



*A tribute to  
Professor Jones*

**new•generation**

newsletter for alumni and friends

Nuclear, Plasma, and Radiological Engineering

University of Illinois at Urbana-Champaign

fall 2010





## The people of NPRE

### faculty

James F. Stubbins, *department head*  
Roy A. Axford  
Brent J. Heuser  
Barclay G. Jones  
Ling Jian Meng  
David W. Miller  
Magdi Raheb  
David N. Ruzic  
Clifford E. Singer  
Rizwan Uddin

### other faculty

Michael Aref, *adjunct assistant professor*  
Robert S. Averback, *affiliate faculty*  
Stephen A. Boppart, *affiliate faculty*  
Thomas J. Dolan, *adjunct professor*  
Masab H. Garada, *adjunct assistant professor*  
Daniel F. Hang, *professor emeritus*  
Brian E. Jurczyk, *adjunct assistant professor*  
Kevin K. Kim, *affiliate faculty*  
Kyu Jung Kim, *postdoctoral research associate*  
Vijay Surla, *postdoctoral research associate*  
Xiaoling Yang, *postdoctoral research associate*  
Susan M. Larson, *affiliate faculty*  
Nie Luo, *visiting research assistant professor*  
Charles P. Marsh, *adjunct professor*  
David W. Miller, *adjunct assistant professor*  
George H. Miley, *professor emeritus*  
Richard F. Nelson, *adjunct assistant professor*  
Martin J. Neumann,  
*adjunct research assistant professor*  
Suzanne L. Rohde, *adjunct 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*

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### On the Front

A young Barclay Jones in his graduate student days conducts a boiling heat transfer experiment.

## NPRE Teachers Ranked Excellent by Their Students!

### Spring 2009:

Roy A. Axford  
George H. Miley  
William K. Roy  
David N. Ruzic  
Rizwan Uddin

### Fall 2009:

Roy A. Axford  
Martin J. Neumann

### Spring 2010:

Roy A. Axford  
William K. Roy  
James F. Stubbins



Department Head James F. Stubbins presents NPRE alumnus and professor, Barclay G. Jones, with the 2010 Distinguished Alumni Award.

## Congratulations, Professor Jones!

This fall has seen a flurry of activity here at NPRE!

Perhaps it seems busier than in previous years because of all the new, young people who have chosen to focus their professional lives in nuclear engineering, and in plasma and radiological technologies. This year our undergraduate enrollment has swollen to 174 students, while we count 67 graduate students. The undergraduate number is four times that what it was 10 years ago, while the graduate student total matches our highest number within the past decade. (See chart, page 17.)

We wholeheartedly welcome all our students, and take encouragement from their efforts to learn and excel. While the enrollments have increased, the admissions standards are higher than ever. These pages offer evidence of the high achievements, with stories on (current and former) graduate students J'Tia Taylor, Michael Jaworski, Wayne Lytle, and Prashant Jain; undergraduate Richard Boettcher, and all the award winners from our spring Honors Banquet. (Student section starting from page 26.)

We know that our students' success stems in part from our faculty's knowledge and dedication. Thankfully, NPRE is rich in these attributes, with the standard set by our distinguished veterans, Profs. George Miley, Roy Axford and Barclay Jones. We are grateful that even though recently retired, Emeritus Professor Miley will continue in NPRE, building upon his outstanding legacy in research and teaching. (See pages 10-11.) We are proud that this past spring the campus recognized Professor Axford, the consummate teacher, with the Campus Award for Excellence in Undergraduate Teaching. (See pages 39-40.) And, we are touched that, as Professor Jones accepted the 2010 Distinguished NPRE Alumni Award, many of his colleagues, and past and present students told stories of how his concern for each of them added quality to their experience here. In fact, many of them contributed financially to the Barclay Jones Endowed Fellowship, enabling us to award the first fellowship fully held in NPRE! (See pages 4-9.)

This brings me to thanking all of our wonderful alumni and friends, not only for your gifts of time and finances to NPRE, but for those contributions you make beyond our campus: Bill Burchill, for his advocacy of the American Nuclear Society (pages 18-20); Ken Lewis, for his efforts on behalf of the students at South Carolina State University (page 20); Henry Sampson, for his writings on the African American experience (page 21); K.R. Sridhar for his pursuit of "green" energy (pages 22-23); and for the purpose-filled work of many, many more included in these pages.

While the College and Campus face financial challenges, our students continue to rely on the standards of excellence we have set in the past. With changes to come in the future, we are reaching out to you to let us know what parts of your experience here have been most beneficial, and what things, in retrospect, you would suggest for improvement. As change comes, we want to ensure that we maintain the educational standards and opportunities for which we are known. We need your help with this. We've designed an online survey (<https://illinois.edu/fb/sec/1780605>) for this very purpose and ask that each of you relate the experience you have had at Illinois. What you tell us will help us move in the right direction, following the road paved for us by Miley, Axford and Jones, and set the standards that have brought you the success and opportunities you enjoy today. Please let us know what you think.

Sincerely,

James F. Stubbins  
NPRE Professor and Head



# Barclay G. Jones

## NPRE 2010 Distinguished Alumnus

Cited for his leadership and commitment in guiding Nuclear Engineering education the past 50 years at the University of Illinois, Prof. Barclay G. Jones has been presented with the 2010 NPRE Distinguished Alumni Award.

Several NPRE students, alumni, colleagues and other friends offered Jones their thanks and congratulations during the presentation at this year's Honors Banquet, held April 29. The evening also featured the awarding of the inaugural Jones Fellowship to Jones' own student, Hyun-Jong Joe, and University of Illinois Alumni Association Loyalty Awards for Exceptional Alumni Service to Terrill R. and Deborah A. Laughton for their tireless efforts in the successful campaign to endow the Jones Fellowship.

"Barclay has helped define this Department throughout its history, in both the good times and the not-so-good," said Department Head James F. Stubbins. "He is a model for integrity in both science and education, and his devotion to our students is second to none. I can think of no one more deserving than Barclay for this honor."

Jones, MS 60, PhD 66, earned his bachelor's degree in Mechanical Engineering in 1954 from the University of Saskatchewan. After working at Atomic Energy of Canada, Ltd., he spent two-and-a-half years in Great Britain as an Athlone Fellow at the English Electric Company, in Rugby, England, and the Atomic Energy Research Establishment at Harwell, England, becoming a trained reactor operator. Returning to Canada, he worked at Canadair, Montreal, and then Westinghouse Atomic Power in Pittsburgh. In the fall of 1958 he enrolled at the University of Illinois for what was thought to be a short stay.

Working with Mechanical Engineering Prof. Bei Tse Chao, Jones earned a master's in 1960. Following the Nuclear

Engineering PhD degree program's formal approval in fall 1960, he was encouraged to continue study in nuclear engineering and did so a year later. In spring 1963, Jones began his teaching career at Illinois, and was hired as a full-time faculty member in the fall. When Chao left the country for several months during this time, Jones took over teaching his peers in a graduate-level heat transfer course. In 1966 he finished his PhD program and became an assistant professor. He was promoted to Associate Professor in 1968 and full Professor in 1972.

Jones served as Associate Chair of the Nuclear Engineering Program from 1981 to 1986, and was Acting Head of the newly formed Nuclear Engineering Department for a year, then served as permanent Head from 1987 to 2000. He was honored as one of the founders of the Department when its 50th anniversary was celebrated in September 2008.

His research interests have included thermal-hydraulics, reactor safety, multiphase flow, boiling heat transfer, turbulence measurement and modeling, flow-induced vibrations and aeroacoustics, human-machine interfaces for reactor control and simulation, and food irradiation safety. Among his contributions were the development of an experimental apparatus to look at the behavior of suspended particles in turbulent pipe flow, and the development of an instrument measuring local fluctuating static pressure. Jones also led the design of the reactor coolant system for the University of Illinois' Advanced TRIGA Reactor.

Jones is a Fellow of the American Nuclear Society, a faculty initiate of Tau Beta Pi, and an Honorary Member of Alpha Nu Sigma. His honors include the 2000 Glenn Murphy Award from the American Society of Engineering






## Ode to Jones

*From his kind salutations  
to his deep knowledge  
of differential equations  
I speak of a professor  
whose door never shuts.  
He is always there ready  
when a question erupts.  
It's clear that it is  
his passion to teach  
and of the benefits  
of nuclear power  
he's not afraid to preach.  
I consider it an honor  
to have been in his class  
beyond just the benefit  
of knowing the transfer  
of heat and mass.  
To a great inspiration  
I propose this toast  
Professor Jones,  
you deserve this the most!*

*By Dieter Brommer, recent NPPE graduate;  
now a graduate student at MIT.  
Delivered at NPPE's 2010 Honors Banquet.*

Education, the 1998 NPPE Outstanding Professor Award, the 1991 Power Engineering Educator Award from the Edison Electric Institute, and the 1982 Halliburton Education Leadership Award.

Jones said of this latest honor, "I am humbled and very pleased to be receiving this award. It marks more than a half-century of my association with the University and the NPPE Department. It started with having several professors at the University of Saskatchewan who were

alumni of engineering at Illinois. When I returned from the United Kingdom and was searching for nuclear engineering graduate study; the fledgling program at the University of Illinois topped the list. The rest is history and it chronicles a very satisfying and challenging career, which continues to this day. With the strength of our student body and colleagues in the Department, College and across the campus, the U of I provides a rich environment in which to contribute. I continue to be blessed — thank you!" 



jones tribute

1. From left, former NPRE Secretary Carol Mathis; Barclay Jones; Elizabeth Miley; Chris Stalker (widow of late NPRE staff member Lynn Stalker); George Miley; and Tom Hanratty, emeritus professor of chemistry. 2. Barclay Jones and his wife, Becky. 3. The Joneses with NPRE Prof. Rizwan Uddin. 4. NPRE Emeritus Prof. Dan Hang with Barclay Jones. 5. The Joneses with NPRE alumnus Franco Almerico. 6. Paying tribute to Barclay Jones are Scott Morris, former NPRE business manager; Dieter Brommer, NPRE student; and NPRE Prof. Roy Axford.







7. Barclay Jones' family. From left, son-in-law Michael Cannon holding newest granddaughter, Rebekah; grandson Christopher Endres; daughter Catherine Cannon; Barclay Jones; grandson Steven Endres; Becky Jones; daughter Sarah Jones; daughter Deborah Jones; daughter Allison Jones; and granddaughter Jessica Endres. 8. From left, NPRE alumnus Bill Burchill with his wife, Sue, with the Joneses. 9. From left, the Joneses with NPRE alumnus Jeff Binder and his wife, Lori. 10. NPRE Profs. Barclay Jones and George Miley. 11. NPRE Department Head Jim Stubbins presents Barclay Jones with a photo collage including scenes from the TRIGA reactor. 12. From left, TAM alumnus Pete Planchon and graduate student Qinyang Rao pay tribute to Barclay Jones.

Jones tribute





# NPRE Loyalty

## Terrill and Debbie Laughton Recognized for Alumni Service

The University of Illinois Alumni Association has selected Terrill R. Laughton, BS 92, MS 96, and Deborah A. Laughton, BS 95, for the 2010 University of Illinois Loyalty Awards for Exceptional Alumni Service.

Established in 1957, this award is bestowed upon alumni who have made significant, notable and meritorious contributions, and who have consistently demonstrated exceptional loyalty, commitment, dedication and service to the University of Illinois Alumni Association for the advancement of their Alma Mater.

Terrill, currently the Director of Strategic Consulting for Johnson Controls, Inc., of Milwaukee, and Debbie, a partner in the law firm of McAndrews, Held & Malloy of Chicago, began giving back to the University of Illinois and, specifically, to NPRE, shortly after earning their degrees.

Their support has been not only in terms of financial contributions, but also, more importantly, in terms of their time commitment and grassroots efforts to raise the consciousness of fellow NPRE alumni. Debbie has served on NPRE's Constituent Alumni and Industry Advisory Board for several years and Terrill recently joined the board. Debbie and Terrill, together with NPRE alumnus Mike Giacobbe, BS 91, MS 95, PhD 99, a 2008 Loyalty Award winner, organized a network of fellow alums to create the Catherine Pritchard Scholarship Fund, the first undergraduate award within NPRE. Once that was fully



**Top:** From left, Ellen Amberg of the University of Illinois Alumni Association and NPRE alumnus Mike Giacobbe present Loyalty Awards for Exceptional Alumni Service to NPRE alumni couple Debbie and Terrill Laughton. Giacobbe won the award in 2008, and helped nominate the Laughtons. At right is NPRE Department Head Jim Stubbins.

**Middle:** From left, NPRE alumni Terrill and Debbie Laughton pose with NPRE Prof. Barclay Jones and NPRE alumnus Mike Giacobbe and his wife, Cathy. The Laughtons and Giacobbe were instrumental in raising funds to endow the Jones Fellowship in NPRE.

**Bottom:** From left, NPRE alumni Terrill and Debbie Laughton, and Cathy Giacobbe and NPRE alumnus Mike Giacobbe pose with former NPRE Secretary Catherine Pritchard and her husband, William. Creating the Pritchard Fund in NPRE to support undergraduate scholarships was the Laughtons' and Giacobbes' first fund-raising effort.



To make a gift to the Jones Fellowship Fund, go to [http://www.ne.uiuc.edu/give\\_online.php](http://www.ne.uiuc.edu/give_online.php).

funded, the couple turned their attention to endowing the Barclay G. Jones Fellowship, establishing the first fellowship to be held entirely within NPPE.

The Laughtons and Giacobbe, along with fellow alumnus William L. Myers, BS 85, MS 90, PhD 95, wrote letters, urging all NPPE alumni to contribute. Not only did the Laughtons lend their names to the letters, but they also participated in monthly teleconferences with NPPE administrators to plan strategy in the campaign, and made follow-up calls to key contributors. Thanks in large part to their efforts, the endowment goal has been reached, enabling NPPE to announce the first Jones Fellow at the 2010 Honors Banquet!

Noting his friends' steadfast support for Illini athletics, Giacobbe said, "The devotion the Laughtons possess for supporting the academic objectives of the University is even more impressive. (The Jones Fellowship) is an amazing accomplishment that will strongly support the continuation of academic excellence in NPPE. In addition, the significance of the fund extends beyond monetary support, as it sends a message to the general community regarding the importance an NPPE education has for the development of students and industry professionals.

"In a nutshell," Giacobbe concluded, "the blood that runs through the Laughtons is orange and blue."

## Jones Fellowship

NPPE is pleased to present the inaugural Barclay G. Jones Fellowship to Hyun-Jong Joe, who earned an MS in NPPE in 2002, and a BS in industrial Engineering in 1997 from Dongshin University in Korea.

"I am so lucky to have Prof. Jones as my advisor with his patient guidance through the years," Joe said. "At the same time, I highly honor the Jones Fellowship upon his contribution on research and education for more than four decades. Finally, I appreciate to become the first recipient of the award."

Joe's research has focused on the passivity breakdown and CRUD growth on zircaloy cladding of PWR. While much effort has been focused on finding the causes of Axial Offset Anomaly (AOA), a detailed understanding has not yet been developed because of the complexity of its causes. Porous CRUD deposits on zirconium oxide in the



NPPE Department Head Jim Stubbins, left, and Prof. Barclay Jones, right, present graduate student Hyun-Jong Joe with the inaugural Jones Fellowship award.

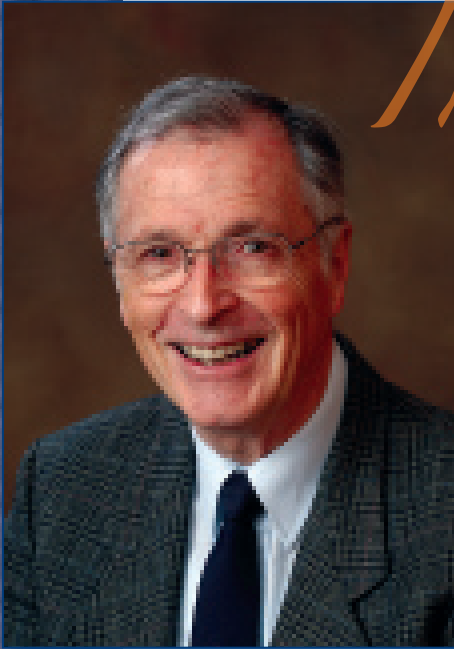
form of the non-stoichiometric nickel-ferrite ( $\text{Fe}_x\text{Ni}_{3-x}\text{O}_4$ ) have been observed on the Zircaloy cladding surface of the subcooled boiling length of fuel rods.

Joe's research examines the effect of radiolysis upon passivation breakdown of zirconium oxide and crud growth on the top of the oxide, and also, the effect and the concentration of electroactive radiolysis products ( $\text{H}_2$ ,  $\text{O}_2$ , and  $\text{H}_2\text{O}_2$ ) within the CRUD. He investigates the solute transport of molecular hydrogen, oxygen, and hydrogen peroxide, which are the most stable radiolysis products that directly affects 1) oxidation-reduction reactions at an interface of crud/cladding and 2) formation of nickel ferrite within the CRUD deposit.

This investigation employs the principles of thermal hydraulics and chemical reactions in the micro structures of the CRUD.

This Fellowship has been made possible through the many NPPE alumni and friends who have paid tribute to Professor Jones by endowing the fellowship fund in his name. This is the first fellowship held entirely within NPPE, and to all our supporters we offer a hearty thank you!

## In Search of a Black Swan



George H. Miley

In a research university known worldwide for its legendary engineers and scientists, NPRE Prof. George H. Miley stands among the most prolific.

Over a half-century on campus, Miley has helped grow the nuclear program from its infancy, steer to it some of the best minds in the field, and guide it through some of its most difficult moments. At the same time, he has challenged many of the

University's bright, young students, including his own 52 NPRE PhDs, seven PhDs from other College of Engineering departments, and many master's degree students in NPRE and across the College.

Through this all, Miley has demonstrated an incredible work ethic, pouring out research and earning an international reputation. Among his published works have been six books, over 230 articles in journals, and another 550 articles in conference proceedings. He holds 19 patents.

Miley's retirement was official in August, but he will keep going strong in NPRE in teaching and research as an emeritus. Meantime, he's working on no less than three books! In one, entitled *Technologist Search for a Black Swan*, Miley recalls his fascinating journey in research, service and teaching. "I have indeed been looking for a 'black swan,'" Miley wrote. "For me, that would be some discovery that revolutionizes energy sources or energy conversion."

NPRE will recognize Miley's lifelong contributions with the **Nuclear Energy Research Conference - Celebrating Prof. George Miley's 50 Years of Research and Teaching at the University of Illinois**, to be held April 15, 2011. More details will follow at a later date.

Miley's passion emerged from growing up in Western Pennsylvania among the coal mines and industrial steel mills. "We had pollution," he recalled of that time in the 1940s and 50s. "I had to keep my window closed to keep the soot ash from coming in. When I became a student I wanted to work in new energy, and I didn't particularly care what form." Nuclear energy later caught and held his attention.

Equipped with a chemical engineering bachelor's degree from Carnegie Tech as well as a master's and PhD in chemical and nuclear engineering from Michigan (he was Michigan's first nuclear PhD), Miley began his career in 1958 at the General Electric Research Laboratory. He worked on nuclear submarine reactors, achieving success early. "My colleagues and I developed a remarkable new approach using 'burnable poisons' to lengthen (nuclear submarine) reactor fuel operational lifetimes by building the control rods into the fuel materials."

His stay there wasn't long: Marv Wyman, a founder of what was to become NPRE, recruited Miley to Illinois in 1961. "Marv told me all the great things about Illinois and the (new) TRIGA reactor. He wanted me to create a program in TRIGA reactor kinetics and dynamics.

"The early days of the reactor were tremendous," Miley recalled. "(The reactor) could pulse in milliseconds from very low power up to thousands of megawatts and you would get this blue flash. I did what I came to do: created a program in reactor pulse propagation and coupled core kinetics and pulsing capability.

"Those were the heydays. I was teaching a class once and a student asked, 'How fast can we pulse the reactor?' I said, 'Well, we could do a couple of calculations but, better yet, let's go over and do it and see.' And we did that the same day. You wouldn't be able to do that now. Regulations to pulse the reactor would require paperwork you wouldn't believe."

Miley's fission research produced major achievements in nuclear pumped lasers, the first diode electron beam pumped lasers; advanced lasers; and nuclear batteries. He also performed some very practical service in the fission area when he was appointed in 1987 to the Nuclear Regulatory Audit Group that oversaw safety operations at the nuclear power plant in Clinton, Illinois.

Miley's administrative duties in Illinois' nuclear program grew as he took over as chair after Wyman stepped down. Miley led the program the next 14 years, helping to make it truly interdisciplinary with colleagues such as B.T. Chao from mechanical engineering, Bob Bohl from material sciences, Ben Ewing from civil engineering and Joe Verdeyne from electrical engineering. Miley also hired current NPRE Department Head Jim Stubbins. "I was a pioneer in breaking down walls between the departments to bolster the materials area in nuclear engineering," Miley said. Under his leadership, the

To make a gift to the Miley-LENR Fund, go to [http://www.ne.uiuc.edu/give\\_online.php](http://www.ne.uiuc.edu/give_online.php).





**“I have indeed been looking for a ‘black swan.’ For me, that would be some discovery that revolutionizes energy sources or energy conversion.” — George H. Miley**

program grew to 19 affiliated faculty members.

Miley also handcrafted the Department’s venture into plasma and fusion areas, with applications for power, industrial needs and space exploration. “I decided to develop a fusion effort (in the 1970s),” he recalled. “I founded the Fusion Studies Laboratory and began hiring people. We had some great people – Chan Choi (now at Purdue), Thomas Blue (now at Ohio State), John Gilligan (now at North Carolina State), Finis Southworth (now at Areva), Glenn Gerdin (now at Old Dominion University) – all young guys that we managed to attract here that gave an emphasis to our program. We really became a major force.” Later recruits from Princeton were current Profs. David Ruzic and Clifford Singer, who continue to be key in the Department’s programs.

Miley’s personal interests in fusion and plasma research continue, with work in Inertial Confinement Fusion (ICF), a process where nuclear fusion reactions are initiated by heating and compressing a fuel target; Inertial Electrostatic Confinement (IEC), a concept for retaining a plasma using an electrostatic field; Low Energy Nuclear Reactions (LENR), nuclear fusion of atoms at conditions close to room temperature; fuel cells; and fusion propulsion for space exploration.

He also heads NPL Associates, incorporated in 2001. The small, high-tech firm has spearheaded efforts to develop IEC devices, practical low-level neutron sources and, more recently, borohydride fuel cells.

As in most scientific ventures, Miley’s career-long search for “black swans” has been somewhat elusive. Obstacles beyond his control have challenged both his research and the Department’s goals. The 1979 Three Mile Island accident and a subsequent public sentiment against nuclear energy led to the University’s closure of the TRIGA reactor in 1998. Further dark days for the nuclear program followed when the College of Engineering considered ways to restructure or else disband the Department in the early 2000s. “Fortunately, this resulted in the formation of the broader-based NPPE Department. At times it’s been a real struggle,” Miley said of those periods.

But his deep belief in nuclear energy’s benefits have driven him despite the rough spots. “We have been very vital, not only to the state but to the nation in terms of supplying research and students. I think you’ll find we have supplied many outstanding leaders in the field.”

Now the political winds have shifted, and the country is turning back to nuclear energy as a viable alternative. Miley,

who claims patience and optimism as his trademarks, is hopeful for the future.

“Right now we’re on the edge of a tremendous opportunity. We can help (the country) with fission, fusion and other innovative energy sources. We’re just where we want to be to continue into the next 50 years.”

### *A Lifetime of Accomplishments... and Many Honors*

- Pioneering book on *Direct Conversion of Nuclear Radiation Energy* (1971) that initiated the field of nuclear batteries.
- First electron beam diode pumped laser (1969). The laser field quickly “exploded” with new electron beam pumped lasers.
- First visible Nuclear Pumped Laser (1976).
- Seminole book on *Fusion Energy Conversion* (1976) that initiated serious research on advanced fuel fusion.
- First comprehensive theory for solid-state gamma battery (1980).
- Concept development and detailed physics for a spark ignited inertial confinement fusion target using burn propagation into deuterium (1990).
- Discovery of Star Mode operation for inertial electrostatic confinement devices, opening the way to small lab scale neutron sources and industrial applications (1994).
- Theory and experiments in low energy nuclear reactions created in multi-layer thin-film electrodes (1997).
- Theory and experiments on a unique phonon-driven solid state x-ray laser (2002).
- Concept of an inertial electrostatic confinement neutron source driven sub-critical fission reactor for student laboratory use (2003).
- Co-inventor of a regenerative fuel cell employing hydrogen peroxide and offering major advantages for applications (2004).
- 1992 Fusion Energy Division of the American Nuclear Society (ANS) Outstanding Achievement Award.
- 1995 Edward Teller Medal.
- 2003 IEEE Nuclear and Plasma Sciences Award.
- 2004 ANS Radiation Science and Technology Award.
- 2006 “Integrity in Research Award.”
- 2006-2007, Giuliano Preparata Silver Medal.
- Editor of three major professional journals.
- Fellow of four major professional societies.
- Licensed Professional Engineer.

### ***Miley-LENR Scholarship Supports Students!***

**T**he George H. Miley-LENR Endowed Undergraduate Scholarship Fund honors its namesake’s contributions and recognizes outstanding NPPE undergraduates.

Seven NPPE students have won Miley Scholarships since the award’s inception in 2003-04. Donors are encouraged to give to the fund to pay tribute to one of nuclear engineering’s leaders and support future generations of students. Please give by going online to [http://www.ne.uiuc.edu/give\\_online.php](http://www.ne.uiuc.edu/give_online.php), or contacting the NPPE Department at 217-333-2295. Thanks for your support!

## View from campus and beyond

### NPRE Aids in Planning Nuclear Energy Conference in Jordan

**N**PRE faculty members in March helped plan the first International Nuclear & Renewable Energy Conference (INREC '10) in Jordan, as that country's scientists and government officials move to establish nuclear power there and possibly in other Middle Eastern countries.

Papers from 27 countries were submitted to INREC '10, held March 21 to March 24 in Amman, Jordan. The conference was expected to have a major effect on the Middle East's energy policy and future interactions with the U.S., Jim Stubbins, NPRE Department Head and INREC '10 General Chair, predicted.

"Jordan plays a central role in technology development in the region," Stubbins said. "Jordanian scientists are at the forefront of developing nuclear power educational programs to support the near term development of a nuclear power station in their country. The U.S. State Department supports this effort. Other countries in the Middle East are also moving in this direction. We feel that INREC '10 will play a major role in defining future directions for this critical region of the world."

Unlike many of its neighboring countries, Jordan is not rich in oil resources. Jordan is interested in nuclear power to meet its energy needs, and recently hired a South Korean firm to begin the design and construction of a research reactor at Jordan University of Science and Technology (JUST).

The country's leaders realize Jordan will need nuclear engineering education to operate and regulate this new power source. Recently, Jordan has been sending graduate students to the University of Illinois and other U.S. universities for higher education.



*INREC '10 was held on the beautiful campus of Jordan University of Science and Technology (JUST).*

Meanwhile, JUST began accepting students for its own nuclear engineering degree program in 2008, and the first degrees should be awarded in 2011. NPRE Profs. Rizwan Uddin and Magdi Ragheb traveled to Jordan in March 2007 to make recommendations on curriculum, and a contingent of JUST officials came to Illinois in 2009 to tour facilities and talk with faculty members.

INREC '10 was the next step in this continuing effort.

Stubbins, Uddin and Ragheb, along with several NPRE graduate students, presented papers at the conference. Prof. Mohammed Khasawneh, who recently spent a two-year sabbatical at Illinois, was instrumental in organizing the conference on behalf of JUST.

Keynote speakers included

- Hussein Khalil, Argonne National Laboratory's Nuclear Engineering Division Director;
- Peter B. Lyons, Principal Deputy Assistant Secretary of the U.S. Department of Energy's Office of Nuclear Energy;
- Broder J. Merkel, Professor of Geology at Technische Universität Bergakademie, Freiberg, Germany;
- Noam Lior, Professor of Mechanical Engineering and Applied Mechanics, University of Pennsylvania;
- Myung Seung Yang, President of the Korea Atomic Energy Research Institute;
- Peter W. Sauer, Grainger Chair Professor of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign;
- Hector E. Otheguy, General Manager and Chief Executive Officer of INVAP S.E. (research reactor vendor), President of the Latin American Section of the American Nuclear Society, and Chair-



man of the Board of Directors of Black River Technology Inc., INVAP's U.S. subsidiary.

Topics covered at the conference included:

- Education and training;
- Enabling technologies for nuclear applications;
- Nuclear physics;
- Nuclear power in developing countries;
- Nuclear radiation and shielding;
- Nuclear reactor technology;
- Policy studies and issues
- Renewable energy;
- Sustainable energy;
- Water, hydrogen and energy storage.



### ANS President Visits NPRE

Sharing his goal of "Getting It Done," Dr. Thomas L. Sanders, 2009-10 president of the American Nuclear Society, interacted with NPRE students and faculty and presented a graduate seminar while visiting the Urbana campus in October 2009.

The "It" Sanders referred to is the U.S. nuclear renaissance. There's been a lot of talk about "it" in the past decade, Sanders maintained, but now is the time for action. For example, he believes, U.S. industry could now exploit a considerable worldwide market by building inside factories smaller, more affordable reactors that could then be deployed in the field. These "right-sized" reactors could provide nuclear energy benefits to all nations while simultaneously eliminating the need for those nations to produce materials of proliferation concern. Sanders' advocacy for these opportunities was the subject of his seminar talk, "Global Energy Needs: Defining a Role for a 'Right-Sized Reactor'."

Sanders further believes the 11,000-member ANS, dedicated to advancing and promoting nuclear science and technology, can play a major role in the licensing and decision-making processes for the new plants. Sanders has been active in ANS since the mid 1970s, when he served as student branch president at the University of Texas. There, he earned bachelor's, master's and doctoral degrees in mechanical engineering with a focus on nuclear science and engineering.

As president, Sanders' ANS duties included traveling the world to promote nuclear energy. His visit to Champaign-Urbana included speaking at the Central Illinois Section ANS meeting October 20 as well as visiting with NPRE faculty and students. Sanders toured several NPRE laboratories, including the virtual reality lab where he experienced immersion in 3D, virtual and interactive models of nuclear facilities. The models can be used for training purposes.

In addition to his ANS duties, Sanders is Co-founder and former Vice President of the American Council on Global Nuclear Competitiveness. Since 1997, he has served as Sandia National Laboratory's Manager/Integrator of the Global Nuclear Materials Management and Nuclear Futures Initiatives.

As such, Sanders has led the development of topical meetings, policy papers, news articles, partnership events with other countries and non-government organizations, and caucus events on Capitol Hill to articulate that a healthy and thriving U.S. nuclear energy infrastructure (from education to labs, suppliers, operators, and NGOs) is key to global prolif-



*American Nuclear Society 2009-10 President Thomas L. Sanders visited with members of the local ANS student chapter last fall. Above, from left, are Richard Boettcher, Eric Stein, Cody Morrow, Ayasha Athar, Carlos Altamirano, Sanders, Jose Rivera and Eric Becker. Below, Sanders experiences Prof. Rizwan Uddin's Visbox laboratory first-hand.*



*View from Campus and Beyond...from page 13*

eration risk management in the future. He has developed a complementary partnership initiative between seven U.S. and nine Russian lab directors. This message has been delivered at Presidential summits, White House and Congressional briefings, and to numerous champions throughout government, industry, labor, and academia.

Sanders assumed the ANS presidency in June 2009, upon the conclusion of NPRE alumnus William E. Burchill's term as president.



## Homecoming 2009/2010 Visitors Advise Students on Nuclear Engineering Careers

An effort to bring together NPRE alumni, students and faculty was accomplished successfully during the 2009 and 2010 University of Illinois Homecomings, as alumni returned to campus to share with students information on jobs and careers in nuclear engineering.

Fifteen visitors attended each of the October events in 2009 and 2010. Gaining momentum, the event has been renamed "NPRE Interchange" to reflect the goal of the groups meeting and performing an exchange before going on their ways.

Said Becky Meline, NPRE Student Affairs Coordinator, "Our students are very excited about connecting with alumni to learn about current research and internship and permanent career opportunities. We wanted to bring in both recent alumni who are closer in years to the experiences of the students, and more established alumni who, with longer work history, can provide a broader prospective. It was great to see all the interaction among the students, alumni, and faculty. I think it was a very well-received event that will definitely be held again."

NPRE Interchange has a two-fold purpose. One is to give NPRE students a chance to network with the guests about industries, national laboratories and regulatory agencies that focus on nuclear power and plasma engineering. The second is to acquaint alumni with the students available for internships and/or permanent positions.

Companies and organizations wanting to participate in future events of this kind should contact Meline at [bmeline@illinois.edu](mailto:bmeline@illinois.edu).



### NPRE Interchange

- 1) From Exelon, Jeffrey Dunlap, tie, and Brad Adams, suit, 2010.
- 2) From the NRC, Ken Riemer, white shirt and tie; Jason Draper, left of Riemer; Jennifer Gall, right of Riemer, 2009.
- 3) From Argonne National Lab, Abdellatif Yacout, right, 2010.
- 4) From Starfire Industries, Mike Reilly, white shirt, and Robert Stubbers, suit, 2010.



Representing their employers, the 2009 and 2010 visitors met individually with small groups of students throughout the day. The visitors then joined together to give presentations in two panels: one, focusing on industry and regulation, the other on national laboratories and plasma engineering.

### 2009 Interchange Participants

#### Argonne National Laboratory:

— Mitchell T. Farmer, PhD 88, Nuclear Engineer, Section Manager, Engineering Development Laboratories, Nuclear Engineering Division

#### Brookhaven National Laboratory:

— William C. Horak, BS 72 *Aerospace Engineering*, MS 73, PhD 80, Chair, Energy Sciences and Technology Department

#### Exelon Corporation:

— Gabriel Chavez, BS 07, Qualified Nuclear Engineer, Dresden Generating Station

— Sarfraz M. Taj, BS 05, Project Manager, Corporate Project Nuclear Management Group, Cantera Headquarters

#### Idaho National Laboratory:

— Maria A. Okuniewski, MS 04, PhD 08, Research and Development Scientist and Engineer Basic Fuel Properties and Modeling Division

#### Nuclear Regulatory Commission:

— Jason D. Draper, BS 07, Reactor Engineer, Division of Reactor Projects, Region III Office, Lisle, Illinois.

— Jennifer M. Gall, BS 08, General Engineer, Nuclear Safety and Professional Development Program, Office of Nuclear Reactor Regulation, Department of Operating Reactor Licensing

— Kenneth R. Riemer, BS 84, Branch Chief, Division of Reactor Projects, NRC Region III Office, Lisle, Illinois

#### Oak Ridge National Laboratory:

— Jeffrey L. Binder, BS 85, MS 87, PhD 91, Program Manager, Isotope Production

#### Sandia National Laboratory:

— Paul S. Pickard, former NPRE faculty member, Technical Director, U.S. DOE Generation IV Energy Conversion Program

— Jason P. Petti, BS 98 *Civil Engineering*, MS 00 *Civil Engineering*, PhD 04 *Civil Engineering*, Senior Member Technical Staff, Structural Integrity and Licensing Support, Nuclear Safety Energy Technologies

#### Sargent & Lundy<sup>LLC</sup>:

— Mirko Ascic, BS 05 *Electrical Engineering*, BS 05, MS 06, Associate, Nuclear Technology and Regulations Group

— Kristin C. Geiger, BS 07, Associate, Mechanical Engineering Group

#### Starfire Industries<sup>LLC</sup>:

— Brian E. Jurczyk, BS 95 *Aerospace Engineering*, MS 97, MBA 00 *Technology Commercialization*, PhD 01, President, Starfire Industries<sup>LLC</sup>

(Alumnus Michael R. James, BS 89, MS 93, PhD 97, a nuclear engineer working at Los Alamos National Laboratory also met with students during Homecoming 2009.)



#### NPRE Interchange

5) From Sargent & Lundy, Dennis DeMoss, left, and David Gennardo, beard, 2010.

6) From Oak Ridge National Lab, Jeff Binder, 2010.

7) From Idaho National Lab, Maria Okuniewski, 2009.

8) From Brookhaven National Lab, Bill Horak, 2009.

continued on page 16

View from campus





**NPRE Interchange**  
9) From Sandia National Lab, Paul Pickard, left, and Jason Petti, right, 2009. 10) From Soladigm, Martin Neumann, left, 2010.



*View from Campus and Beyond... from page 15*

### 2010 Interchange Participants

#### Argonne National Laboratory:

— Abdellatif Yacout, MS 86, PhD 90, Nuclear Engineer, Nuclear Engineering Division

#### Exelon Corporation:

— Bradley J. Adams, BS 81, MS 83, Plant Manager, Byron Generating Station

— Jeffrey A. Dunlap, MS 94, SFP and Decommissioning Manager, Exelon Generation Co.'s Exelon Nuclear Division

— Thomas E. Sowinski, BS 09, Reactor Engineer, Dresden Power Station

— Eric Stein, BS 10, Reactor Engineer, LaSalle Nuclear Power Station

#### Idaho National Laboratory:

— Maria A. Okuniewski, MS 04, PhD 08, Research and Development Scientist and Engineer, Basic Fuel Properties and Modeling Group, Nuclear Fuels and Materials Division

#### Nuclear Regulatory Commission:

— Jason D. Draper, BS 07, Reactor Engineer, Division of Reactor Projects, NRC Region III

— Kenneth R. Riemer, BS 84, Branch Chief, Division of Reactor Projects, NRC Region III

— April M. Scarbeary, BS 08, Reactor Engineer, Division of Reactor Projects, NRC Region III

#### Oak Ridge National Laboratory:

— Jeffrey L. Binder, BS 85, MS 87, PhD 91, Program Manager, Isotope Production

#### Sargent & Lundy<sup>LLC</sup>:

— Dennis DeMoss, MS 81 *Materials Engineering*, Senior Vice President and Project Director

— David J. Gennardo, BS 07, MS 10, Nuclear Associate, Nuclear Technology and Regulations Division

#### Starfire Industries<sup>LLC</sup>:

— Michael P. Reilly, BS 03 Aerospace Engineering, MS 05, PhD 09, Research Engineer

— Robert A. Stubbers, MS 98, PhD 02, Vice President of Research, NPRE Adjunct Research Assistant Professor

## University of Pisa Students Visit Illinois



**Above:** NPRE Prof. Rizwan Uddin, at left, with students from the University of Pisa, Italy, on a tour of the Clinton, Illinois, nuclear power station (in the background) in Fall 2009. **Right:** Fall 2010 marked the fifth year Italian students have spent the month of September studying in NPRE on the Urbana-Champaign campus. Again touring the Clinton plant, Uddin is second from the right, while Prof. Marco Beghini, who traveled from Pisa to Illinois to teach a class during the fall semester, is fourth from the left.





## Energy and Sustainability Graduate Option Debuts in Spring 2010

Beginning in January 2010, the College of Engineering offered a Graduate Option Program in Energy and Sustainability Engineering (EaSE), designed to provide the components of breadth and depth for students who are enrolled in a departmental masters or PhD program, where they build a core competence in a discipline.

"The EaSE initiative is a significant step in breaking down barriers to interdisciplinary work on the challenge of transitioning to a sustainable energy future," remarked NPRE Prof. Clifford E. Singer, who is the initiative's co-director. The topics of energy and sustainability are highly interrelated; a leading example is bioenergy, which has major implications concerning land, water, atmosphere, and sustainability.

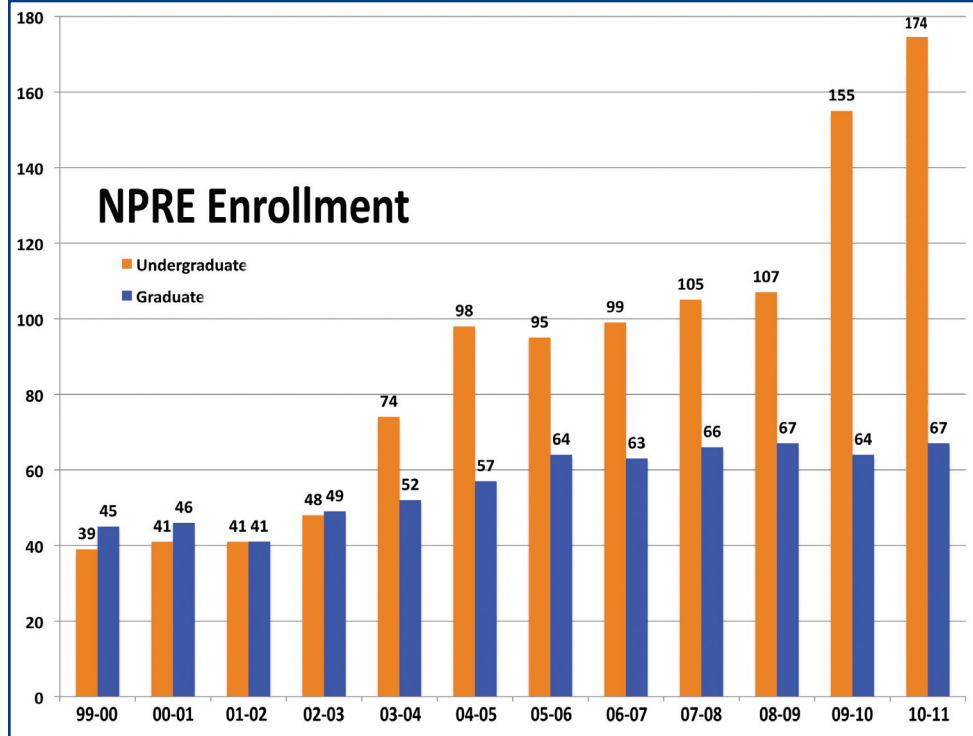
Energy Engineering refers to the development of technologies for energy harvesting, conversion, transmission and use that are highly efficient and sustainable in future generations. Sustainability Engineering refers to the development of technologies that provide the necessities for civil society and the infrastructure for commerce in efficient and renewable ways that minimize adverse impact on the earth system.

"An effective preparation for the student is to acquire a rigorous background in a core engineering discipline, combined with an interdisciplinary understanding of the energy and sustainability challenges and a deeper understanding of a chosen sub-topic," explained Victoria Coverstone, associate dean for graduate and professional programs in the College of Engineering at Illinois. "The purposeful mixture of core, breadth, and depth will allow the graduate to tackle problems that are faced in research, planning, development, and implementation of advanced technologies, as well as the interface between technology and society."

The College of Engineering initiative in Energy and Sustainability Engineering (EaSE) has four goals:

- To promote interdisciplinary research that joins the

### NPRE Enrollment



fields of science, engineering, environment and policy.

- To provide education and training for the global workforce.
- To engage industrial partners in the research and educational missions of the university.
- To link efforts within the College to complementary programs on campus.

"The new EaSE Graduate Option Program is the result of a rich dialogue between all the departments in engineering, earth sciences, chemistry, and architecture/urban planning," according to John Abelson, a professor of materials science and engineering and co-director of the Energy and Sustainability Engineering initiative. "During the next year, we will enthusiastically promote the writing of interdisciplinary research proposals, taking advantage of the new initiatives from the federal government."

Participation in EaSE will not delay a student's progress towards the degree or add to the total course load. The option is based on courses that are currently offered by the college of engineering and by other schools at Illinois. To gain interdisciplinary understanding, all students will enroll in a team-taught core course consisting of ENG 471, Seminar in EaSE, and ENG 571, Theory and Methods in EaSE. The core course consists of a series of modules. The seminar speakers are faculty experts in each of the EaSE areas of specialization; there will also be guest lecturers from industry and other universities.

# Getting the Word Out

## Burchill's Mission

As the top ambassador for the American Nuclear Society, NPRE alumnus William E. Burchill saw his presidency of that organization as a prime opportunity for "Getting the Word Out."

ANS president from June 2008 to June 2009 and, more recently, immediate past president, Burchill, MS 65, PhD 70, literally traveled the ends of the earth to fulfill his mission.

As the organization's vice president and president, Burchill traveled to 21 states and 10 foreign countries, meeting with officials of nuclear industry and government. He gave talks to 19 ANS Local Sections, including five outside the United States; six ANS Student Sections; 13 national conferences including PARTRAM, WIN, an ANS Student Conference, Nuclear Non-Operating Owners Group, California Clean Innovation Conference, and three ANS topical meetings; nine universities; and nine international conferences: the 2008 LAS/ANS Symposium, the 2008 IAEA General Conference, the 2008 Mexican Nuclear Society Meeting, the 2008 Slovenian Nuclear Society Meeting, the 2008 Pacific Basin Nuclear Conference, the 2009 Korea Atomic Industrial Forum, the 2009 Japan Atomic Industrial Forum, the Atomic Energy Society of Japan 50th anniversary celebration, and the Korean Nuclear Society 40th anniversary celebration.

He also toured numerous nuclear facilities:

- in France, the Areva La Hague Reprocessing Plant, the Areva Melox MOX Fuel Fabrication Plant, the Areva Chalons/Saint Marcel Heavy Metal Fabrication Plant, the Areva Creusot Forge, and the CEA Laboratory at Saclay
- in Slovenia, the Jozef Stefan Institute
- in Brazil, the Angra nuclear power plant including its environment monitoring laboratory and operator training center
- in Japan, the Nuclear Fuels Limited Rokkasho facilities, the

- Hitachi Kaigan Factory (turbines) and Rinkai Factory (nuclear key and heavy components), the Toshiba Isogo Engineering Center (T-H and FBR test facilities) and Keihin Product Operations (turbines and nuclear key and heavy components), the Mitsubishi Heavy Industries Kobe Main Shop (nuclear heavy components and maintenance training center) and Futami Plant (nuclear heavy components), the Japan Steel Works Zvisen Sword Smithy (art swords) and Muroran Plant (nuclear heavy forgings), the Hokkaido Electric Power Tomari Nuclear Power Station, and the Japan Atomic Energy Agency Tokai Nuclear Fuel Cycle Engineering Laboratories Reprocessing Plant and Chemical Processing Facility
- in Taiwan, the Atomic Energy Council National Emergency Response Center and the Institute for Nuclear Energy Research
- in South Korea, the Korea Hydro and Nuclear Power Shin-Kori Nuclear Power Station
- in China, the Tsinghua University Institute of Nuclear and New Technology Engineering 10 Mwt high temperature gas cooled pebble bed reactor (HTR-10), the Shanghai Jiao Tong University nuclear engineering laboratories, the Daya Bay and Ling Ao nuclear power stations, and the Sanmen site at which the world's first AP-1000 nuclear power plants are under construction
- and in the United States, the DOE Waste Isolation Pilot Plant in Carlsbad, NM, the Westinghouse nuclear fuel manufacturing plant in Columbia, SC, and the General Electric nuclear facilities in Wilmington, NC.

Burchill believes the relentless advocacy touting the benefits of nuclear energy paid dividends. In the following, he tells of his experience, what was accomplished, and what must still be done.

### Q: What particular anecdotes give insight into your mission and what you were trying to accomplish?

A: For many months (following his campaign and eventual election), President Obama's position on nuclear energy was quite unclear," Burchill said. "The uncertainty of his position was noted by others with whom I interfaced throughout my travels in the United States, Austria, France, Slovenia, Japan, Taiwan, South Korea, and China.

This had the potential to undermine the United States' position of leadership and influence relative to nuclear policy in the world. Fortunately, this situation improved significantly. During his State of the Union Address on January 27, 2010, President Obama said "to create more of these clean energy jobs, we need more production, more efficiency, more incentives. And that means building a new generation of safe, clean nuclear power plants in this country."



The first substantive evidence of his intent came on February 16, 2010, when he announced that the Department of Energy had offered conditional commitments for a total of \$8.33 billion in loan guarantees for the construction and operation of two new nuclear power reactors at the Plant Vogtle in Burke County, Georgia. The project is the first U.S. nuclear power plant to break ground in nearly three decades. The President's FY2011 budget requests an additional \$36 billion in loan authority, which would triple the loan guarantee authority for nuclear energy.

Further evidence is provided by the announcement on January 29, 2010, by DOE Secretary Chu of the appointment of a "Blue Ribbon Commission on America's Nuclear Energy Future." The announcement described this action "as part of the Obama Administration's commitment to restarting America's nuclear industry."

The announcement further stated "The Administration is committed to promoting nuclear power in the United States and developing a safe, long-term solution for the management of used nuclear fuel and nuclear waste." These positive announcements are most welcome and may, in part, reflect ANS members' "Getting the Word Out" efforts.

**Q. What goals did you have, what progress do you feel was made, and what do you think must still be achieved?**

A. My goal was to change ANS infrastructure and practices in a manner that "Getting the Word Out" became more institutionalized. Much progress has been made. An example is the major expansion of public information available to members on the ANS website. Another is ANS' new initiative, endorsed by the Board of Directors, to provide recommendations for various appointments to federal positions, particularly in the Department of Energy and the Nuclear Regulatory Commission. Another is ANS members' participation in the numerous lunches and tutorials on public information that have been conducted at the last few ANS national meetings. Yet another is the enthusiastic engagement of Local Sections with the public, educators, and press in their local areas. Each of these can be improved even further.

**Q: Can you summarize how you view the state of the nuclear field, and where it needs to go from here?**

A. The most visible aspect of the "nuclear field" is nuclear energy. The renaissance of interest in expanding the use of nuclear energy is more robust in many other countries of the world than in the United States. This was particularly evident in the outcomes of the G8 Energy Ministers meeting in May 2009, and the G8 Heads of State meeting in July 2009.

Strong enthusiasm for nuclear energy was expressed by France, Japan, South Korea, China, India, and the United Kingdom. This was mirrored in many other applications of nuclear technology in fields such as agriculture, medicine, food preservation, desalination, and sterilization.

Although the United States' nuclear industry remains technologically at the forefront of many applications, favorable government export policies are required to allow successful competition against sources which have more nationalized support.



*The retired Head of Texas A&M University's Nuclear Engineering Department, Bill Burchill has 37 years of experience working for an NSSS vendor, two nuclear utilities, a university, a defense facility, and a national laboratory. His research interests include: nuclear power, nuclear safety, risk management, reactor regulation, reactor operations, and reactor design. Among his honors has been the 2008 NPPE Distinguished Alumni Award.*

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Alumni

*Burchill's Mission/Getting the Word Out...from page 19*

During 2009 the United States executed nuclear export agreements, called "123 Agreements" which refers to Section 123 of the United States Atomic Energy Act, with India and the United Arab Emirates. This opens the door to competition in these emerging nuclear markets. The 123 Agreement with China allowed Westinghouse to bid successfully on the first four AP 1000 contracts in that country.

However, the United States government must become even more proactive relative to both nuclear power in the United States and supplying nuclear technology to other countries. A major factor in export considerations is providing assurance of non-proliferation. A principal means of providing this assurance is disallowing export of enrichment and reprocessing technologies. However, this requires that there be some form of fuel supply-and-return policy between the United States, which has enrichment and reprocessing capabilities, and customer nations that do not.

**Q. What did you most enjoyed about your year as president?**

A. During my year as ANS President I most enjoyed meeting with the extremely diverse variety of professionals in both the United States and many other countries of the world. The enthusiasm of these individuals and of their organizations was a strong source of encouragement and stimulation to carry forward the ANS mission. I was honored to represent ANS in many professional forums and to establish foundations for continued communications both personally and on behalf of the Society that will last well into the future.

*The retired Head of Texas A&M University's Nuclear Engineering Department, Bill Burchill has nearly 40 years of experience working for an NSSS vendor, two nuclear utilities, a university, a defense facility, and a national laboratory. His research interests include: nuclear power, nuclear safety, risk management, reactor regulation, reactor operations, and reactor design. Among his honors has been the 2008 NPPE Distinguished Alumni Award.*

## Lewis Chosen for ANS Compton Award



*Kenneth D. Lewis*

Society recognized Lewis for his five years of dedicated work in establishing a fully viable nuclear science and engineering program at South Carolina State University (SCSU). SCSU now is the only member of the Historically Black College and Universities with an Accreditation

**N**PRE alumnus Kenneth D. Lewis, MA 79 (Applied Mathematics), PhD 82, has received the 2010 Arthur Holly Compton Award in Education for outstanding contributions in nuclear science and engineering education.

The American Nuclear So-

Board for an Engineering and Technology accredited program in nuclear engineering.

Since 2005 Lewis has served as Dean of the College of Science, Mathematics, and Engineering Technology and BWXT Professor of Nuclear Engineering at SCSU. The academic post evolved from a mentor-protégé agreement reached a year earlier between Lewis' employer, BWXT Y-12LLC, and the university.

Lewis was honored in 2008 with the University of Illinois College of Engineering Alumni Award for Distinguished Service for contributions in serving and safeguarding the public through his work as an educator and nuclear engineer.

In addition to his lifelong commitment to promoting higher education among African Americans, Lewis served his country by helping to complete the successful 1994 "Sapphire project." The secret U.S. mission involved retrieving approximately 600 kilograms of very highly enriched weapons-grade uranium (sufficient to construct several Hiroshima-size atomic bombs) from the former Soviet Republic before it could fall into terrorists' hands.





## African American Journal Chronicles Sampson's Life

**A** recollection of the prejudices and eventual triumphs NPRE alumnus Henry T. Sampson, Jr., experienced as he worked to become a successful nuclear engineer and author are detailed in the Spring 2009 edition of *The Journal of African American History*.


"Autobiographies and 'life-writings' are some of the most valuable primary sources on the African American experience, and autobiography is the most important genre in the African American literary and intellectual traditions," according to the journal's introduction.

Beginning with his 1934 birth in racially segregated Jackson, Mississippi, Sampson carries the reader through a litany of obstacles he overcame in his effort to maintain his human dignity. In one case he talked about how he and other African American boy scouts, on a train ride home from a national jamboree in 1950, were told to exit their coach because a group of white scouts preferred it and wanted to use it. Sampson led the way in exiting the train but refused when told to re-board to another coach. Faced with the peaceful demonstration, organizers eventually allowed the black scouts to return to their original coach.

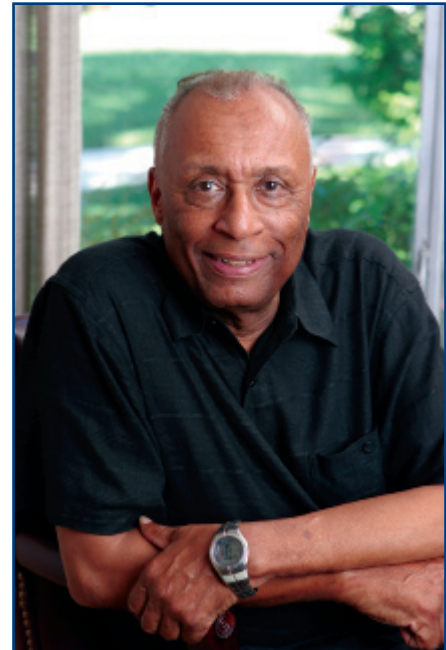
Sampson also tells how he was given a bed in the Purdue University infirmary rather than a dorm room early on while earning his bachelor's degree there in the 1950s, and that he was told, "No Negro engineers are being hired," when he first went for interviews as a senior.

Despite the hardships, Sampson got a job at the U.S. Naval Ordnance Test Station in El Segundo, California, and earned a few patents while there. He later earned a master's degree at the University of California at Los Angeles before coming to Illinois for a PhD. Sampson and his advisor, NPRE Prof. George H. Miley, worked together to invent the gamma-electric cell, a new type of solid-state device that converted gamma radiation directly into useful electrical power. They gained a patent on the device.

Sampson then returned to California to work on satellite programs for the Aerospace Corporation, continuing there until his retirement in 2004. In addition to his Engineering career, Sampson pursued a second interest of documenting the history of African Americans in films, theater and other entertainment. This research project, started while he was still in graduate school at Illinois, culminated in several books, including *Blacks in Black and White: A Source Book on Black Films* (1977; second edition 1995); *Blacks in Blackface: A Source Book on Early Black Musical Shows* (1980); *The Ghost Walks: A Chronological History of Blacks in show Business, 1965-1910* (1988); *That's Enough Folks: Black Images in Animated Cartoons, 1900-1960* (1998); and *Swingin' on the Ether Waves: A Chronological History of African Americans in Radio and Television Broadcasting, 1925-1955* (2005).

Recognizing Sampson's notable career and record of service, the University of Illinois College of Engineering honored him with the 2009 Alumni Award for Distinguished Service. 

**Editor's Note:** Readers interested in viewing the full journal article should either go to the association's website at [www.asalh.net](http://www.asalh.net), or call 1-202-865-0053 for more information. The association will then guide readers through means to purchase the journal.



Henry T. Sampson, Jr.



Photo by Jonathan Sprague/Redux

*K.R. Sridhar, principal co-founder and CEO of Bloom Energy, displays the fuel cells that are the heart of his greentech energy system.*

## **Alumnus KR Sridhar Attracts National Attention for his Green Tech Energy System**

**N**PRE alumnus KR Sridhar, MS 84 (*PhD 1990 Mechanical Sciences and Engineering*) made a splash with the national media this past winter when his company, Bloom Energy, unveiled the “Bloom Box,” a fuel-cell system that promises cleaner, more reliable and more efficient alternative energy.

Interviewed in February by CBS *60 Minutes* reporter Lesley Stahl, Sridhar made a case for Bloom Boxes replacing the standard electric grid for the company’s customers. “This technology is fundamentally going to change the world,” he believes. “It’s going to have a disruptive impact on the way energy is produced.”

Bloom Energy has attracted many high-powered believers: the Silicon Valley-based tech firm has raised around \$400 million in investment capital. Companies such as Google, Coca Cola, Walmart, FedEx Corp., eBay Inc. and Staples have signed on to test the product.

The groundbreaking technology is based on a “powder to power” concept. Bloom Energy uses common beach sand to produce flat, solid ceramic squares that are about the size of a compact disc case. Either side of the

square is coated with a green or a black ink made from a secret formula Sridhar developed. Oxygen is fed into one side of the square, and fuel to the other. The two combine within the cell to create a chemical reaction that produces electricity.

One square generates enough power for a light bulb. Stacking the squares one upon the other increases the amount of energy produced. Many of the squares arranged together result in what the company calls a Bloom Energy Server, or, what is nicknamed a “Bloom Box.” Each server provides 100 kilowatts (kW) of power in roughly the footprint of a parking space. Each system generates enough power to meet the needs of approximately 100 average U.S. homes or a small office building. For more power, customers simply deploy multiple servers side by side. The modular architecture allows customers to start small and “pay as they grow.” Currently, “Bloom Boxes” cost \$700,000 to \$800,000 each, but the company believes the price can decrease as demand increases.

According to the company, the Bloom Energy Server converts air and nearly any fuel source – ranging from natural gas to a wide range of biogases – into electricity via a clean electrochemical process, rather than dirty combustion. Even running on a fossil fuel, the systems are approximately 67% cleaner than a typical coal-fired power plant. When powered by a renewable fuel, they can be 100% cleaner.

Founded in 2001, Bloom Energy can trace its roots to the NASA Mars space program. For NASA, Sridhar and his team were charged with building technology to help sustain life on Mars using solar energy and water to produce air to breathe and fuel for transportation. They soon realized that their technology could have an even greater impact here on Earth and began work on what would become the Bloom Energy Server.





# Bloom Box Energy for the Future

"Bloom Energy is dedicated to making clean, reliable energy affordable for everyone in the world," said Sridhar. "We believe that we can have the same kind of impact on energy that the mobile phone had on communications. Just as cell phones circumvented landlines to proliferate telephony, Bloom Energy will enable the adoption of distributed power as a smarter, localized energy source."

Prior to founding Bloom Energy, Sridhar was Director of the Space Technologies Laboratory (STL) at the University of Arizona, where he was also a professor of Aerospace and Mechanical Engineering. Under his leadership, STL won several nationally competitive contracts to conduct research and development for Mars exploration and flight experiments to Mars.

Sridhar has served as an advisor to NASA and has led major consortia of industry, academia, and national labs. *Fortune Magazine* recognized his work for the NASA Mars program to convert Martian atmospheric gases to oxygen for propulsion and life support. The magazine cited Sridhar as "one of the top five futurists inventing tomorrow, today."

As one of the early pioneers in green technology, Sridhar also serves as a strategic limited partner at Kleiner Perkins Caufield & Byers and as a special advisor to New Enterprise Associates. He also has served on many technical committees, panels and advisory boards and has several publications and patents.

Sridhar earned his bachelor's degree in Mechanical Engineering with Honors from the University of Madras, India. As a student at the University of Illinois, he worked with NPRE Profs. Barclay Jones and Jim Stubbins, and with Bei Tse Chao, now MechSE emeritus professor. All three were tremendous mentors, Sridhar said.


"Barclay Jones was such a nurturing person. From him, I learned what it meant to be a good boss and to have a heart. Jim Stubbins was a younger professor who had just joined the faculty from industry; he was full of enthusiasm and energy, and was always available. Both



Photo: Bloom Energy

*K.R. Sridhar with a Bloom Energy Server.*

helped very nicely in my transition to B.T. Chao (who supervised Sridhar's PhD work.)

"What (Chao) taught me is something that I, too, practice to this day. He was a phenomenal multi-tasker. (As department head, Chao) had one of the biggest mechanical engineering programs in the country, in addition to research and teaching. He always had to do many things on his plate, but he had the knack for focusing on one thing at a time without getting distracted. That was a life lesson; not an engineering lesson." 

## The News Got Around

CBS *60 Minutes* interview with K.R. Sridhar on his company, Bloom Energy, can be viewed at [http://www.youtube.com/watch?v=khK\\_QTWI5Nc](http://www.youtube.com/watch?v=khK_QTWI5Nc).

News of Sridhar and the "Bloom Box" also has been covered in these media outlets:

- |                                |                              |
|--------------------------------|------------------------------|
| <i>Newsweek</i>                | <i>FoxNews</i>               |
| <i>Santa Cruz Sentinel</i>     | <i>PC Magazine</i>           |
| <i>Los Angeles Times</i>       | <i>MarketWatch</i>           |
| <i>USA Today</i>               | <i>Greentech Media</i>       |
| <i>The New York Times</i>      | <i>Time</i>                  |
| <i>The Wall Street Journal</i> | <i>Business Week</i>         |
| <i>MercuryNews.com</i>         | <i>The Atlantic Monthly</i>  |
| <i>Fast Company</i>            | <i>Guardian UK</i>           |
| <i>Forbes</i>                  | <i>Business Week</i>         |
| <i>TriplePundit</i>            | <i>Fortune</i>               |
|                                | <i>CNNMoney/Business 2.0</i> |

*Summer*



# Classes

## 1960s

**Bernard "Bud" Cherry**, BS 62 Chemistry, MS 63 NPRE, is Chairman and Chief Executive Officer of Energy 5.0 in West Palm Beach, Florida. The company develops, finances, constructs, and operates renewable energy production facilities. In December 2009, the Florida Public Service Commission approved E5.0's contract with Tampa Electric Company to purchase solar power supplied by the Energy 5.0 Solar I Project, a planned 25 megawatt solar photovoltaic electric generation station. For a 25-year period beginning in 2011, Tampa Electric will purchase the entire electrical output from the project. The approval provides Tampa Electric full rate recovery of the costs associated with power purchase agreement executed with Energy 5.0 in February 2009.

## 1970s

**David P. Weber**, MS 70, PhD 74, has retired from Argonne National Laboratory after a 36-year career. Most recently, Weber directed the Transportation Research and Analysis Computing Center at Argonne National Laboratory. He previously had directed New Program Development in the areas of transportation, nuclear energy and homeland security, and had directed the Nuclear Engineering Division, among other duties.

## 1980s

**Stephen A. Coggeshall**, MS 81, MM Music 84, PhD 84, is Chief Technology Officer of ID Analytics, which applies advanced analytics technology and a business model to address identity fraud. Coggeshall has worked closely with ID Analytics and its executives since its inception and was instrumental in building the company's initial technical team and roadmap. In 2002,

Coggeshall was co-founder and CEO of the analytics consulting company, Los Alamos Computational Group, which worked primarily with Morgan Stanley. Coggeshall has spent his 20-plus year career leading scientists to build solutions to difficult business problems using advanced analytics. He joined Morgan Stanley as an Executive Director, working in the areas of asset allocation, portfolio analysis, stock selection, proprietary derivatives trading and behavioral forecasts of investors and financial advisors. Prior to Los Alamos Computational Group, Coggeshall was Group Vice President of the technology development organization at HNC Software. Until that time, Coggeshall was co-founder of CASA, where he managed a group doing consumer behavioral and portfolio modeling and analysis (CASA was purchased in 2000 by HNC Software). Coggeshall also spent 11 years at the Los Alamos National Laboratory in the field of laser fusion. Coggeshall was named a Technology Executive of the Year by the San Diego Business Journal in 2008.

### Yousry Y.

**Azmy**, MS 82, PhD 85, Head of the Nuclear Engineering Department at North Carolina State University, recently published a book, *Nuclear Computational Science*, discussing the developments made to the mathematical theory and computational science underlying the discipline, and advances in areas such as high-order discretization methods, Krylov Methods and Iteration Accel-



Yousry Azmy

eration. Azmy's research interests are in the development, implementation, and analysis of advanced methods and solution techniques for particle transport problems.

### John F. Kotek

BS 89, Partner in Gallatin Public Affairs consultant group in Boise, Idaho, is serving as the Staff Director of a Blue Ribbon Commission U.S. Department of Energy Secretary Steven Chu formed



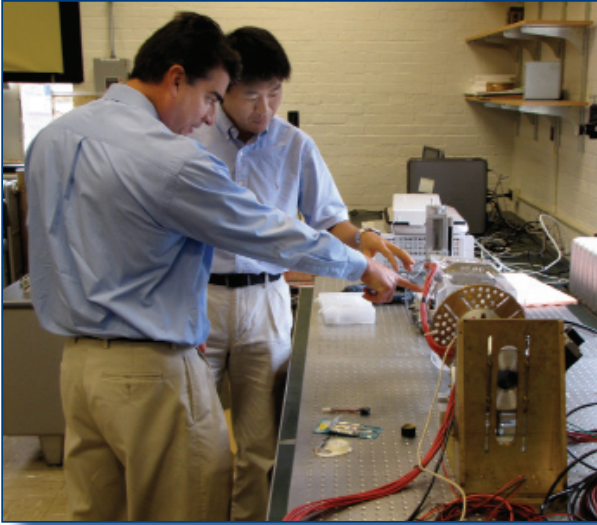
John Kotek

to conduct a review of policies for managing the back end of the nuclear fuel cycle and recommend a new plan. Gallatin provides consultant expertise and lobbying assistance on energy policy and facility siting. Kotek's work at Gallatin involves bringing together business, political, and community support for projects that will help address local and national energy needs. Kotek is a recognized expert on energy policy issues. He has testified before Congress and state legislatures and has written for *Scientific American* and other periodicals.

## 1990s

**Michael Kaminski**, BS 94, MS 96, PhD 98, a Principal Materials Engineer at Argonne National Laboratory, has been involved in nuclear waste minimization and stabilization technology since his undergraduate studies. He is responsible for advanced nuclear fuel cycle radioactive waste development under the Advanced Nuclear Fuel Cycle Initiative within DOE, including thermal transport, radiation dosimetry, and facility design. He also has developed technologies for decon-





NPRE Assistant Prof. Ling Jian Meng, right, explains some of his latest research projects to alumnus Michael Kaminski, who presented a seminar in NPRE in January.

tamination of nuclear facilities and for decontamination of urban centers following a radionuclide release. Kaminski is developing medical treatment technologies based on magnetic nanospheres that he originally developed under an alternative nuclear waste management program for the Department of Energy.

**Douglas B. Hayden**, BS 92, MS 95, PhD 99, has joined Applied Materials' flat panel LCD display division as Senior Director of Product Marketing and Management. He is responsible for creating product value and communicating internally and externally to deliver market share goals for the CVD product line. Hayden will take the lead in translating market needs to product specifications and roadmap, implementing them by driving product development, product configuration and change control, and developing/executing product pricing and positioning strategy. Prior to joining Applied Materials, Hayden worked for Novellus, where he gained more than ten years of capital equipment experience and moved up the ladder in technology management positions. In his most recent role at Novellus, he

was Director of Technology of the Gapfill Dielectric Business Unit.

**Derek Jokisch**, BS 95, an astronomy professor at Francis Marion University (FMU) in Florence, South Carolina, received the 2010 Elda E. Anderson Award for research contributions to the health physics community. The award was presented at the 55 Annual Health Physics Society Conference in Salt Lake City. Jokisch has been an FMU faculty member since

1999, having earned master's and PhD degrees in health physics from the University of Florida. He is certified in comprehensive practice by the American Board of Health Physics, and is a leader of FMU's Health Physics Program.

## 2000s

**Jean Paul Allain**, MS 00, PhD 01, an assistant professor of nuclear engineering at Purdue University in West Lafayette, Indiana, has been chosen for an Early Career Research Program Award by the U.S. Department of Energy. The award supports Allain's research in harnessing nanotechnology concepts to bring about new "plasma-facing" materials for use in advanced thermonuclear fusion devices. Allain and his collaborators recently have made discoveries critical to understanding reactions between hot plasma inside a fusion reactor and surfaces facing the plasma. The work is part of a global effort to develop advanced nuclear fusion power plants. The multidisciplinary research will enable new designs tolerant to radiation damage. Allain and his wife, an NPRE

alumnae, **Monica M.C. Allain**, MS 00, PhD 04, also are celebrating the January 5 birth of their daughter, Camille Elise Allain. Monica Allain is managing director of the Birck Nanotechnology Center in Discovery Park.

**Eric Rozek**, MS 03, returned in December to active duty as an Executive Officer on a submarine. He had been working at the Defense Nuclear Facilities Safety Board in Washington, D.C.

## In Memorium

**Jason L. Forsythe**, BS 97, 34, of Wilmington, Illinois, died March 4, 2010 from injuries sustained in an automobile accident. Forsythe was employed by Exelon Dresden Nuclear, was a member of the U of I Alumni Association, a fan of Raiders football and enjoyed playing Texas Hold 'em for charity. Survivors include his wife; two sons; parents; three siblings; nieces and nephews; great nieces and nephews; mother and father-in-law; two sisters and brothers-in-law; and several aunts, uncles and cousins.

**Andrei G. Lipson**, a visiting research scholar who had worked with NPRE Prof. George H. Miley for four years, died November 1. He was 52. A physicist from the Institute of Physical Chemistry and Electrochemistry from the Russian Academy of Sciences, Moscow, Lipson is survived by his wife, Natalia, and daughter, Maria, who is studying at the University of Illinois at Urbana-Champaign. Lipson's area of expertise was condensed matter physics and radiation physics of condensed matter. His main area of expertise was nuclear emissions during cold fusion effects, and his interest was in discovering the nuclear origin of those effects.

Summ

## Welcome New Alums!

*The following is a listing of NPRE graduates earning degrees from August 2009 to May 2010, and their latest known employer.*

*Bachelor's of Science Degrees  
December 2009*

**Valerie Myers:** NRC, Nuclear Safety Professional Development Program  
May 2010

**Eric M. Becker:** Pacific Northwest National Laboratory, National Security Internship Program

**Deiter B. Brommer:** MIT, Mechanical Engineering Graduate Program

**David A. Burns:** Peace Corps

**Michael K. Collins:** graduate school, NPRE at Illinois

**Matthew S. Duchene:** graduate school, NPRE at Illinois

**Daniel A. Durbin**

**Brian Kleinfeldt:** graduate school, NPRE at Illinois

**William W. Matisiak:** Oak Ridge National Laboratory

**Alexander W. Rehn:** MIT, Nuclear Science & Engineering Graduate Program

**Jason P. Ruzic:** Exelon, Braidwood Station

**Eric J. Stein:** Exelon, LaSalle Station  
*Master's of Science Degrees  
August 2009*

**Kenzo Ibano**  
*October 2009*

**Pappas Harrison:** UIUC, MBA program  
**Chen Xi**  
*December 2009*

**Abdul-Qadim Alzalloum:** Exelon, Clinton Station

**Anastasios Deligiannis:** Idaho State University, Physics Graduate Program with focus on Health Physics

**Corey Struck:** Air National Guard Air Force Reserve Command Test Center, Developmental Test Engineer

**Xiaoxu Zhou:** graduate school, NPRE at Illinois  
*May 2010*

**David Gennardo:** Sargent & Lundy  
*Doctor of Philosophy Degrees  
October 2009*

**Travis Gray:** Oak Ridge Institute for Science & Education, assignment at Princeton Plasma Physics Laboratory, Fusion Energy Post-doctoral Fellow

**Michael Jaworski:** Princeton Plasma Physics Laboratory

**Michael Reilly:** Starfire Industries  
*December 2009*

**Alan Bolind:** Ibaraki University, Japan, Frontier Research Center for Applied Atomic Sciences, Post Doctoral Researcher

**Hyung Joo Shin:** University of Houston, Plasma Processing Science Laboratory, Post-doctoral Fellow  
*May 2010*

**Hitesh Bindra:** State University of New York, Levich Institute, Research Associate

**Prashant Jain:** Oak Ridge National Laboratory, Nuclear Science and Technology Division, Thermal Hydraulics and Irradiation Engineering, Post Doctoral Research Associate

**Stefano Markidis:** Katholieke Universiteit Leuven, Center for Plasma Astrophysics, Postdoctoral Fellow

**J'Tia Taylor:** Argonne National Laboratory, Nuclear Engineering Division, Nonproliferation Technical Specialist

**Di Yun:** Argonne National Laboratory, Nuclear Engineering Division, Nuclear Engineer

## Welcome New Students!

**NPRE welcomed classes of 53 new undergraduates and 13 new graduate students in Fall 09, and 51 new undergraduates and 15 new graduate students in Fall 10.**

*AY 09-10 Undergrads*  
Cem Bagdatlioglu, Istanbul, Turkey  
Alexander T. Bara, Tinley Park, IL  
Andrew T. Barbel, Aurora, IL  
Luke W. Barry, Morrison, IL  
Zachary T. Berent, Chicago, IL  
Josh M. Bradley, Green Bay, WI  
Lois D. Bunten, Waterloo, IL  
Cody T. Carsella, Ingleside, IL  
Gregory E. Coultas, Rochester, IL  
Wesley N. Cowan, Lexington, KY  
Brent S. Cross, Minier, IL  
Matthew J. Euwema, Oak Brook, IL  
Ashley E. Farman, Des Plaines, IL  
Alex W. Foley, Galesburg, IL  
Robert J. Geringer, Palatine, IL  
Imran J. Haddish, Chino Hills, CA  
Clark J. Halliday, Flossmoor, IL  
Syed E. Haque, Houston, Texas  
Robert Y. Hart, Champaign, IL  
James B. Hicks, Plainfield, IL  
Brendan P. Joyce, Des Plaines, IL  
Rayn L.C. Kent, The Woodlands, TX  
Leo E. Kirsch, Frankfort, IL  
Shishil Kumar, Champaign, IL  
Mary L. Leon, Crystal Lake, IL  
Julie L. Less  
Yaning S. Liang, Shenyang, China  
Alexander R. Locher, Evanston, IL  
James V. Madrigal, Oak Lawn, IL  
George E. McKenzie, Ingleside, IL  
Peter A. Mouche, Naperville, IL  
Travis C. Mui, Arlington Heights, IL  
Brandon E. Osborne, Pacific, WA  
Anthony J. Paneral, Berwyn, IL  
Brian P. Pekron, Elmhurst, IL  
David J. Peterson, Orland Park, IL  
Glenn R. Peterson, Lake Villa, IL  
Shane N. Raeber, O'Fallon, IL  
Collin R. Rahrig, Bourbonnais, IL  
Jaspreet S. Rehal, Naperville, IL  
Alyssa M. Ruiz, Bartlett, IL  
Kristin E. Schoemaker, Carpentersville, IL  
Joseph A. Serio, West Chicago, IL

Needhi V. Shah, Plainfield, IL  
Nivedita A. Vaidya, Bangalore, India  
Nathan M. Van Loon, Lincoln, NE  
Quinn T. Vandermeersch, Knoxville, TN

Kathleen J. Weichman, Albuquerque, NM

Adam H. Wilson, Downers Grove, IL  
Hyun Ho Yun, Fort Wayne, IN  
Jeffrey L. Zhou, Geneva, IL  
Erik P. Ziehm, Palatine, IL

Nicholas S. Zimmer, Trout Valley, IL  
*AY 10-11 Undergrads*

Molly R. Bilderback, Kankakee, IL  
Joshua A. Dotson, Champaign, IL  
Ryan D. Holstein, Farmer City, IL  
Vikrum S. Joshi, Frankfort, IL  
Ajey R. Kaushal, Pleasanton, CA  
Ryan E. German, Lake Tapps, WA  
Mark M. Kamuda, Buffalo Grove, IL  
Jang Won Kang, Kyungkido, Republic of Korea

Shane M. Keniley, Plainfield, IL  
Martin Kocaj, Roselle, IL  
Charles M. Kusk, Richmond, IL  
Steven W. Marcinko, McHenry, IL  
Christopher D. O'Brien of Oak Lawn, IL  
Gianluca A. Panici, New Lenox, IL  
Vidit P. Patel, Danville, IL

Jonathon M. Pelayo, Riverside, IL  
Victoria K. Perez, South Elgin, IL  
Johnathan B. Pflingsten, Harvard, IL  
Richard S. Piantini, Kissimmee, FL  
Zachary M. Price, North Aurora, IL  
Nino Puka, Wheaton, IL  
Vishnu Ravenndran, Westmont, IL  
Daniel J. Roberts, West Chicago, IL  
Gregory R. Saltz, Naperville, IL  
Deesha K. Shah, Skokie, IL  
Andrew P. Spangenberg, Glen Carbon, IL

Matthew M. Szott, Orland Park, IL  
Ryan M. Thompson, Kewanee, IL  
Azamat Uskenbayev, Bloomington, IN  
Greg A. Vinson, Fairfield, OH  
Nathan P. Walter, Evanston, IL  
Adi Wasserman, Highland Park, IL  
Bennett T. Williams, Robinson, IL  
Jo A. Zoril, Toulon IL

*AY 09-10 Graduate Students*  
Nabeel Ahmed, UIUC



Daniel Bradley, UIUC  
Jeffery Cardoni, UIUC  
Rabab Elzohery, Alexandria  
University, Egypt  
Ahmed Hamed, Alexandria  
University, Egypt  
Xiaochun Han, Shanghai Jiao Tong  
University, China  
Soonwook Jung, Seoul National  
University, Korea  
Zebo Li, Beijing University, China  
Yingjin Miao, Tsinghua University,  
China

Georgi Neychev, Moscow Power  
Engineering Institute, Russia  
Jose Rivera, UIUC  
Rijan Shrestha, Providence College  
Melissa Strehle, Purdue University,  
Lafayette, IN  
Cem Bagdatlioglu, Istanbul, Turkey  
Alexander T. Bara, Tinley Park, IL  
Andrew T. Barbel, Aurora, IL  
Luke W. Barry, Morrison, IL  
Zachary T. Berent, Chicago, IL  
Josh M. Bradley, Green Bay, WI  
Lois D. Bunten, Waterloo, IL

*AY 10-11 Graduate Students*  
Michael Collins, UIUC  
Matthew Duchene, UIUC  
Carolina Fineman-Sotomayor, UC-  
Berkeley  
Jungmi Hong, Seoul National  
University, Korea  
Abhishek Jaiswai, Idaho State  
University  
Paul Keutelian, UIUC  
Brian Kleinfeldt, UIUC  
David Lartonoix, UIUC

Xin Li, University of Science and  
Technology, China  
Yonghui Li, Tsinghua University,  
China  
Timothy Milligan, Southern IL  
University-Carbondale  
Carl Rytych, UIUC  
Yui Lun Wu, UC-Berkeley  
Tai-Ni Yang, Tsinghua University,  
Taiwan  
Yang Zhao, Jiaotong University, China

## Boettcher Wins College of Engineering's Lisle Abbott Rose Memorial Award

**N**PRE undergraduate Richard A. Boettcher has won the College of Engineering's 2010 Lisle Abbott Rose Memorial Award.

Friends of Rose, the College's former director of public information, established a fund in his memory for an annual award to recognize an outstanding senior engineering student. Lisle's widow, Mildred Maddux Rose, Lisle's widow, endowed the award in perpetuity. It is presented to a student who most nearly approaches the ideal of technical excellence combined with cultural breadth, depth, and sensitivity.

A nontraditional student, Boettcher has life experiences that have afforded him a unique perspective, guiding both his undergraduate and intended graduate education and future career.

Coming from a rural, below-the-poverty-line family, Boettcher joined the Navy after high school, becoming a nuclear reactor operator and Navy diver. While on active duty, he had a "life-changing experience," — aiding his aunt, a 41-old, deaf single mother, in her fight against cancer. Working through the process of researching her condition and communicating treatment options to her and their extended family, he helped her add two years of quality life, while altering his own career path—to attend college with the intent of becoming a research oncologist.

Since arriving on campus in 2005, Boettcher has served as an undergraduate research assistant at the Beckman Institute. There, he earned substantial responsibility in various

projects relating to cancer research.

He also took advantage of a scholarship that allowed him to study in China. He interned in the radiology department at Beijing's Tongren Hospital. He was in China when an earthquake struck, and he spent his spring break helping with the relief efforts. Using his language and military training, Boettcher supervised the distribution of American relief supplies and ensured that sanitary conditions existed at a makeshift refugee camp in Jiuzhou Stadium.

Returning to Illinois, Boettcher has served as a Provena Hospice volunteer. He also would like to travel to Hangzhou, China, in January to study the Chinese medical educational and research system at Zhejiang University. He would take part in the research hospital's radiology department and attend medical classes, while observing, writing and studying how the Chinese apply translational medicine from bench to bedside. His plans also include applying for an MD/PhD program or enrolling in medical school to study cancer research.

As the winner of the Lisle Abbott Rose Memorial Award, Boettcher will receive a cash award and will have an individual plaque bearing his name placed on the permanent memorial in Engineering Hall.



*Richard A. Boettcher*



NPRE graduate student J'Tia Taylor with Hans Blix, former Director General of the International Atomic Energy Agency, at the World Nuclear University Summer Institute final reception.

## Taylor Gains Lifetime Experience at World Nuclear University

*Treated to addresses from world-renown experts including Hans Blix, former Director General of the International Atomic Energy Agency, and given the opportunity to work with young nuclear scientists from across the planet, NPRE graduate student J'Tia Taylor, who recently earned her PhD, gained the experience of a lifetime while a World Nuclear University Fellow during the summer of 2009.*

*Taylor was one of about 100 Fellows from some 35 countries chosen for the 2009 WNU Summer Institute, held at Christ Church, a college of the historically spectacular University of Oxford. World authorities on global environment and sustainable development, nuclear-related technology innovation, non-proliferation, and nuclear industry operations presented lectures and tutorials, and Fellows toured nuclear and industrial facilities. NPRE's Marvin E. Wyman and Felix T. Adler funds subsidized expenses so Taylor could make the trip.*

*Taylor, now a Nonproliferation Technical Specialist in the Nuclear Engineering Division at Argonne National Laboratory, gave this recap of her WNU experiences.*

**W**e enjoyed lectures on a host of topics ranging from climate change, nuclear research and operations to nuclear law from experts in each

field. A particularly memorable lecture was "An Environmentalist's Case for Nuclear Power," from Greenpeace founder Patrick Moore. Gaining perspectives on international nuclear programs from leaders such as Gideon Frank, the former Director General of the Israeli Atomic Energy Commission (IAEC), was invaluable.

The most anticipated speaker was Hans Blix, former Director General of the International Atomic Energy Agency and he did not disappoint. Dr. Blix spoke about his time at the agency and gave insight into his time as the chief UN weapons inspector during the Iraq disarmament crisis. Dr. Blix also spent downtime with the Fellows. He was featured in the oddball comedy movie *Team America: World Police*, featuring puppets in lieu of actors and delighted all when he referenced the scene in which Kim Jong Il drops him into a pool of sharks after denying him nuclear inspection access.

By far, the best part of the Institute was meeting other Fellows from around the globe. Some programs may give you a chance to introduce yourself to others but the WNU Summer Institute gave me a chance to genuinely get to know and work with the Fellows. Over the six weeks, Fellows were divided into working groups and assigned tasks to complete concerning material presented with each Fellow having three different working groups over the time period. Through the assigned tasks and pursuant discussions, I felt like I built a bond with every person in the working group and I would not hesitate to contact anyone in the future.

My first working group, led by our mentor Jean-Louis Nigon, was tasked with a team-building activity in which we were given a box of material and told to design and market a product. Our group was a very dynamic bunch and although our product, a nuclear powered car, was not of the best construction, we were awarded best presentation. Our presentation was in the vain of an "infomercial." Our presentation including an overenthusiastic host, a cheesy soundtrack featuring the song, "Eye of the Tiger," and a Japanese speaking technical expert deemed "Dr. Fusion."


My last working group, led by mentor Alan Waltar, was tasked with providing insight into "Public Fear of Nuclear Energy." The group went above and beyond the scope of a two-week project. The group conducted a survey about energy concerns with an emphasis on nuclear, produced a video of citizen concerns, a pamphlet on how to discuss





nuclear energy with the public and also a public service video about nuclear energy. I was truly amazed at the work ethic and dedication of the group in tackling the topic. Currently, the group is still in touch and working on getting the pamphlet and video published.

I was amazed and in awe by the experience as a whole including the Fellows, mentors, location, presentations and nuclear site visits. The Fellows, mentors and presenters were top-notch young professionals and nuclear industry experts who were open to learning and teaching about not only the nuclear industry but also each other. Access to such nuclear sites such as the new construction of the European Pressurized Reactor (EPR) at Flamanville during the French nuclear tour was extraordinary and unique.

The Institute brought together things that I have learned throughout my education and reinforced my desire to be involved in the nuclear industry. 

## NPRE Scientists Produce Self-Stirring Liquid Metal System

**A** group of researchers led by recent NPRE PhD Michael A. Jaworski have combined strong magnetic fields with non-uniform temperatures to produce a self-stirring liquid metal system.

The effect holds promise for several areas of science and technology, including metallurgy and fusion energy that use liquid metals. *Physical Review Letters* has accepted a paper on the work for publication.

Jaworski, who earned his PhD in October 2009, said the phenomenon surprised him and his group.

"The thermoelectric magneto-hydrodynamic (TEMHD) flow was not expected to be the dominant flow driver when we started the project," he said. "We expected a more ordinary and typical driver to be operating in the experiment based on surface tension effects. TEMHD had never been directly observed before, and I doubted it would be significant even if it were a 'real effect.'"

"It was definitely a "wow, that's really weird" moment when we were able to watch the flow swirl about the target in a way that wasn't consistent with the surface tension effect. After several tests, we confirmed the origin of the flow to be

TEMHD."

Jaworski and his collaborators used lithium, a liquid metal that has strong thermoelectric properties and creates currents in non-uniform temperature fields. In the experiments, the thermoelectric currents interacted with the magnetic field and pushed the fluid, resulting in a swirling motion. The resulting velocity was significant, with speeds greater than a foot per second in some cases, and matched a theoretical prediction for the flow.

The technique could lead to a more efficient, cost-effective means of stirring liquid metals.

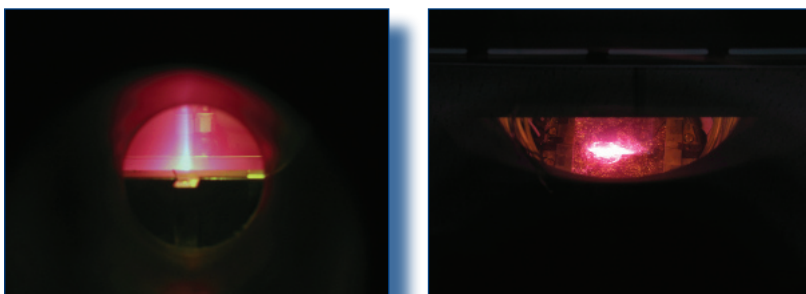
Many metallurgical processing systems use rotating external magnetic fields to stir molten metals, but power losses result from passing the rotating magnetic fields through conducting walls. Combining a steady magnetic field with a temperature-controlled insert in a material would encourage TEMHD stirring without power losses.

"Since every single metal product one uses passes through a metallurgical process, there is a large potential impact," Jaworski said.

He also believes the effect could have a global impact on the use of fusion energy.

Theoretically, fusion could provide a non-carbon emitting energy source that would not be prone to solar and wind energy's intermittency problems. However, fusion is not cost-effective now because science has not yet produced materials to build machines that withstand fusion's intense power fluxes.

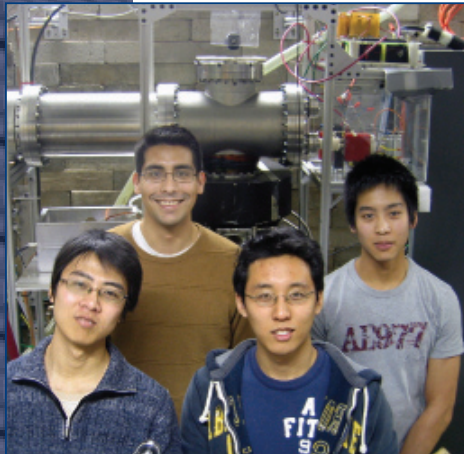
"One alternative to solid materials are liquid



Left, photo of the electron beam as it strikes the liquid metal target. Right, photo of the electron beam heating and creating a plasma and glow on a solid lithium target.

continued on page 30

*Self-stirring Liquid Metal...from page 29*



*Working on the self-stirring liquid metal system were, from left, Wenyu Xu, Michael Jaworski, Jason Kim and Matthew Lee*

metal plasma-facing-components(PFCs), of which lithium is a lead candidate," Jaworski said. "If it can be made to work and be controlled, liquid metal PFCs have the potential to address several outstanding issues that are hampering our ability to create power plants based on fusion. TEMHD pumping can be used in the PFCs as well as other areas of the machine."

Jaworski's doctoral thesis, "Thermoelectric magneto-hydrodynamic and thermo-capillary driven flows of liquid conductors in magnetic fields," was based on this work.

As a master's degree student in NPRE, Jaworski worked on what are now state-of-the-art light sources for semiconductor chip manufacturers. For his PhD, he chose to bring new direction to previous liquid metal experiments. Upon observing significant results on the CDX-U machine at Princeton's Plasma Physics Laboratory, Jaworski decided to build a follow-up machine in the Center for Plasma-Material Interactions Laboratory at Illinois, and further examine the phenomena with the support of his advisor, NPRE Prof. David N. Ruzic. In 2006 Jaworski wrote a white paper proposing the apparatus that was built and then culminated in the machine used for the liquid metal stirring experiments.

Said Jaworski, "It took a while since the electron beam is peculiar to the experiment and had to be designed, fabricated and tested. Additionally, the liquid metal container technology and apparatus needed to be designed and fabricated. It was definitely worth it in the end with these results."

Now, as a research associate at Princeton's Plasma Physics Laboratory, Jaworski continues to examine the behavior of liquid metals in their use as plasma facing components in fusion experiments.

Working with Jaworski on the Illinois experiments were NPRE Adjunct Assistant Prof. Martin J. Neumann, October 2009 PhD Travis K. Gray, graduate student Wenyu Xu, 2008 NPRE bachelor's degree graduates Michael K. Antonelli and Cheuk Y. Lau, and Molecular and Cellular Biology undergraduates Jason J. Kim and Matthew B. Lee.

## NPRE Students Garner DOE,ANS Awards

Several NPRE students have been successful in securing Scholarships and fellowships from the U.S. Department of Energy and the American Nuclear Association recently.

Undergraduates Jonathan George of Bolingbrook, IL; Timothy P. Grunloh of Teutopolis, IL; and Jon B. Hansen of O'Fallon, IL, are repeat winners, having been awarded DOE Nuclear Energy Universities Program (NEUP) scholarships the last two fiscal years. Other 09-10 scholarship winners were Dieter B. Brommer of Exeter, NH; Matthew J. Jasica of Broomfield, CO; Brian Kleinfeldt of Flossmoor, IL; Cody A. Morrow of Virden, IL; and Alexander W. Rehn of Flossmoor, IL. NPRE students who received NEUP scholarships for the first time this fiscal year were Kenneth A. Saunders of Princeton, IL; Jeffrey M. Schappaugh of Petersburg, IL; Peter R. Fiflis of Indian Head Park, IL; Ryan L. Kent of the Woodlands, TX; and Leo E. Kirsch of Frankfort, IL.

Graduate student Ian M. Percel was chosen last fiscal year for an NEUP fellowship.

Seven NPRE undergraduates and three graduate students earned awards and recognition from the national ANS organization.

George, Hanson and Saunders each received Undergraduate Scholarships. Ayesha Athar of Carol Stream, IL, won the Angelo F. Bisesti Memorial Scholarship, honoring Bisesti for contributions to construction on commercial nuclear plants. Leigh A. Kesler of Rantoul, IL, earned a Pittsburgh Local Section Undergraduate Scholarship, awarded to a nuclear science and technology student who either has some affiliation with Western Pennsylvania or who attends school at a nearby university within the region. Morrow received the John and Muriel Landis Scholarship, awarded to students planning a career in nuclear science, nuclear engineering, or a nuclear-related field.

Graduate student Benjamin A. Holtzman of Highland Park, IL, earned a Young Members Group Commendation and Young Professionals Congress Excellence Award recognizing his efforts to support the ANS 2007 Young Professionals Congress and accomplishments as marketing chair for the 2009 Young Professional Congress, respectively.

Graduate student Xiang Chen of Changzhou, Peoples Republic of China, earned a Graduate Scholarship. And graduate student Hyun-Jong Joe of Hollis, NY, received 2nd place for his poster, "Passivity Breakdown and CRUD Growths," entered in the ANS Student Conference Best Paper/Poster Award competition on April 8-11 at the University of Michigan in Ann Arbor.





Wayne Lytle

## Lytle Wins Scholarship for Plasma-cleaning Research

An international optics and photonics society has recognized NPRe graduate student Wayne Lytle for his work in developing a contactless, plasma-based cleaning technology.

Lytle received a \$4,500 BACUS scholarship from SPIE, which rewards outstanding students based on their potential for long-range contribution to optics and photonics, or a related discipline. Lytle's thesis

topic has been in developing the dry, in situ technology that cleans lithographic masks or other surfaces used for integrated circuit manufacturing. He invented two new techniques called PACE, for Plasma-Assisted Cleaning by Electrostatics, and PACMAN, Plasma-Assisted Cleaning by Metastable Atom Neutralization, and showed how they can clean EUV masks without damaging the pattern.

David N. Ruzic, NPRe professor and Director of the Center for Plasma-Material Interactions, is Lytle's advisor.

## Mills Award Honors Jain's Modeling Work

Prashant Jain, a May 2010 PhD graduate, has earned a national honor for his modeling and simulation work on understanding two-phase dynamics to help improve operations of boiling water nuclear reactors (BWRs).

The American Nuclear Society Mark Mills Award recognizes the graduate student author who submits the best original technical paper that advances science and engineering related to the atomic nucleus. Jain's paper, based on his PhD research work, was titled "Simulation of Two-Phase Dynamics Using Lattice Boltzmann Method (LBM)."

The work focused on the development and application of LBM for boiling and two phase flows such as those that occur in BWRs. Issues related to heterogeneous boiling (wall effects), large density gradients; and the modeling difficulties facing the interfacial dynamics have challenged researchers for a long time. All of the challenges were addressed in the new LBM model, called the artificial interface lattice Boltzmann (AILB) model that Jain developed to simulate two-phase dynamics. The model is based on the principle of free energy minimization, and invokes the Gibbs-Duhem equation in formulating non-ideal forcing function.

One of the most significant advantages of Jain's AILB model is that it can easily simulate large density and viscosity ratios of the two phases — ratios that earlier models failed to handle. His model is able to quantitatively capture the coexistence curve for the van der Waals equation of state for different temperatures. Moreover, spatially varying viscosities can be simulated by choosing the relaxation time as a function of local density.

NPRe Prof. Rizwan Uddin advised Jain, who is now a postdoctoral research associate in Thermal Hydraulics and Irradiation Engineering group in the Nuclear Science and Technology Division at the Oak Ridge National Laboratory (ORNL). At ORNL, Jain is extending his PhD work on LBM for the simulation of turbulent flows in existing and future nuclear reactor designs.

Jain first became an NPRe student in Fall 2004, after earning a bachelor's degree in mechanical engineering from the Indian Institute of Technology (IIT)-Bombay. He completed his master's degree research in Summer 2006 where he focused in the area of next generation nuclear power plant design and safety analysis, particularly on stability analysis of the super critical water reactor design.

ANS established the Mills Award in 1958 as a memorial to Mark Mills, recognizing his significant contribution to nuclear science and Engineering. Mills, an American nuclear physicist and developer of atomic bombs, made contributions to atomic energy research at North American Aviation, the University of California and Lawrence Livermore National Laboratory.



Prashant Jain



*Jim Stubbins, Eric Stein and David Burns*



*Jim Stubbins, David Burns and Zachary Kriz*



*Jim Stubbins, Ayesha Athar and Catherine Pritchard*

## 2010 Award Winners, Student Recognitions

The Department of Nuclear, Plasma and Radiological Engineering recognized over 100 students as well as several faculty members and alumni during the department's 2010 Honors Banquet, held April 29.

NPRE's 2010 Honors Banquet is sponsored in part by the Edward E. Mineman Memorial Endowment Fund. NPRE alumnus Edward F. Mineman, BS 84, and his brother Blaine A. Mineman, AB 85, Political Science, MBA 87, established the fund to honor their father.

Following is a list of students honored and their awards:

### **NPRE Outstanding Academic Achievement Award to a Graduating Senior**

The NPRE Outstanding Academic Achievement Award to a Graduating Seniors are awarded to the graduating seniors with the highest cumulative GPA.

**David A. Burns of Urbana, IL  
Eric J. Stein of Earlville, IL**

### **NPRE Outstanding Undergraduate Research Award**

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

**David A. Burns of Urbana, IL  
Zachary D. Kriz of Eden Prairie, MN**

### **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.

**Ayesha Athar of Carol Stream, IL  
Jonathan George of Bolingbrook, 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.

**Timothy P. Grunloh of Teutopolis, IL**

### **George H. Miley/LENR Undergraduate Scholarship**

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

**Peter R. Fiflis of Indian Head Park, IL**

### **Barclay G. Jones Endowed Fellowship**

The Barclay G. Jones Endowed Fellowship, established by NPRE alumni and friends in honor of Prof. Barclay G. Jones, is NPRE's first department-owned fellowship. 2010 marks the first year the award has been made.

**Hyun-Jong Joe of Hollis, New York**



**American Nuclear Society  
Student Chapter Awards  
Undergraduate Outstanding  
Service Award**

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

**Eric M. Becker of Downers Grove, IL**

**Graduate Outstanding  
Service Award**

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

**Jose E. Rivera of Berwyn, IL**

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

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

*Scholarships:*

- Carlos A. Altamirano of Davie, Florida**
- Harry W. Arnold IV of McHenry, IL**
- Ayesha Athar of Carol Stream, IL**
- Joseph R. Bernhardt of Bloomington, IL**
- Dieter B. Brommer of Exeter, NH**
- Peter R. Fiflis of Indian Head Park, IL**
- Jonathan George of Bolingbrook, IL**
- Timothy P. Grunloh of Teutopolis, IL**

- Jon B. Hansen of O'Fallon, IL**
- George J. Isaac of Worcester, MA**
- Matthew J. Jasica of Broomfield, CO**
- Christopher Kallapodi of Glen Ellyn, IL**
- Ryan L. Kent of the Woodlands, TX**
- Leigh A. Kesler of Rantoul, IL**
- Leo E. Kirsch of Frankfort, IL**
- Brian Kleinfeldt of Flossmoor, IL**
- Leigh Lin of Buffalo Grove, IL**
- James V. Madrigal of Oak Lawn, IL**
- Dana C. Miranda of Wheaton, IL**
- Cody A. Morrow of Virden, IL**
- Jason A. Peck of Fairview Heights, IL**
- Brian P. Pekron of Elmhurst, IL**
- Collin R. Rahrig of Bourbonnais, IL**
- Anthony M. Ravnic of Arlington Heights, IL**
- Alexander W. Rehn of Flossmoor, IL**
- Kenneth A. Saunders of Princeton, IL**
- Jeffrey M. Schappaugh of Petersburg, IL**
- Joseph A. Serio of West Chicago, IL**
- Daniel J. Sheehan of Chicago, IL**
- Eric J. Stein of Rockford, IL**
- Andrew C. Taylor of Champaign, IL**
- Matthew J. Weberski of Spring Valley, IL**
- Kathleen J. Weichman of Albuquerque, NM**
- Jeffrey L. Zhou of Geneva, IL**

*Fellowships:*

- Neal E. Davis of Champaign, IL**
- Benjamin A. Holtzman of Highland Park, IL**
- Aaron J. Oaks of Brea, CA**
- J'Tia P. Taylor of Champaign, 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.

**Bradley L. Swenson of Crystal Lake, IL**

**Exelon Corporation  
Nuclear Power Engineering  
Education Program Scholarships**

Nuclear Power Engineering Education Program (NPEEP) Scholarships initially are awarded based on strong high school academic



*Jim Stubbins, Timothy Grunloh and Roy Axford*



*Jim Stubbins, Peter Fiflis and George Miley*



*Jose Rivera, Jim Stubbins and Eric Becker*



Eric Stein, Jim Stubbins and Jose Rivera



Jim Stubbins, Bradley Swenson, and Exelon Corp. representatives Ed McVey and Bill Green

records. These merit-based scholarships are then renewable provided recipients maintain a semester 3.0 GPA and progress toward their degree in the NPRE curriculum. Exelon Corporation contributes to these scholarships.

- Carlos A. Altamirano of Davie, FL
- Harry W. Arnold, IV of McHenry, IL
- Ayesha Athar of Carol Stream, IL
- Alexander T. Bara of Tinley Park, IL
- Andrew T. Barbel of Aurora, IL
- Luke W. Barry of Morrison, IL
- Zachary T. Berent of Chicago, IL

- Josh M. Bradley of Green Bay, WI
- Lois D. Bunten of Waterloo, IL
- Cody T. Carsella of Ingleside, IL
- Gregory E. Coultas of Rochester, IL
- Wesley N. Cowan of Lexington, KY
- Michael T. Cunningham of Chicago, IL
- Matthew J. Euwema of Oak Brook, IL
- Matthew S. Farrell of Arlington Heights, IL
- Peter R. Fiflis of Indian Head Park, IL
- Imran J. Haddish of Chino Hills, CA
- Clark J. Halliday of Flossmoor, IL
- Jon B. Hansen of O'Fallon, IL
- Robert Y. Hart of Champaign, IL
- Matthew J. Jasica of Broomfield, CO
- Brendan P. Joyce of Des Plaines, IL
- Ryan L. Kent of the Woodlands, TX
- Leigh A. Kesler of Rantoul, IL
- Leo E. Kirsch of Frankfort, IL
- Mary L. Leon of Crystal Lake, IL
- Kyle A. Lindquist of Lisle, IL
- Alexander R. Locher of Evanston, IL
- James V. Madrigal of Oak Lawn, IL
- Brooke L. McClure of Bourbonnais, IL
- George E. McKenzie of Ingleside, IL
- Cody A. Morrow of Virden, IL
- Travis C. Mui of Arlington Heights, IL
- Brian P. Pekron of Elmhurst, IL
- David J. Peterson of Orland Park, IL
- Glenn R. Peterson of Lake Villa, IL
- Shane N. Raeber of O'Fallon, IL
- Collin R. Rahrig of Bourbonnais, IL
- Jaspreet S. Rehal of Naperville, IL
- Alyssa M. Ruiz of Bartlett, IL
- Kenneth A. Saunders of Princeton, IL
- Jeffrey M. Schappaugh of Petersburg, IL
- Joseph A. Serio of West Chicago, IL
- Needhi V. Shah of Plainfield, IL
- Daniel J. Sheehan of Chicago, IL
- Ryan A. Switts of O'Fallon, IL
- Andrew C. Taylor of Champaign, IL
- Kathleen J. Weichman of Albuquerque, N M
- Adam H. Wilson of Downers Grove, IL
- Jeffrey L. Zhou of Geneva, IL
- Eric P. Ziehm of Palatine, IL
- Nicholas S. Zimmer of Trout Valley, 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

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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.

**Eric M. Becker of Downers Grove, IL**

**National Academy  
for Nuclear Training  
Institute of Nuclear Power  
Operations**

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

*Scholarships:*

- Richard A. Boettcher of Urbana, IL
- Alexander W. Rehn of Flossmoor, IL
- Eric J. Stein of Rockford, IL

*Fellowship:*

- Jeffrey N. Cardoni of Normal, IL

**U.S. Department of Energy  
Nuclear Energy  
Universities Program**

In fiscal year 2009, the Office of Nuclear Energy (NE), consolidated its university support to what is now called the Nuclear Energy University Programs (NEUP). The scholarships and fellowships granted under the NEUP program will help to recruit and train the next generation of nuclear scientists and engineers – a critical need as the nation moves toward greater use of nuclear energy to meet our energy needs and



address the global climate crisis. In FY 2009, NE provided about \$2.9 million in 76 scholarships and 18 fellowships to U.S. nuclear science and engineering students. In FY 2010, NEUP intends to continue to provide scholarships and fellowships and possibly expand into faculty grants/community college/trade schools.

*Scholarships:*

- Dieter B. Brommer of Exeter, NH**
- Jonathan George of Bolingbrook, IL**
- Timothy P. Grunloh of Teutopolis, IL**
- Jon B. Hansen of O'Fallon, IL**
- Matthew J. Jasica of Broomfield, CO**
- Brian Kleinfeldt of Flossmoor, IL**
- Cody A. Morrow of Virden, IL**
- Alexander W. Rehn of Flossmoor, IL**

*Fellowship:*

- Ian M. Percel of Chicago, IL**

**DOE Nuclear Engineering Fellowships**

The DOE established the Nuclear engineering Scholarships and Fellowships to encourage students to continue education in a nuclear energy field. This program helps prepare students as leaders in fission technology and supports the advancement of fission energy research.

*Continuing Fellowships:*

- Carolyn A. Tomchik of Urbana, IL**

**Society of Women Engineers, University of Illinois Chapter Outstanding Sophomore Scholarship**

The Society of Women Engineers (SWE) is a not-for-profit educational and service organization that empowers women to succeed and advance in the field of engineering, and to be recognized for their life-changing contributions as engineers and leaders. Founded in 1950, SWE is the driving force that establishes engineering as a highly desirable career for women through an exciting array of training and development

programs, networking opportunities, scholarships, outreach and advocacy activities.

- Ayesha Athar of Carol Stream, IL**

**College of Engineering SURGE Fellowships**

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

*Continuing Fellowships:*

- Melissa Strehle of Saline, MI**
- J'Tia P. Taylor of Champaign, IL**

**College of Engineering Dale and Wanda Weaver Scholarship**

This College of Engineering scholarship is awarded an engineering student for one and up to two years.

- Richard A. Boettcher of Urbana, IL**

**Alpha Nu Sigma Society**

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

*Spring 2010 Initiates:*

- Rabie A. Abu Saleem of Al Salt, Jordan**
- Ayesha Athar of Carol Stream, IL**
- Joseph R. Bernhardt of Bloomington, IL**
- Dieter B. Brommer of Exeter, NH**
- Valentyn Bykov of Prague**
- Wei-Ying Chen of Champaign, IL**
- Xiang Chen of Changzhou, Peoples Republic of China**
- Akshay J. Dave of Jakarta**
- Peter R. Fiflis of Indian Head Park, IL**
- Manas R. Gartia of Attabira, India**
- Jon B. Hansen of O'Fallon, IL**
- Matthew J. Jasica of Broomfield, CO**
- Michael J. Karich of Libertyville, IL**
- Nan Li of Champaign, IL**
- Leigh Lin of Buffalo Grove, IL**



*Jim Stubbins, Eric Becker and Dennis DeMoss, Senior Vice President at Sargent & Lundy<sup>MLC</sup>*

- Liang Meng of Suzhou Anhui, Peoples Republic of China**

- Dana C. Miranda of Wheaton, IL**
- Aaron J. Oaks of Brea, CA**

- Zihao Ouyang of Liuyang, Peoples Republic of China**

- Jason A. Peck of Fairview Heights, IL**
- Kenneth A. Saunders of Princeton, IL**
- Daniel J. Sheehan of Chicago, IL**
- Jiawei Tan of Urbana, IL**
- Di Yun of Urbana, IL**

*Continuing Members:*

- Richard A. Boettcher of Urbana, IL**
- David A. Burns of Urbana, IL**
- Nicholas R. Florence of Chicago, IL**
- Jonathan George Bolingbrook, IL**
- Timothy P. Grunloh of Teutopolis, IL**
- Benjamin A. Holtzman of Highland Park, IL**
- Prashant K. Jain**
- Brian Kleinfeldt of Flossmoor, IL**
- Benjamin C. Masters of Urbana, IL**
- Ian M. Percel of Chicago, IL**
- Alexander W. Rehn of Flossmoor, IL**
- Eric J. Stein of Rockford, IL**
- Carolyn A. Tomchik of Urbana, IL**
- Hsiao-Ming Tung of Taipei, Taiwan**
- Bei Ye of Wuyi, Peoples Republic of China**

*continued on page 36*

students

### 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.

- Alexander T. Bara of Tinley Park, IL
- Richard A. Boettcher of Urbana, IL
- David A. Burns of Urbana, IL
- Matthew S. Farrell of Arlington Heights, IL
- Peter R. Fiflis of Indian Head Park, IL
- Jon B. Hansen of O'Fallon, IL
- Matthew J. Jasica of Broomfield, Colorado
- Ryan L. Kent of The Woodlands, Texas
- Leigh A. Kesler of Rantoul, IL
- Brooke L. McClure of Bourbonnais, IL
- Joseph A. Serio of West Chicago, IL
- Jeffrey L. Zhou of Geneva, IL

### James Scholars

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

- Ayesha Athar of Carol Stream, IL
- Alexander T. Bara of Tinley Park, IL
- Luke W. Barry of Morrison, IL
- Richard A. Boettcher of Urbana, IL
- David A. Burns of Urbana, IL
- Valentyn Bykov of Prague
- Cody T. Carsella of Ingleside, IL
- Gregory E. Coultas of Rochester, IL
- Wesley N. Cowan of Lexington, KY
- Matthew S. Farrell of Arlington Heights, IL
- Peter R. Fiflis of Indian Head Park, IL
- Jonathan George of Bolingbrook, IL
- Robert J. Geringer of Palatine, IL
- Andrew N. Groll of Harwood Heights, IL
- Timothy P. Grunloh of Teutopolis, IL
- Jon B. Hansen of O'Fallon, IL
- George J. Isaac of Worcester, MA
- Matthew J. Jasica of Broomfield, CO
- Brendan P. Joyce of Des Plaines, IL
- Christopher Kallapodi of Glen Ellyn, IL
- Michael J. Karich of Libertyville, IL
- Ryan L. Kent of The Woodlands, TX
- Leigh A. Kesler of Rantoul, IL
- Leo E. Kirsch of Frankfort, IL
- Mary L. Leon of Crystal Lake, IL
- Yaning Liang of Shenyang
- Kyle A. Lindquist of Lisle, IL

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- Brooke L. McClure of Bourbonnais, IL
- Peter A. Mouche of Naperville, IL
- Travis C. Mui of Arlington Heights, IL
- Jason A. Peck of Fairview Heights, IL
- Brian P. Pekron of Elmhurst, IL
- Glenn R. Peterson of Lake Villa, IL
- Jaspreet S. Rehal of Naperville, IL
- Joseph A. Serio of West Chicago, IL
- Daniel J. Sheehan of Chicago, IL
- Ryan A. Switts of O'Fallon, IL
- Quinn T. Vandermeersch of Knoxville, TN
- Kathleen J. Weichman of Albuquerque, NM
- Hyun Ho Yun of Fort Wyane, IN
- Jeffrey L. Zhou of Geneva, IL

### College Honors — Dean's List

Eligible undergraduates must have achieved a GPA for a given semester that places them in the top 20 percent of their college. The following listing is for Fall 2009.

- Ayesha Athar of Carol Stream, IL
- Eric M. Becker of Downers Grove, IL
- Joseph R. Bernhardt of Bloomington, IL
- Dieter B. Brommer of Exeter, NH
- Valentyn Bykov of Prague
- Akshay J. Dave of Jakarta
- Ittinop Dumnernchanvanit of Bangkok
- Zachary J. Duncan of Bolingbrook, IL
- Peter R. Fiflis of Indian Head Park, IL
- Nicholas R. Florence of Chicago, IL
- Jonathan George of Bolingbrook, IL
- Timothy P. Grunloh of Teutopolis, IL
- Matthew J. Jasica of Broomfield, CO
- Brian Kleinfeldt of Flossmoor, IL
- Kyle A. Lindquist of Lisle, IL
- Dana C. Miranda of Wheaton, IL
- Peter A. Mouche of Naperville, IL
- Jason A. Peck of Fairview Heights, IL
- Glenn R. Peterson of Lake Villa, IL
- Carl R. Rytych of Downers Grove, IL
- Kenneth A. Saunders of Princeton, IL
- Eric J. Stein of Rockford, IL
- Bradley L. Swenson of Crystal Lake, IL
- Jeffrey L. Zhou of Geneva, IL



Alpha Nu Sigma Spring 2010 initiates: from left, Dieter B. Brommer, Xiang Chen, Wei-Ying Chen, Peter R. Fiflis; Zihao Ouyang; Kenneth A. Saunders; (second row, from left) Ayesha Athar; Rabie A. Abu-Saleem; Daniel J. Sheehan; Manas R. Gartia; Aaron J. Oaks; Liang Meng; Di Yun; and Jiawei Tan.



## Meline, Singer Recognized for Advising Excellence

**N**PRE Student Services Admissions and Records Officer Becky J. Meline and Prof. Clifford E. Singer have been honored with the 2010 Engineering Council Award for Excellence in Advising.

The top 10 percent of engineering advisors are chosen for this award, recognizing the important role that advisors play in the academic planning process of every engineering student on campus.

Students nominate the candidates.

Meline joined NPRE in 2000 on a temporary basis to provide general administrative support in Student Services. She soon transitioned to greater responsibilities in graduate admissions and advising with a focus on integrating new students into the program.

With the increase in the Department's undergraduate student numbers in recent years, her responsibilities have shifted to include more undergraduate advising. She currently advises all NPRE incoming freshmen and transfer students on course registration as well as works with inter-college transfers.

Meline serves as Chief Advisor representing the Department within the College. Projects she most enjoys include organizing student panels on internship and study abroad experiences, and coordinating national laboratory and industry visits in which representatives talk with students about research and career opportunities.

Related to this, Meline helped initiate the now regularly-offered and popular spring Undergraduate Seminar that brings outside speakers to campus to present on topics across NPRE's varied research and career areas. She also works with Department Head James F. Stubbins on securing scholarship and fellowship funding that helps students financially support their education.

Meline says of her advising experience, "We have great students and a great program. The students have a lot of opportunities open to them; they just have to know that they're there and take advantage. It's great for me to see them be successful and to help them get there."

An expert on international security and energy, Singer was instrumental in developing the College of Engineering's Graduate Option Program in Energy and Sustainability Engineering (EaSE) that began in January 2010. The program was designed to provide the components of breadth and depth for students who are enrolled in a departmental masters or PhD program, where they build a core competence in a discipline.

Singer joined NPRE's faculty in 1986, becoming a full professor in 1992. He also has directed the Program in Arms Control, Disarmament and International Security (ACDIS).

Singer was the 2008 winner of the Madhuri and Jagdish N. Sheth Distinguished Faculty Award for International Achievement, presented by the University of Illinois International Programs and Studies Office of International Engagement, Communications, and Protocol. The honor recognized Singer's prominence in the field of nuclear proliferation, eight-year appointment as ACDIS Director, and his service on the University of Illinois campus, nationally, and abroad.



*Becky J. Meline*



*Clifford E. Singer*

## Stubbins Wins ASEE Glenn Murphy Award

The Nuclear Engineering Division of the American Society for Engineering Education (ASEE) has chosen NPRE Department Head James F. Stubbins as the 2010 winner of the Glenn Murphy Award.

Stubbins was cited for excellence in course and program development; teaching; building international bridges in nuclear engineering education; supervision of student-conducted research activities in the areas of irradiation damage and its effects; development of impedance spectroscopy to monitor and study corrosion; and use of magnetic properties to assess radiation damage in steel. He also was noted for excellence in administration of nuclear engineering education as well as for providing leadership to the leaders by serving as the head of the Nuclear Engineering Department Heads Organization.

An NPRE faculty member the past 30 years and Department Head since 1999, Stubbins has made significant contributions to nuclear engineering in his role as an educator, researcher and administrator.

He was instrumental in revising NPRE's undergraduate curriculum to incorporate plasma-fusion and radiological aspects with standard nuclear engineering. This enabled the department to weather a downturn in undergraduate enrollments in the 1990's and to develop the additional foci to enrich the units' offerings and research. His continued outreach efforts have been clearly demonstrated in NPRE's seven-year collaboration with the University of Pisa. Through the program, Stubbins travels each May to the Italian university to teach, and, in turn, a group of Italian students come to the Urbana campus each September for a cultural and educational exchange.

Stubbins has contributed major research in the areas of irradiation damage and effects in reactor structural materials; high temperature corrosion for HTGR systems; corrosion in liquid metal systems; and mechanical properties and associated design technologies of reactor structural materials. Recently, Stubbins has:

- developed the use of magnetic properties for assessing radiation damage in steels;
- developed the use of Impedance Spectroscopy to

monitor and study corrosion in liquid metal cooled reactor;

- obtained a patent for using electron beams for "machining" of BN nanotubes.

Stubbins has maintained a vigorous graduate program with collaborations with several Department of Energy (DOE) laboratories. Supporting his research efforts, he has served on several materials-related groups and American Nuclear Society divisions, chairing those in the areas of education, materials and fusion.

Stubbins has been active in administration at the Department, College and University levels. At the national level, he has served the DOE and national laboratory groups, providing direction for programs.

Stubbins is a Fellow of the American Nuclear Society, has been an ASEE member since 1999, and is a member of the Nuclear Engineering Department Heads Organization, which he chaired from 2002-2003.

He began his career in NPRE in 1980, after earning a bachelor's in nuclear engineering in 1970 from the University of Michigan, and a master's in nuclear engineering and PhD in materials science from the University of Cincinnati in 1972 and 1975, respectively. Prior to coming to Illinois, Stubbins held a post doc position at the University of Cincinnati's Materials Science and Metallurgical engineering Department; a visiting scientist position in the Institute for Materials Research Nuclear Research Center in Karlsruhe, Germany; and a post doc position in the University of Oxford's Metallurgy and Science of Materials Department.



*James F. Stubbins*



Stubbins will be presented the Glenn Murphy Award in June, during the ASEE Annual Meeting in Louisville, KY.

Glenn Murphy was an engineering faculty member at Iowa State University from 1932 until his death in 1978. He attained the rank of Anson Marston Distinguished Professor of Engineering and served as the head of Aeronautical Engineering, Theoretical and Applied Mechanics. He organized the Department of Nuclear Engineering and served as its head for fourteen years. At the time of his death he was coordinator of the Engineering Education Projects Office in the dean's office at Iowa State University. Dr. Murphy was very active in ASEE, having served as its President in 1962 and Vice President for two terms, 1957-59 and 1965-68.

In honor of Glenn Murphy, this award, endowed by the

Friends of Glenn Murphy, the Edison Electric Institute and Iowa State University, is made annually to a distinguished nuclear engineering educator in recognition of notable professional contributions to the teaching of undergraduate and/or graduate nuclear engineering students.

Founded in 1893, ASEE is a nonprofit organization of individuals and institutions committed to furthering education in engineering and engineering technology. In pursuit of academic excellence, ASEE develops policies and programs that enhance professional opportunities for engineering faculty members, and promotes activities that support increased student enrollments in engineering and engineering technology colleges and universities.

## Campus Honors Axford for Teaching Excellence

Maintaining an unparalleled record of teaching excellence at all instructional levels over his 44-year tenure as an NPRE faculty member, Prof. Roy A. Axford has been selected for the 2010 Campus Award for Excellence in Undergraduate Teaching.

To qualify as a candidate for the Campus Award, Axford first was selected for this year's College of Engineering Teaching Excellence Award.

Since starting his career at Illinois, following faculty positions at Texas A&M and Northwestern universities, Axford has established and maintained a first-rate teaching record in nuclear science and technology. He has accomplished this through dedication to developing courses at the upper division undergraduate and graduate levels. He has taught nearly all of NPRE's 400-level courses over the years and initiated and developed many of them. Also to his credit, Axford played the central role in shaping NPRE's undergraduate curriculum a few years ago, developing and first teaching several of the new and revised courses.

Axford's dedication to his students is demonstrated through the teaching course load he continually requests. He always teaches a minimum of two – and frequently three – upper division undergraduate and graduate level courses each semester, and routinely is available to provide students help and answer questions. His mentoring style is to set and expect high intellectual standards, but with meaningful personal involvement in his students' learning processes.

Axford has been equally committed to "teaching" through the research and advanced development of undergraduate and graduate students. He has produced 53 PhDs, and continues to keep in touch and advise them as they progress in their careers. His dedication to the mentoring of individual students at each stage of their professional developments is extraordinary. Axford is legendary in the vast web of his PhD students who have gone on to conduct research in sup-



Roy A. Axford

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*Axford, Teaching Excellence...from page 39*


port of our government's long-standing policy of developing and maintaining a credible nuclear deterrence capability.

This latest award adds to a long list of achievements Axford has accumulated. Numerous times he has been honored with the American Nuclear Society Student Chapter Excellence in Undergraduate Teaching Award. He's also received the College of Engineering Rose Award for Teaching Excellence (2008), the Graduate College Outstanding Mentor Award (2004); and the College of Engineering Everitt Award for Teaching Excellence (1985). Twice before he was a finalist for the Campus Award for Excellence in Undergraduate Teaching (1979, 1981).

Axford's dedication to his craft is also reflected in his Instructor and Course Evaluation System (ICES) scores, which are consistently at the top of the NPRE Department and the College of Engineering. He is always included on the "Teachers Ranked as Excellent List."

There is a quote that past and present NPRE students share: "Take any course that Axford teaches, and whatever else you need for your degree." In fact, students hold him in such high esteem that the T-shirt for this academic year's ANS group was designed with an etching of Axford's image on the front.

Axford said it best himself when he was interviewed for NPRE's 50th Anniversary video in 2008: "Students are very sensitive to faculty whom (the students) can respect for knowing something. It's the knowledge that draws their interest."

"Teaching and research are coupled together. One way to attract good research students is to pay attention to the teaching function. You get perceived as doing teaching right and you don't have any problems attracting research students." 



*Cody Morrow, Treasurer for the American Nuclear Society student chapter at the University of Illinois, shows off the organization's latest fashion apparel honoring NPRE Prof. Roy Axford.*

## Axford Image Makes for Popular ANS T-Shirt


Is the ultimate tribute having your face printed on a T-shirt?

Could be, especially if those paying tribute are a group of nuclear engineering students, and the one being honored is NPRE veteran Prof. Roy A. Axford.

The American Nuclear Society student chapter at Illinois chose an unmistakable image of Axford's face etched in white on a black shirt to serve as the 2009-10 ANS T-shirt. It went over well.

"When we mentioned what the shirt was going to be at the first general (ANS) meeting, everyone wanted one," said 09-10 ANS Student Chapter President Jose Rivera. "I heard people saying it was the best ANS shirt ever and how some people wanted to buy two of them."

The student group asked Axford before using his image. Said Rivera, "When I asked Professor Axford for permission, he smiled and said okay. Later on he told me he was proud to be on the shirt."

Past generations of students like the shirts, too. The Department presented them as gifts to alumni who returned to campus to serve on a Homecoming career/networking panel in October 2009, and at another alumni event held in Washington, D.C., in November 2009 in conjunction with the national winter ANS Conference. "When we offered them to the alumni panel it was, again, one of those 'I need to have this shirt!' reactions," Rivera said. 





## Experiment Demonstrates Benefits of Virtual “Seeing”

**V**irtual seeing led to believing for nuclear engineering students last fall when they compared simulated navigation to following a paper map.

For the last several years NPRE Prof. Rizwan Uddin and his students have been developing and improving upon a virtual and interactive 3D model of a nuclear reactor designed for teaching and professional training purposes. Using gaming software, Uddin’s group has mimicked the now-decommissioned University of Illinois TRIGA reactor and its operating equipment so that they can be accessed by ordinary PCs as well as by the Visbox system; a 3D, immersive, virtual reality display system.

Last fall Uddin designed an experiment for a total of 70 students of NPRE 100 (Orientation to Nuclear, Plasma, and Radiological Engineering) to test how well the simulation experience works.

Each test required two small groups of about a half dozen students. One group was led to the Visbox laboratory where they were encouraged to play video games that familiarized them with the TRIGA reactor building’s layout. The other group was brought first to the actual building. The latter group right away was given a paper map showing six locations where candy was hidden in the building. The group led first to the Visbox lab also got the map, but not until after having experienced the simulation.

Each group was timed on finding the hidden treasure. The students who played the videogame before searching for the treasure took, on average, 24.3 percent less time to find the candy. Those students rarely seemed to get lost in the reactor, but those who first used the map tended to be disoriented when they moved from the building’s entrance level to the bottom level. Those running the experiment concluded that the three-dimensional virtual view proved more useful than paper maps showing three floors.

“The results are in line with what we thought would occur,” Uddin said. “Having seen the location (virtually) helped significantly in knowing where to go to find the items.”



**TOP:** NPRE 100 students get a virtual “peek” at the layout of the building that houses the now-decommissioned TRIGA nuclear reactor. While the College of Engineering’s Ritch Strom filmed them, the students participated in an experiment comparing virtual navigation to a paper map.

**BOTTOM:** NPRE students are filmed as they scurry around the now-decommissioned TRIGA nuclear reactor in search of hidden treasure.

## ANS Students Honor Uddin for Undergraduate Teaching

**T**he Student Chapter of the American Nuclear Society has chosen Prof. Rizwan Uddin for the 2010 Excellence in Undergraduate Teaching Award.

This makes the seventh year that Uddin, an NPRE faculty member since 1996, has received the honor. He also is consistently included on the List of Teachers Ranked Excellent by Their Students. Uddin also was recognized for his

teaching skills in 1994 while he was on the Mechanical, Aerospace and Nuclear Engineering faculty at the University of Virginia.

Uddin earned a bachelor’s degree in mechanical engineering at the Middle East Technical University in 1980. He earned a master’s and a PhD in NPRE in 1983 and 1987, respectively.



Rizwan Uddin

# Midwest Experts Agree on Recommendations for Nuclear Waste Storage

By James E. Kloeppe, physical sciences editor, Illinois News Bureau

**F**ifty thousand dry casks of spent nuclear fuel have nowhere to go for long-term storage. Yucca Mountain in Nevada appears to be all but dead as an option.

So now is the time to create specific institutions,

funds and financial incentives to manage the spent fuel at the power plants where it was produced, according to a recent report produced from a consensus of nuclear experts from seven Midwestern universities.

That consensus was reached during a workshop at the University of Illinois, an appropriate site since Illinois produces more nuclear power than any other state, in a region of nuclear power producing states.

The workshop, held in March 2009, was the latest step in a project that began with interviews with dozens of congressional staff, from both sides of the aisle, according to Clifford Singer, a professor of nuclear engineering and of political science at Illinois, and one of three writers of the report, produced by the university's Program in Arms Control, Disarmament and International Security (ACDIS).

The interviews were followed with a June 2008 workshop with national policy experts and advocates in Washington, D.C., which was then followed with additional interviews with congressional staff. Those later interviews revealed a need for additional input from the states that generate spent nuclear fuel, Singer said, and faculty from nuclear engineering programs seemed a natural starting point.

Despite fears to the contrary, dry casks of spent fuel are a minor safety and security concern compared with other facilities and materials at a nuclear power plant, Singer said. "The spent nuclear fuel in dry casks is a negligible addition to the overall hazard on the site," he said.

The presence of the casks requires little more quality control or security than should be in place to manage the reactor and spent fuel stored in wet pools, Singer said. Also, dry casks, made mostly of concrete and steel, are built to be almost impenetrable, and the material inside becomes less hazardous over time.

"If you're OK with the reactor there, then you should be OK with the dry cask storage there. And if you're not, then you should be trying to get rid of the reactor, not worrying about the dry cask storage," Singer said.

As a consequence of the current situation, with long-term storage in limbo, the U.S. government is losing lawsuits over its failure to take title to spent nuclear fuel, with its total liability estimated at about \$11 billion over the next decade, according to the report. Additional millions are being spent to manage spent fuel "stranded" at plants no longer in operation. More spent fuel is being stored longer in wet pools at plants, where it is more vulnerable to sabotage, rather than being moved to dry casks.

With no resolution to the issue, the report also says, legal restrictions in many states regarding the storage of spent fuel also stand in the way of new plant construction. And U.S. influence may suffer internationally on issues of climate change, nuclear nonproliferation, and the future of nuclear technology.

The report is titled "Plan D' for Spent Nuclear Fuel," with the D referring to extended dry cask storage primarily at power plants as one of five alternatives for spent nuclear fuel management.

Plan A, as defined by the report, is reprocessing spent fuel for use in breeder reactors. Plan B is deep burial as called for in the Nuclear Waste Policy Act of 1982, which led to the project at Yucca Mountain. Plan C is actinide burning, a process to reduce the size of the waste requiring storage. Plan E is building no more nuclear reactors and abandoning potential future spent-fuel reprocessing.

Technical, political or cost concerns have essentially elimi-



Clifford E. Singer



nated A, B, C and E as options, according to the report, leaving the U.S. with Plan D “for the foreseeable future at least.”

Among its recommendations, the report suggests setting up regulated escrow funds for utilities for the costs of managing spent fuel in dry casks. It also suggests allowing the shipment of spent fuel between the reactor sites of different utilities within a state, and financial incentives for states to agree to accept spent fuel shipped from an inoperative reactor in a neighboring state to an operating reactor in their own.

Another recommendation suggests that any state be allowed to ask for much larger financial incentives for cooperating on hosting long-term spent-fuel management facilities, possibly setting up a permanent fund from which it can tap earnings from interest.

This contrasts with the arrangements made for Yucca Mountain, Singer said, through which the state reaps little financial benefit from hosting the site.

Currently utilities “have no incentive to do anything but sue the federal government for not solving the problem,” Singer said.

The suggested funds, along with other recommendations, “basically would marketize the system,” he said. “The utility would have the motivation to move the spent fuel offsite when, and only when, it’s economically advantageous to do so, within the safety regulations set by the government.”

According to Singer, Plan D is not just the only option remaining, but “what we should have been doing all along. “ In dealing with spent nuclear fuel, it’s not practical to think you can “put it in a can, put it in a hole in the ground, and walk away,” he said.

“It is both difficult and unnecessary to try to engineer a facility at this point for long-term storage for tens of thousands of years,” Singer said. “About a century from now, people should have a much better idea how to design such facilities and more perspective on whether spent fuel should be placed in them permanently, or with access for potential future reprocessing.”

“The problem we face here is we have an engineering problem that is going to be addressed with future engineering solutions, but we still need, in the present, to devise the institutional structures to give people the confidence that there will be a framework for now for managing these things.”

The challenge is similar to that faced in maintaining Europe’s massive cathedrals over many centuries, Singer said. “What keeps those things up is not the original engineering,” he said, but rather the institutional structure put in place to constantly maintain them.

The other writers of the report were Rodney Ewing, a professor in the departments of geological sciences and of nuclear engineering and radiological sciences at the University of Michigan, and Paul P.H. Wilson, a professor in the department of engineering physics at the University of Wisconsin-Madison.

The other universities represented at the March 16 workshop, in addition to Illinois, Michigan and Wisconsin, were Iowa State University, Missouri University of Science and Technology, Purdue University and the University of Missouri.

The project was funded throughout by the John D. and Catherine T. MacArthur Foundation, through its Science, Technology and Security Initiative.



*About a century from now, people should have a much better idea how to design such facilities (for long-term nuclear waste storage) and more perspective on whether spent fuel should be placed in them permanently, or with access for potential future reprocessing. –*

*Clifford Singer*

## Detector Research Benefits Biomedical Imaging, Astrophysics

**N**PRE Assistant Prof. Ling-Jian Meng is developing radiation detectors and nuclear imaging systems that help scientists observe phenomena ranging from cell migration in the human body to giant supernovas in outer space.

Meng's work primarily focuses on developing novel x-ray and gamma ray detectors that could offer excellent spatial, energy and temporal resolutions.

"We are interested in a wide range of nuclear imaging applications based on x-ray, gamma ray and charged particles," Meng said. "We are in the process of expanding our effort to areas well beyond biomedical imaging."

Meng works with colleagues from Washington University at St Louis and the Harvard University to develop CdZnTe detectors for a hard x-ray telescope to be placed onboard the upcoming Energetic X-ray Imaging Survey Telescope (EXIST) satellite mission. His group will be working on the development of a pixelated CdZnTe (CZT) detector and associated readout electronics for use as the HET's focal-plane detector. This work, which began this summer, recently was awarded \$800,000 from the National Aeronautics and Space Administration (NASA).

Meng's lab also has been developing ultrahigh resolution single photon emission computed tomography (SPECT) systems that help visualize the distribution of radio-labeled cells in mice. This system can be installed inside a MRI scanner for simultaneous SPECT and MR imaging studies, providing a unique tool for in vivo cell imaging in small animals. The system is based on a recently developed energy-resolved photon counting (ERPC) detector. Initially supported by the National Institute of Biomedical Imaging and BioEngineering, the work recently received a \$600,000 U.S. Department of Energy grant for developing a prototype imaging system to be installed in an existing MRI scanner in the Beckman Institute.

Meng's group also is working with Prof. Yuan-Chuang Tai and Prof. H. Krawczynski at Washington University on a DOE funded project aimed at developing small-pixel CdZnTe detectors for ultrahigh resolution PET imaging applications. As the first step, these CZT detectors will be used as virtual-pinhole PET (VP-PET) insert-detectors placed inside a scintillation-detector based animal PET system. In this configuration, the CZT inserts could provide extra information allowing for ultrahigh resolution (potentially sub-500  $\mu\text{m}$ ) PET imaging.

The group also is involved in developing an X-ray Fluorescence Emission Tomography (XFET) technique for 3-D mapping of elemental distribution in biological samples. This technique combines state-of-art imaging sensor with novel image-formation strategies, offering a dramatically improved efficiency. The XFET technique would provide a non-destructive way of studying many endogenous metals and metal ions – such as Fe, Cu, and Zn – that play critical roles in signal transduction and reaction catalysis. In addition, exogenous metals are often critical components of new in-vivo molecular imaging agents: Gd and Mn are used in magnetic resonance imaging (MRI) agents, and Cd and Au are used in nanoparticle-based optical imaging agents. When applied to tissue samples excised from animal models, XFET technique would provide calibration and subcellular localization information critical for the continued advancement of these technologies.

"Over the past four years, the group has certainly enjoyed the crucial contributions from group members, such as NPPE students Geng Fu, Jia-Wei Tan, Nan Li and Liang Cai," Meng said. "Their hard working and intelligent efforts have been the key for our recent success."



*NPPE students JiaWei Tan, left, and Liang Cai assemble an MRI-compatible SPECT system at the Biomedical Imaging Center (BIC).*



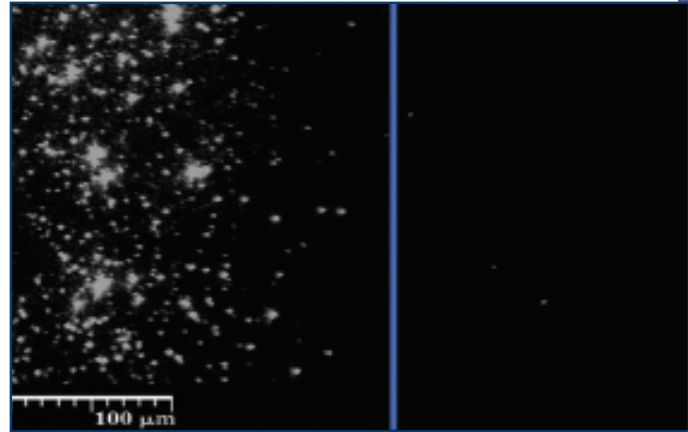
## Plasma Technique Provides Cleaner Chip-making Surfaces

A group from the Center for Plasma-Material Interactions has gained a patent on a non-contact method that uses plasma to clean very small dust and contamination particles from surfaces in the making of computer chips.

The technique is used to remove contamination from semiconductor wafers and the patterns used to make the chips during fabrication. Martin Neumann, NPRE adjunct faculty member and a co-developer of the process, said that even in a clean-room environment, dust and contamination becomes more of an issue, as the feature sizes of chips get ever smaller.

Through the newly developed technique, plasma is pulsed in such a way that it creates a charge to grow in the dust or contamination, forcing the particles off the surface being cleaned. Said Neumann, "The principle is a lot like when your hair stands up due to static electricity: the like charge build up repels the hairs from each other."

The system has a number of advantages for computer chip fabricators. It is a dry process, so no chemicals are used and nothing has to be wetted. It is non-invasive, oc-



*A wafer containing 80 nm polystyrene contaminant particles was masked where the blue in is and the area to the right was exposed to the submicron particle removal system. As you can see, the particles are fully removed. This shows fully the cleaning and selectivity of the process.*

curing quickly, and is easily adapted into a fabrication line. It is also cost-effective.

Neumann said the process has applications beyond computer chip production. "Any application that requires non-contact methods cleaning of nanometer-sized contaminants would be appropriate," he maintains. "This has a wide range of applications within any industry working with optics and high-precision manufacturing. There may also be medical applications to this as well."

Several companies have expressed interest in the process although it has not yet been used commercially. The development team is working on test cases before licensing the patent from the University of Illinois, Neumann said.

In addition to Neumann, an NPRE alumnus, BS 99, MS 04, PhD 07, those included on the patent are David N. Ruzic, NPRE professor and Director of the Center of Plasma-Material Interactions; Brian E. Jurczyk, NPRE adjunct faculty member and alumnus, BS 95 *Aerospace Engineering*, MS 97, PhD 01; and NPRE alumni Darren A. Alman, BS 97, MS 01, PhD 03; and Huatan Qiu, MS 05, PhD 07. Allman works for Champaign, Illinois-based Starfire Industries, an advanced plasma technologies company Jurczyk cofounded with NPRE alumnus Robert Stubbers, MS 98, PhD 02. Qiu is a research engineer for Novellus Systems Inc., San Jose, California.



*The University of Illinois was host to the National Science Foundation's (NSF) Industry/University Cooperative Research Centers (I/UCRC) Program Meeting on October 29 and 30. As a new member, the Center for Plasma-Material Interactions (CPMI), directed by NPRE Prof. David N. Ruzic, shared latest research endeavors with participants from three other universities and several industry representatives.*

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The alumni and friends listed contributed to the Nuclear Engineering Unrestricted Fund, the Roy A. Axford Fund, the Bruce W. Spencer Fund, the Catherine Pritchard Fund, the Barclay G. Jones Fund, the George Miley/LENR Fund, and the NPRE Radiological Engineering Chair Fund during Fiscal Year 08 (July 1, 2009-June 30, 2010). Thank you for your gifts! (All degrees are in NPRE unless otherwise indicated.)

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### ANS Winter 2009 Meeting

NPRE Department Head Jim Stubbins presented an update on enrollment statistics, faculty numbers and fund-raising efforts during an alumni breakfast the Department hosted November 17 in conjunction with the American Nuclear Society winter meeting in Washington, D.C. Attending were, from left, NPRE student Lulu Li; Bob Penn, BS 77; Blair Bromley, MS 98 *Aerospace Engineering*, PhD 01; Maria Okuniewski, PhD 08; NPRE Alumni Coordinator Susan Mumm; Dan Ingersoll, MS 74, PhD 77; Ben Holtzman, BS 08; Tunc Aldemir, MS 75, PhD 78; Eric Rozek, MS 03; NPRE Department Head Jim Stubbins; W. San Horton, MS 86, PhD 89; Adjunct Prof. William Roy; Kristine Aldemir, BS 76 *Commerce*; and NPRE Emeritus Prof. Dan Hang. Also attending but not pictured here were S.Y. Chen, MS 73, PhD 78; John Gutteridge, Nuclear Regulatory Commission Education Program Manager; Ron Knief, PhD 72; Don Potter, BS 74 *Aerospace Engineering*, MS 75; Terry Rathgeber, College of Engineering Advancement Director; and Nicholas Tsoufanidis, MS 65, PhD 68.



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*NPRE Prof. Magdi Ragheb's class builds a wind turbine on the Engineering Quadrangle to learn about the capabilities of alternate sources of energy. In the foreground of the Grainger Engineering Library, students measure how much electricity the turbine produces.*