students who have completed two or more years and will be entering as juniors or seniors.

Graduate student Peter R. Fflis of Indian Head Park, Illinois, has won an ANS graduate scholarship. This award is made to graduate students in a program leading to an advanced degree in nuclear science, nuclear engineering or a nuclear-related field.

Gartia Helps Develop Award-winning Mobile Phone Water Sensor



Manas Gartia and the MoboSens device

Graduate student Manas R. Gartia has been working with a group of Illinois researchers in developing MoboSens, a low-cost, smartphone-based sensor that allows users to test water quality and specifically detect nitrate concentration.

The device that Electrical and Computer Engineering Assistant Prof. Gang Logan Liu and his research team of graduate and undergraduate students — Gartia, Xinhao Wang, Te-Wei Chang, Jing “Jimmy” Jiang, Caleb Qian, Will Wang, and Tristan Wietsma — have developed received second place out of more than 400 participant teams in the Vodafone Wireless Innovation Project competition, a competition that identifies and funds innovative wireless-related technology addressing critical social issues around the world. The team received a \$200,000 research grant to fund the project.

The MoboSens sensor, integrated with a micro-and nanofabricated chip and associated circuit board, is a small device coupled to a smartphone. The MoboSens sensor connects to the smartphone’s audio jack and thus allows almost any kind of cell phone to measure and collect the sensing data using a cross-platform app. The phone app also sends the data to a cloud computing platform which allows MoboSens users and other individuals to view environmental information in actual time on Google or Bing maps.

Gartia worked on the development of the microelectrochemical sensing chip for the sensor. He explained that available conventional bench-top chemical analysis techniques are unsuitable for large scale field deployment due to their massive instrumentation, bulky features, complex measurement procedures, and cost.

“It is unlikely that normal citizens will buy these instruments to perform water testing at home,” Gartia said. “Due to simplicity, sufficient sensitivity, small footprint, and cost effectiveness, proposed microelectrochemical-based methods for detection is a viable option for sensor networks as well as integrating to smartphone platforms. Since smartphones are now an integral part of our life, it is quite natural that a sensor platform connectable and operable by smartphones will be quite helpful and successful.”

Liu and the MoboSens team were recognized at the Vodafone Wireless Innovation Project awards ceremony and Global Philanthropy Forum in Silicon Valley in April. They plan to continue their research and expand the sensor’s capabilities.

Liu is affiliated with the Department of Bioengineering, Beckman Institute, and Micro and Nanotechnology Lab.

Li Advances Imaging Technology to Detect Tumors, Heart Disease

Graduate student Joanne Li is refining innovative imaging technology to detect small tumors and atherosclerosis at very early stages.

Working with Dr. Stephen Boppart, an NPRE affiliate, Li has earned a highly prestigious graduate assistantship from the Midwest Cancer Nanotechnology Training Center (M-CNTC), sponsored by the National Institutes of Health (NIH), to support her work.

Li said the research holds particular promise for detecting heart disease before it can cause major damage.

“Some MIs (myocardial infarctions) are caused by blockages of fat lipids and cholesterol inside the coronary arteries around the heart. With the current technology, that’s hard to see because these vessels are deep within the chest. You wouldn’t know it’s happened until after a heart attack occurs,” she said.

“The object is to detect before the heart attack happens.”

Li’s research employs Optical Coherence Tomography, a process similar to ultrasound but using light instead of sound waves. Li injects into the blood vessels

of lab rats microspheres containing radioactive isotope Copper 64. The isotope creates Cerenkov luminescence, producing a blue light much weaker but similar to that of a pulse created in a nuclear reactor during radioactive decay.

Living tissue tends to absorb the blue light. “It’s hard to see the light from the outside if the microsphere agents are really deep,” Li said.

To counteract this, Li adds quantum dots to the inside of the microspheres. The dots are made of cadmium selenide, a semiconductor. The blue light emitted from the isotope excites the quantum dots, converting the blue light to red.

“If the light is red or near-infrared, it has a chance of being seen,” she said.

Li said molecules on the outside of the microspheres work like puzzle pieces that fit into areas of the tumors or blockages so that the microspheres settle in a damaged area of the body, indicating where the damage is.

Working on this project the past year, Li now is collecting more data to verify her results. Said Boppart of the research “Joanne’s targeted multimodal microsphere contrast agents are very unique, especially in the way they can convert light to longer wavelengths. The oil-based composition of the microspheres also makes the Cerenkov luminescence process more efficient in tissue. These agents are very likely to have the potential for detecting early changes in heart disease or new blood vessel growth around tumors.”

Li will earn her master’s degree in December, and then plans to continue for a PhD. Li earned her bachelor’s degree in chemical engineering from the University of Washington in Seattle. She also interned at the Pacific Northwest National Laboratory.

In addition to the NIH support, Li holds a fellowship from the College of Engineering’s Support for Under-Represented Groups in Engineering (SURGE) program.



Joanne Li and Stephen Boppart

NPRe Graduate Students Invited to Present Research Internationally

Over the fall semester, three NPRe graduate students were invited to present their research at prestigious, international conferences.

Emission Tomography, Detectors

Andrew N. Groll and Jacob B. Stinnett presented at the 2013 IEEE Nuclear Science Symposium and Medical Imaging Conference, and Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors workshop (IEEE NSS/MIC/RTSD). Sponsored by the Institute of Electrical and Electronics Engineers, the conference was held at the end of October in Seoul, South Korea.

Groll's presentation, "Element Identification in Organic Samples Utilizing a Modular Benchtop X-Ray Fluorescence Emission Tomography (XFET) System," ranked fourth among thousands of abstracts submitted for the conference. It was presented in the prestigious Plenary and Award section of the IEEE Nuclear Science Symposium and Medical Imaging Conference.

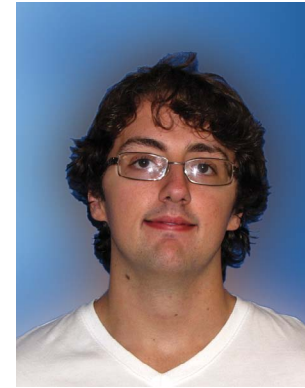
"The work focuses on developing a new type of stimulated emission tomography technique that allows researchers to derive precise 3-D elemental distribution in biological samples with a bench-top imaging system," Groll said. "In the past, most of X-ray fluorescence computed tomography (XFCT) techniques were relying on synchrotron radiation sources (a particular type of cyclic particle accelerator). Synchrotrons are generally limited to national labs, which limits the widespread use of XFCT. Our work could potentially break this bottleneck, and bring this powerful imaging technique into general biomedical research labs."

Groll works under the direction of NPRe Associate Prof. Ling-Jian Meng.

NPRe Assistant Prof. Clair Sullivan advises Stinnett, who delivered the presentation, "An Automated Isotope Iden-



Andrew Groll



Jacob Stinnett



Daniel Elg

tification Algorithm Using Bayesian Statistics," during the Instrumentation for Homeland Security II: Imaging and Algorithms section.

Stinnett's presentation was selected for an oral presentation — the only student paper selected for oral presentation in this very competitive topic area. This completely novel mathematical approach to the age-old problem of isotope identification attracted the interest of the international community at the conference.

Stinnett's research focuses on automated isotope identification algorithms. Handheld radio-isotope identifiers (RIIDs) are used to detect and identify nuclear materials at shipping ports and other locations. While these detectors are essential to deter nuclear threats and halt illegal nuclear materials trafficking, many published evaluations have shown that these detectors are shockingly inaccurate. However, the hardware is not the weakness — a trained spectroscopist can look at these spectra and identify the materials correctly even when the identifier fails. Rather, the algorithms that make the identifications are the issue.

"Our research group is focused primarily on developing new algorithms that can be used on these detectors," Stinnett said. "My work uses Bayesian statistics to identify these spectra. I believe that my method will not only be a vast improvement to existing algorithms but will also eventually be able to provide extra information about the source — Is it shielded? Is it an enriched source — etc."

Extreme Ultraviolet Lithography

Graduate student Daniel T. Elg, who works with NPRe Prof. David Ruzic, presented at the International Symposium on Extreme Ultraviolet Lithography in Toyama, Japan, in October. Elg described the symposium as a gathering of "all the major players" in the Extreme Ultraviolet Lithography industry.

"Very few universities have EUV research contracts, so it was an honor to stand on the same stage as industry giants and tell them about my research," Elg said. "(My) project was also mentioned in a much-anticipated invited talk by San Diego-based Cymer LLC, which funds my research and is the industry leader in manufacturing EUV sources."

Elg's research has impact for the continual effort to reduce the size of computer chips for fabrication of increasingly smaller electronics devices.

Currently, Elg explained, integrated circuits (IC) are made by etching patterns with 193 nanometer light. The industry's goal is to use 13.5 nm light to improve the resolution of IC manufacturing.

However, 13.5nm light is "extreme ultraviolet" (EUV) and, using a plasma process, is difficult to produce. Specifically, said Elg, the best way to produce EUV is by blowing up a droplet of tin with a laser in a vacuum chamber. Problems arise because the process causes tin to coat the inside of the vacuum chamber. Furthermore, EUV cannot be transmitted by any known windows or lenses; it must be collected and focused by a special mirror that employs Bragg reflection. Such a mirror is made of alternating layers of molybdenum and silicon, each layer only 3.5nm thick.

This "collector" mirror must be exposed directly to the EUV-emitting plasma; consequently, it is also exposed directly to the flying tin debris that coats the entire vessel. Even a couple nanometers of tin buildup on this collector mirror significantly degrades the reflectivity, Elg said.

Currently, hydrogen gas is used to blow the Sn particles



Jacob Stinnett at the IEEE conference in Seoul, South Korea.

away from the collector, but this method is not totally successful. Deposition still occurs, and cleaning is required. Manually cleaning the collector requires shutting down the system and venting the chamber for very long periods of time, an unacceptable outcome in the high-speed world of semiconductor manufacturing.

Elg's research involves the use of a hydrogen plasma to clean the collector mirror inside the chamber, avoiding the need to vent and clean the collector manually. In a hydrogen plasma, H₂ molecules are broken apart into single H atoms that react with tin to form SnH₄, which is a gas, so it can be pumped away.

"The method developed here at Illinois is ideal for a variety of reasons," Elg said. "First, as mentioned earlier, hydrogen is already present in an EUV chamber; it is not necessary to introduce any new gases. Additionally, since laboratory plasmas are typically made only at low pressures, we can make use of the low pressures in an EUV vacuum chamber and create a hydrogen plasma without opening the chamber. Finally, our method of using the collector mirror itself as an antenna causes the densest plasma to be created at the collector surface — right where it is needed."

Grad Students Gain First-hand Look at Swedish Spent Nuclear Fuel Storage Facilities

Two NPRE graduate students traveled to Sweden in June to learn how that country is working toward a final solution for storing spent nuclear fuel.

As part of the experience, students Rabie Abdullah Abu Saleem and Kuan-Che Lan toured the Äspö Hard Rock Laboratory, a unique geological disposal research facility near Oskarshamn, where experiments are performed 500 meters underground. There, the Swedish Nuclear Fuel and Waste Management Company (SKB) rehearses procedures for the final Spent Fuel Repository planned for construction in Forsmark, north of Oskarshamn on Sweden's eastern coast line.

The plan is for spent fuel to be stored in copper canisters placed deep in underground tunnels for 100,000 years until the radioactivity decays. The repository must fulfill the authorities' long-term safety requirements, which can be converted into an average dose for human beings of about one per cent of the natural background radiation. Construction on the cutting-edge site could begin in 2016 and the site should be inaugurated in 2022 or 2024.

Locating the most desirable site for the storage facility in the country's Precambrian geological formations has been a 20-year process. Abu Saleem and Lan, along with students from four other universities around the world, gained knowledge on how the site decision was made. The participants developed and presented maps of rock and soil types, conducted tectonic mapping, examined hydrogeology, and considered factors that would affect groundwater chemistry.

"We would measure the direction and orientation of cracks in rocks," Abu Saleem said. "They were teaching us how to make evaluations."

"The fewer number of fractures the better for the site because there would be less chance for a leak to groundwater," Lan explained.

The students also considered historical climatic influences to determine how that would affect rock formations over an extended period of time. Furthermore, they learned about the social and political aspects involved in Sweden's nuclear power policies.

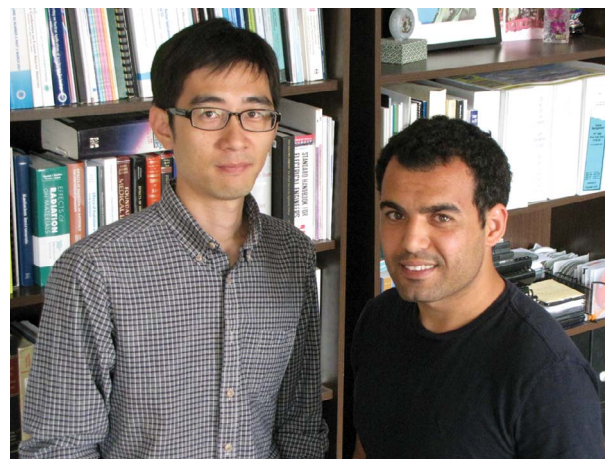
Lan said the majority of the country's citizens are confident of the safety of nuclear power currently, and Forsmark and

Oskarshamn competed for the final repository site. Protests did arise 20 years ago, but nuclear power proponents went into the communities to make their case.

"You have to be very patient to communicate to the people," Lan said.

SKB joined with Swedish universities Linneaus University and Royal Institute of Technology and the Nova Center for University Studies Research and Development to offer the summer program for students including Abu Saleem and Lan. Participants also came from the University of Houston – Downtown; the AGH University of Science and Technology in Poland; the Warsaw University of Technology in Poland; and the Moscow Engineering Physical Institute in Russia.

Lan and Abu Saleem are both students of NPRE Assistant Prof. Tomasz Kozlowski. Lan is studying stability of boiling water reactors, while Abu Saleem is interested in two-phase flow simulations.



Above: Kuan-Che Lan and Rabie Abdullah Abu Saleem. Below: Students in the summer program in Sweden, including Lan and Abu Saleem.

NPRE Graduate Student Shares in Best Presentation Award

NPRE graduate student Abhishek Jaiswal shared in the Best Presentation Award during the Summer School on the Fundamentals of Neutron Scattering.

The school was held in June at the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland, and was sponsored by the NIST Center for Neutron Research and the National Science Foundation.

About 35 students attended the training, devoted to methods and applications of neutron spectroscopy with a session on small angle neutron scattering. The students were divided into seven groups and performed three experiments with various neutron scattering instru-

ments. Jaiswal's group presented on an instrument named Triple Axis Spectrometer or BT-7. The groups were judged based on the information they learned and the results of their experiments.

The course was targeted at those with little or no previous experience with neutron inelastic scattering methods. The combination of introductory lectures and training in scattering techniques will provide participants with a unique opportunity to become familiar with neutron scattering methods and their application to current research topics.

The course included both lectures and hands-on training. Invited speakers gave presentations on the application of neutron scattering in



Abhishek Jaiswal

their current research activities.

NPRE Assistant Prof. Yang Zhang advises Jaiswal, who works with metallic glass in his research.

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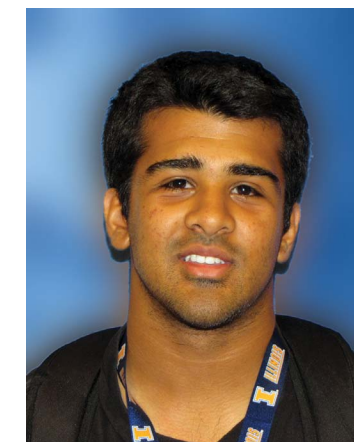
Undergrad Gains NEUP Scholarship

Undergraduate student Aveek Kapat has been awarded a \$5,000 Department of Energy scholarship for the 2013-14 academic year.

The award has been made through the DOE's Nuclear Energy University Programs (NEUP).

Kapat, of Oviedo, Florida, has been working with Prof. David Ruzic in the Center for Plasma-Material Interactions on the Solid/Liquid Lithium Divertor Experiment. Specifically, Kapat is involved in the construction and operation of the vertical TEMHD-driven Lithium flow trench.

Kapat plans to continue his studies in graduate school and would like a career in academia.



Aveek Kapat

Rivera, Kirsh Win College-Wide Student Awards

In addition to his engineering pursuits, Kirsch has studied political relations related to nuclear power. He spent six weeks at the University of Pisa, visiting manufacturing and nuclear power plants, and a General Electric oil and gas turbine factory while studying energy systems. He has also been a volunteer at the Worldwide Youth in Science and Engineering Summer Camp as well as a teaching assistant for the class on Renewable Energy Systems.

This award was established in 1994 by Mildred Mattux Rose, in honor of her husband, Lisle Abbott Rose, who served as the director of public information for the College of Engineering. This award is given to an outstanding senior in the college who most nearly approaches the ideal of technical excellence combined with cultural breadth, depth, and sensitivity.

Remembered

Alumni, Faculty, Recall Catherine Pritchard with Fondness

The friendly face for students of Nuclear, Plasma, and Radiological Engineering for over 20 years, Catherine A. Pritchard died Sunday, January 20, 2013, in Savoy, Illinois.

“Catherine always had time to help you, no matter how busy she was,” said NPRE alumnus Mike Giacobbe, BS 91, MS 95, PhD 99. “She was truly selfless, putting the support of students and faculty above any personal interests. Her individual passion will be missed, but will continue on in all of us that were impacted by her.”

As departmental secretary, Pritchard made such an impression upon Giacobbe and his friends, including alumni Terrill and Debbie Laughton and Bill Myers, that soon after earning their degrees, they banded together to raise funds for the Catherine Pritchard Undergraduate Scholarship, the first undergraduate award within NPRE. Established in 2000, the scholarship is presented to a student who has shown academic ability and activities leadership during his or her first three years, and is to be used during the senior year of study. So far, about 20 students have been honored with the Pritchard Scholarship.

“Catherine will be greatly missed by students, faculty and staff,” said NPRE Emeritus Prof. Barclay Jones, who was NPRE Department Head and Pritchard’s boss for many years. “She provided such dedicated support for all of us! Her care and concern combined to make a smooth transition to college life, particularly for freshman and international graduate students. The undergraduates were so appreciative that they created a fellowship in her name, providing long time remembrance. This is truly a well-deserved honor.”

Said current Department Head Jim Stubbins, “Catherine was always the person who conveyed the sense of family in the NPRE family. We are very proud of the efforts of the students who knew her to establish a lasting memorial of her contributions in the form of her Scholarship fund. We will miss her, but her spirit will live on.”

Pritchard was so highly regarded that she also was honored with the Chancellor’s Distinguished Staff Award in 1994.

The youngest daughter of Mary (Cain) McKeon and Henry McKeon, Pritchard was raised in rural Champaign County. She graduated from Unity High School in Tolono, Illinois, and took her typing skills to the University of Illinois’ secretarial pool.

She met and married William A. (Bill) Pritchard in 1957 and the couple made their home in Champaign, then later settled in Savoy, where they raised three children, Jane Guido (Scott), Sue Danielson (Darwin), and Bill. Catherine and Bill Pritchard marked 54 years of marriage in 2011, prior to Bill’s death.

Catherine Pritchard retired from NPRE in 1997.

She enjoyed traveling, music and playing the piano. She was a true sports fan and rarely missed an Illini football or basketball game, or Chicago Cubs game. Pritchard was a dedicated wife, mother, grandmother and friend who will be deeply missed, but memories of her will be cherished by those who knew and loved her.

Memorials may be made to the University of Illinois Foundation c/o Catherine Pritchard Undergraduate Scholarship, or to a charity of the donor’s choice.



Catherine Pritchard

Excellence

Course Development, Innovation Earn Ragheb College Recognition

Associate Prof. Magdi Ragheb has been honored with the 2013 College of Engineering at Illinois Everitt Award for Teaching Excellence.

The award recognizes a faculty member for outstanding undergraduate teaching: “A teacher who stands out and is remembered with respect, affection and admiration long after the student leaves campus.”

A member of NPRE’s faculty since 1979, Ragheb has built the general nuclear engineering course for non-major undergraduates, NPRE 402, Nuclear Power Engineering, from an enrollment of about 50 students to between 100 and 150 students, depending on the semester. This course delves into the major technical issues associated with nuclear power and the application of nuclear processes, areas which have gained considerable attention in recent years.

Even before the current emphasis on energy, Ragheb had built a strong interest in this area. The high interest and high enrollments are due to word-of-mouth praise for the course since it is outside the normal course elective structure for most students.

Ragheb has poured considerable effort into building the course content, which is available on the internet in what is a more substantial set of materials than could ever be found in a standard text. Interest in this “online text” has been expressed from collaborators and counterparts at other universities and national labs.

In addition to the excellent course content, Ragheb presents the material in an interesting and engaging way; a real challenge for classes of 150. He makes on-the-fly homework assignments so that students are always focusing on the concepts in class: typically one homework assignment per class meeting period – also an encouragement for students to attend class.

In his continuing dedication to undergraduate teaching, Ragheb has also been very active in developing new courses and course materials. He recently developed NPRE 475, Wind Power Systems, again with an on-line text. The on-line text was necessary since there is still no available text for this area that covers the topic area in the technical depth expected by advanced engineering undergraduate students. In fact, the on-line text has become very popular off campus and at least two chapters are now part of a published compendium text on Wind Power.



Former Interim Dean Mike Bragg presents Magdi Ragheb with the College’s Everitt Award.

Still, there are constant requests from other universities to use the on-line material as the major “text book” source for their courses. As with NPRE 402, Ragheb has now built a large and growing enrollment in this course.

The wind power course is remarkable in another sense: it has high student involvement in the hands-on construction of small scale wind turbine systems. The students in the course are required to form groups to build wind power systems to demonstrate the engineering and design principles that they learn in class. These systems are always demonstrated on the Engineering Quad near the end of the Spring Semester. This further attests to the learning process required of the students since their systems must be operational and open for public view and demonstration.

In addition to the two previously mentioned courses, Ragheb over the years has repeated this course development style several times: NPRE 457, Safety Analysis of Nuclear Systems, NPRE 498 MC, Monte Carlo Analysis and NPRE 498 F, Fuzzy Logic, each with a virtual textbook he has developed. Ragheb’s newest effort in this line is the co-development of a course on Energy Storage, taught this semester for the first time as a “Special Topics” course as the pathway to making an upper division technical course. This is again an area where no previous course existed, and a situation

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Japanese Honor Miller for Work Following Fukushima

Dr. David W. Miller, NPRE Adjunct Assistant Professor, has been honored in Japan for his work in the aftermath of the Fukushima nuclear power plant disaster.

Miller was presented the Society Contribution Award during the Japan Society of Mechanical Engineering (JSME) Conference and Honors Banquet in November in Tokyo.

He was cited "for outstanding contributions to the recovery of the Fukushima Nuclear Accident, in developing a joint severe accident database between NPRE and the Nuclear Engineering Department of Tokyo University. He was further recognized for his role as Vice Chair of the Severe Accident Management of Worker Dose Expert Group, responsible for collecting lessons learned from the accidents at Three Mile Island 1, Chernobyl, and Fukushima for future global knowledge. The group is part of the Information System on Occupational Exposure (ISOE), Organization for Economic Cooperation and Development (OECD), International Atomic Energy Agency (IAEA).

ISOE covers 435 reactor as utility members in 29 countries and 26 regulatory bodies members. The Tokyo ISOE Region

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Ragheb — Everitt Award

where Ragheb is developing another in-depth virtual textbook. He has done this despite a heavy teaching load, as a testament to his commitment to excellence in teaching, including moving forward into new, critically important areas where scant course materials exist. He takes on these challenges with an uncommon flare and determination, and the results are always well beyond a "typical" teaching experience, even for Illinois.



Associate Prof. Magdi Ragheb's wind power students build a system on the Quad south of Grainger Engineering Library.

Center has chosen the NATC model of an industry American Electric Power- Cook Nuclear Plant) and NPRE College of Engineering alliance program for the management of the global ISOE nuclear power radiological engineering database.

Miller was also noted for managing annual JSME technical site benchmarking visits for as many as 26 Japanese mechanical engineers to 14 U.S. nuclear power plants since 2005. The JSME engineers study U.S. practices in online maintenance, power uprates, dose reduction, chemical engineering, earthquake preparedness and new plant construction during these benchmarking information exchanges.



Dr. David Miller of NPRE with Dr. Tadashi Narabayashi, professor of Nuclear and Environmental Systems at Hokkaido University and Tokyo University in Japan.



Birthday Celebration

NPRE's heroes gathered in July for a celebration of Emeritus Prof. Dan Hang's 95th birthday. Hang is seated at left with NPRE Adjunct Prof. Tom Dolan, and standing from left are Emeritus Prof. Barclay Jones, Emeritus Prof. George Miley, and Prof. Roy Axford.

Students Honor Faculty, Staff for Teaching, Advising

First-year faculty member Assistant Prof. Clair Sullivan and veteran Prof. Rizwan Uddin shared the 2013 NPRE Teacher of the Year Award. The American Nuclear Society (ANS) student chapter chose the winning teachers.

Also recognized this spring for advising NPRE students was Becky Meline, Coordinator of Academic Affairs.

Sullivan, who began with NPRE in 2012, taught NPRE 451 (Laboratory) both the Fall 2012 and Spring 2013 semesters. The course covers radiation detection and instrumentation, radiation dosimetry and shielding, basic measurements in nuclear engineering, engineering applications, and micro computer data acquisition and experimental control.

Sullivan advised four NPRE undergraduates in their presentation that won the Best Undergraduate Paper Award at the 2013 ANS student conference in April. The students presented "SEE RADS Platform: Social, Every Day, and Emergency Radiation Detection System." (see page 34)

Uddin has stretched his streak of winning the Teacher of the Year Award to nine in a row. Over the past decade Uddin also consistently has been named to the List of Teachers Ranked Excellent by their Students.

With NPRE Department Head Jim Stubbins, Uddin co-taught NPRE 100, Orientation to NPRE, and NPRE 201, Energy Systems, during the Fall 2012 semester. The latter class is a collaborative effort between NPRE and the University of Pisa, Italy, in which Illinois students travel to Italy in the summer for several weeks, and Italian students come to the Urbana campus for several weeks in the fall.

Also in Fall 2012, Uddin taught NPRE 448, Nuclear Systems Engineering and Design, and NPRE 501, Fundamentals of Nuclear Engineering.

NPRE 448 examines engineering principles underlying nuclear systems designed with an emphasis on nuclear power reactors; materials for nuclear systems; easy generation and removal in single- and two-phase flows; and reactor and component control systems and nuclear fuel reloading patterns.

NPRE 501 looks at the background for advanced work in nuclear engineering; problems in materials, heat transfer, and fluid flow; and special emphasis on basic ideas and the mathematical similarity of problems in heat transfer, fluid flow, and diffusion.

In Spring 2013 Uddin taught NPRE 455, Neutron Diffusion & Transport. The course examines neutron migration, neutron slowing down and thermalization; neutron continuity equation, multigroup diffusion theory, homogeneous and heterogeneous medium, thermal and fast assemblies; numerical methods for multigroup diffusion equations; reactor dynamics perturbation theory; reactivity coefficients; and introductory transport theory.

Meline, who joined NPRE in 2000, advises all NPRE incoming freshmen and transfer students on course registration and works. She was recognized with the advising award in 2012 and 2010 as well. 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.

Uddin, Meline Gain New Appointments

To better serve student needs, Prof. Rizwan Uddin and NPRE staff member Becky Meline have new appointments.

Uddin is Associate Head of Academic Programs. In addition to teaching and research, Uddin helps Department Head Jim Stubbins with undergraduate and graduate student advising, curriculum, ABET reviews, graduate admissions and other duties.

Meline is now Coordinator of Academic Programs, a position that more accurately reflects her work as a student advisor, and in planning and executing student programs.



Above: 2012-13 ANS President Molly Bilderback presents the Teacher of the Year Awards to Clair Sullivan and Rizwan Uddin. Below: Becky Meline was honored for student advising.

Thanks to you!

The alumni and friends listed contributed to NPRE's unrestricted and endowed funds from July 1, 2012-June 30, 2013. Thank you for your gifts!

Philanthropists (\$10,000 and up)

Thomas E. and Mary L. Hendricks
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Terrill R. Laughton, BS 92, MS 96
George H. Miley and Elizabeth B. Miley
Thomas R. White, BS 81 *Metallurgical Engr*, and
Carla Broich White, BS 81 *Food Science*,
MS 84 *Food Science*

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MS 72
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Rebekah I. Jones
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Campaign for Axford Fund Begins as Golden Anniversary with NPRE Nears

Roy Axford, whose teaching skills and dedication to the education of NPRE students is unsurpassed, will celebrate his 50th anniversary in the Department in the year 2016.

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

A gift to the Axford Fund is a wonderful way to pay tribute to this legendary professor and to support that which he holds most dear — his students.

To make a gift, use the coupon on the following page, or go online at <http://npre.illinois.edu/giving-opportunities/> make-online-donation and choose the Axford Fund. For more information, contact John Kelley in the College of Engineering Advancement Office, by emailing jekelley@illinois.edu or phoning 217-333-5120.



Anne and Roy Axford

Leadership Alumni Board Endows Speaker Series

NPRE is pleased to announce that members of the Department's alumni group, the Constituent Alumni and Industry Advisory Board, have fully endowed the NPRE Leadership Speaker Series.

This Series will allow NPRE to bring to campus renown experts in our areas of nuclear power, plasma and fusion technologies, and radiological applications.

NPRE expects the inaugural speaker to be chosen for the Spring 2014 semester - stay tuned!

Department of Nuclear, Plasma, and Radiological Engineering Gift and Pledge Form

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News from the Department of Nuclear, Plasma, and Radiological Engineering

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NPRE Student Among Team Members Developing Award-Winning Mobile Phone Water Sensor



NPRE graduate student Manas R. Gartia has been working with a group of Illinois researchers in developing MoboSens, a low-cost, smartphone-based sensor that allows users to test water quality and specifically detect nitrate concentration.

The device that Electrical and Computer Engineering Assistant Prof. Gang Logan Liu and his research team of graduate and undergraduate students—Gartia, Xinhao Wang, Te-Wei Chang, Jing "Jimmy" Jiang, Caleb Qian, Will Wang, and Tristan Wietsma—have developed received second place out of more than 400 participant teams in the Vodafone Wireless Innovation Project competition, a competition that identifies and funds innovative wireless-related technology addressing critical social issues around the world.

[See more.](#)

NPRE Alum, Faculty Member, Organizing ANS Risk Management Topical Meeting



NPRE Alumnus Ron Knief and NPRE Assistant Professor Zahra Mohaghegh are organizing the embedded topical meeting, Risk Management for Complex Socio-Technical Systems, as part of the 2013 American Nuclear Society Winter meeting, to be held November 10-14 at the Omni Shoreham Hotel in Washington, D.C.

Among the topical meeting's organizers, Knief, of Sandia National Laboratory, is General Chair, and Mohaghegh is Technical Program

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The latest vehicle in NPRE's repertoire of staying in touch with our alumni and friends is NPRE Connections, our e-newsletter. Please use our online form at <https://illinois.edu/fb/sec/6193726> to make sure we have your email address.

You can get quick updates through our website, npre.illinois.edu, the NPRE at Illinois Facebook page, https://www.facebook.com/pages/Nuclear-Plasma-and-Radiological-Engineering-at-Illinois/134532773262689?ref=br_tf, and on Twitter at <https://twitter.com/illinoisNPRE>. Networking with other alumni and friends is possible through our Nuclear, Plasma, and Radiological Engineering at Illinois LinkedIn group, <http://www.linkedin.com/groups?gid=4510481&mostPopular=&trk=tyah&trkInfo=tas%3Anuclear%2C%20plasma%2Cidx%3A1-1-1>.

We look forward to hearing from you!