



*A panel discussion on the Fukushima crisis held on March 18, 2011, included (left to right) Professors Ron Gilgenbach, John Lee, Thomas Downar, William Martin, Kimberlee Kearfott, and Annalisa Manera*

# NEWS NOTES

## International media call on UM Nuclear Engineering faculty to explain the Fukushima crisis

**O**n Friday, March 11 at 2:46 p.m. Japan time, an 8.9 magnitude earthquake struck just off the east coast of Honshu, near the Miyagi Prefecture. The real disaster occurred when a Tsunami, with a 30-foot wall of water hit the coast obliterating everything in its path for miles. Neighboring Fukushima Prefecture didn't fair much better and had other issues: the combination of a seawall fracturing and the resulting power outage disabled the cooling mechanisms at the Fukushima Nuclear Power Plant. Radioactive releases occurred and residents within 20 kilometers were evacuated.

The devastation of the tsunami saddened the world but the news of the failure of the nuclear power plant caused an almost global panic. Everyone searched for answers, and experts who could explain what was happening.

*Continued on page 3*

# WELCOME

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Even though the earthquake/tsunami in Japan and the aftermath of the Fukushima Nuclear Power Plant crisis seem a long way back, we are still learning lessons from it. In this issue we discuss the UM NERS reaction to the accident and how our faculty took a leading role in explaining the events to the local, national, and international communities through panel discussions and with forums at UM, Xiamen University and interviews on CNN, the NBC Today Show and other media outlets. NERS department included faculty interviews on our website and added a Japanese-translated section. We have learned that many Japanese residents looked to the UM NERS website as an independent resource for information during this crisis. One NERS faculty member has already traveled to Japan to investigate the potential radiological impact of Fukushima emissions.

We are pleased to announce that Dr. Annalisa Manera has joined the department as an Associate Professor. Annalisa brings her world-class experimental and computational nuclear thermal hydraulics research expertise to UM NERS. This raises the number of tenure track NERS faculty to 23, (including 3 joint appointments) an all time high; we also employ 9 research faculty, 8 adjunct faculty and 5 Emeritus faculty. During the past year, Professor Mark Kushner has been elected to the National Academy of Engineering. Assistant Professor Alec Thomas has been granted a CAREER Award from NSF.

UM NERS student enrollment is strong at some 158 undergraduates (includes Engineering Physics) and 135 graduate students. Research funding by NERS faculty has also reached an unprecedented level of some \$16 million dollars annually.

UM NERS continues its emphasis on international collaborations and outreach. Last Spring, 15 UM students and 6 NERS faculty participated in a Global Intercultural Experience for Undergraduates taught in China at Xiamen University, SNERDI and other nuclear program sites.

Please take a few minutes to read about these important events as well as all the exciting things that our faculty and students are doing to help keep UM NERS a top rated Nuclear Engineering department in the country!

And of course, I continue to be amazed and pleased by the support that we receive from our devoted NERS alumni. It is a goal of mine to reach out to as many alumni as possible and invite them to keep in touch, come visit, or even drop me a note. NERS boasts some of the most distinguished graduates who can influence how we teach and provide guidance to our young, talented minds. NERS faculty members look forward to working with our outstanding students, researchers and alumni this coming year to ensure the bright future of the department and the field of nuclear engineering.

Go Blue!

**Ron Gilgenbach**

Chair and Chihiro Kikuchi Collegiate Professor



*Continued from cover*

Within days of the nuclear crisis at Fukushima, the NERS Chair, Ron Gilgenbach, organized a panel discussion, open to the public, and later broadcast through the UM public television channel, that focused on such topics as: sequence of events in Japanese reactors, hydrogen production / explosion and status of plants, comparisons to Three Mile Island and Chernobyl, effects of radiation exposure on humans, and improvements in existing / future reactors.

Many media sources looked to the top ranked nuclear engineering department in the world, the University of Michigan. "There were so many questions but the Department of Energy employees are not allowed to talk to the press and those at the Nuclear Regulatory Commission said, 'no comment.' So the media turned to academia for answers," says Gary Was, professor in the Nuclear Engineering and Radiological Sciences and Material Science and Engineering departments.

Many UM faculty were on the hot seat to answer media questions. Professors Gary Was, Bill Martin, John Lee, Kim

Kearfott, Mike Hartman and several others fielded questions from such media outlets as CNN, the *Wall Street Journal*, MS-NBC, the Huffington Post, Yahoo Finance, WXYZ Channel 7, WJR radio, *Time Weekly* (a newspaper in China and partner of the *New York Times*), The *NBC Today Show*, radio stations in New Orleans, Brazil, Australia and even a TV station in Japan.

"In the early stages there was an attempt to understand what was going on," says Martin, "as opposed to the fear mongering that began a little later. At first it was difficult because there was little information available, but I felt my role was to try and answer their questions with what information I could get for this very complex issue."

Was's experience was different. Rather than be interviewed over the phone or in a remote TV or radio station, CNN flew him to Atlanta where they had created a "nuclear desk" and Was was dubbed their nuclear expert.

"The experience was phenomenal," says Was. "I got to see so many different sides of the issue. I needed to answer complex questions in 15 seconds so that the average person

*UM Professor Gary Was was a resident expert for many local, national, and international news outlets*

*Continued on page 4*

#### **Wesley E. Bolch**

Professor  
Nuclear and Radiological Engineering  
University of Florida

#### **Forrest Brown**

Diagnostics Applications Group  
Los Alamos National Laboratory  
Los Alamos, NM

#### **Frederick Buckman**

President, Power Group  
N4 Development

#### **Jack M. Davis**

Sr. VP and Chief Nuclear Officer  
DECo, Fermi 2

#### **Jonathan (Josh) Grindlay**

Professor  
Department of Astronomy,  
Harvard University

#### **Simon Labov**

Director, Radiation Detection Center  
Lawrence Livermore National Laboratory  
Livermore, CA

#### **Richard Lanza**

Senior Research Scientist  
Department of Nuclear Science & Engineering  
Massachusetts Institute of Technology

#### **Thomas A. Mehlhorn**

Superintendent, Plasma Physics Division  
Naval Research Laboratory  
Washington, DC

#### **Arthur T. Motta**

Chair and Professor  
Nuclear Engineering Program  
Pennsylvania State University

#### **G. Robert Odette**

Professor  
Mechanical Engineering & Materials  
University of California, Santa Barbara

#### **Charles A. Schrock**

President & CEO  
Integrus Energy Group, Chicago, IL

#### **Dr. Joseph Schumer**

Pulsed Power Physics Branch  
Plasma Physics Division  
Naval Research Laboratory, Washington, DC

#### **Jasmina Vujic**

Professor  
Department of Nuclear Engineering  
University of California, Berkeley

#### **Dr. Steven J. Zinkle**

Director, Materials Science and  
Technology Division  
Oak Ridge National Laboratory, Oak Ridge, TN

## Advisory Board



# Europe rethinks nuclear power: really?

**F**ear of radiation poisoning spread after the Fukushima incident and soon Italy, Switzerland and Germany announced a halt or reduction of their nuclear power plant construction plans and usage. German Chancellor Angela Merkel appointed an ethics committee to review Germany's nuclear power policies.

According to a World Nuclear News article the decision to shut down all Germany's nuclear power plants by 2022 was not thought through. "...the Nuclear Society (Kerntechnische Gesellschaft, KTG) called the 2022 exit date a "sham" based on the lack of clarity in plans to actually replace nuclear plants that provide about one quarter of Germany's electricity."

But U-M Nuclear Engineering Associate Professor Annalisa Manera, a native of Bari, Italy, has another take on Europe's knee jerk reaction. "The most negative responses have been from European countries where elections are imminent, in Finland, Sweden and Holland for example where the elections have passed, their nuclear power usage and construction are still on track. But they did pay attention to what happened at Fukushima and they learned lessons," says Manera.

For countries like Germany, that has a vocal antinuclear constituency, the plan is to replace the nuclear energy by building more wind generators. But as Manera points out wind energy requires more resources (such as land and materials) than nuclear power per kWh of electricity produced. Currently Germany has installed so much wind power that in very good wind conditions they produce so much electricity that they have to basically give it away to neighboring countries like Switzerland and Austria. However, they are building new coal-fired power plants to provide electricity when the wind is not blowing.

"Rather than give up on nuclear power we should have a reasonable mix of energies from wind, solar, water and nuclear so that we can reduce our dependence on fossil fuels," suggests Manera.

What Fukushima should teach us, says Manera, is about safety and safety culture, especially nowadays with new countries in the beginning phases of nuclear power plant construction such as China, and several Middle Eastern countries.

*A nuclear power plant in Lower Saxony, Germany.*



at home on the couch would understand. I needed to debunk bad information on a topic that scares a lot of people. It is difficult for a scientist to speak off the cuff."

At first Was admitted to being very nervous. Here he was sitting next to CNN anchors having to answer questions on live TV. "Each day the situation changed in Japan. Finally I realized that I could control the focus of the interview by providing the questions to the anchors ahead of time and that way I could get to the real issues at hand instead of fending off questions I felt I wasn't qualified to answer. There was definitely a strong pull to tell them what they wanted to hear. But my objective was to dispel myths and calm the situation by explaining and educating."

Both Martin and Was admit to being nervous in front of the camera, but they felt it was their duty as nuclear experts and as U-M faculty to try and educate the public in a topic so few truly understand.

**"The university has a global reach and we know that what we do can have an impact, especially in a time of crisis."**

"Our primary mission is to educate our students, but with that mission comes the responsibility to step outside the classroom and the laboratory and work within the community. The university has a global reach and we know that what we do can have an impact, especially in a time of crisis," says Ron Gilgenbach, chair of the Nuclear Engineering and Radiological Sciences department who also moderated the community panel discussion.

The other faculty couldn't agree more. "Our department and the university felt strongly that informing the public, giving some interpretation is a service that we have an obligation to provide. We all felt that way. It's not something that we signed up for, but we just do it. Definitely during the two to three weeks after the tsunami none of us got a lot of work done," says Martin.

Was concurs saying, "It's the responsibility of those of us in the profession to help others understand and share our knowledge. Being on CNN was definitely way outside my comfort zone but I'm glad I did it."

# Trip to China gives UM students rare opportunities

Last May, 15 UM undergraduate students, many of them from the NERS department, were able to see first-hand the birth of a robust third generation nuclear program. The students, and a handful of faculty, participated in a Global Intercultural Experience for Undergraduates taught in China at Xiamen University, SNERDI and other nuclear program sites.

"We visited 4 nuclear reactor construction sites, including a site for two generation III AP-1000 reactors that are designed by Westinghouse, a US based company (but has not been built in the US yet). Such reactors have the exact safety features to prevent the kind of accident that happened in Japan during an outage. China has bought the technology along with the first 4 such reactors, and we have learned that hundreds of young engineers are helping to complete its engineering design in detail during the construction. The students learned that more than 25 nuclear power reactors are currently under construction in China right now, and China plans to surpass the US to become the largest nuclear-powered country within 20, or maybe be even 15 years. Also, UM NERS has 13 alumni in China right now. They are playing important roles in the Chinese nuclear power industry. Several of them made big efforts to ensure our visit was as successful as it was," explains Lumin Wang, NERS faculty and organizer of the trip.

The four-week trip exposed students to not only nuclear power plant construction, but it gave them a chance to meet Chinese nuclear engineering students and faculty, learn about policy development, and also experience Chinese culture and food.

Students kept a blog while on the trip and one wrote, "It was nice to have a hamburger at Carl Jrs. Going from never having Chinese food to two weeks straight of Chinese food was beginning to not agree with my stomach, so it was nice to have a hamburger." But on a more academic note he also wrote, "So far my appetite has been quenched. I have been able to see three nuclear power plants that are partially under construction or completely and have been able to ask questions and see the difference between American and Chinese methods."

The trip also helped some students seal their plans for a future in nuclear engineering. This trip helped UM student, Andrew Winters, decide what path he would like his career to take.

"I thought the trip would be a great opportunity to find out about another country's nuclear policy," says Winters. "Now I would like to work with an international agency to promote nuclear power, to educate people in nuclear and that power plants are a good thing for an area. I want to promote nuclear power and its benefits. Before I was leaning more toward engineering, but after this trip now I want to work on the policy side of nuclear."

"Now the students have seen how clean and efficient of the subway systems are in Beijing and Shanghai, how fast the trains go in China, and even the most modern nuclear reactors designed by the US and France but have not been built in other parts of the world are under large scale of construction in China. I wanted to use the trip to inspire them, I wanted to let them know if we are too relaxed we are going to soon fall behind," says Wang.



Top photo at Qinshan: Back row, left to right: Kendra Hall, Professor Gilgenbach, Professor Martin, Mrs. Martin, Professor Fleming, Guerlain Ulyss, Ridhisha Rughani, Amisha Agarwal, Jonathan Lewallen, Carlea Hazzard, Amy Meldrum, Congyi Li, Shirley Wang, Andrew Winters, Malcolm Hegeman, Professor Wang, 2 plant employees. Front Row: Arthi Kumar, Lais Duarte, Alyssa Coligado, Mindy Zhong  
Middle Photo at Qinshan: Carlea Hazzard, Amy Meldrum, and Malcolm Hegeman  
Bottom photo: Back row, left to right: Guerlain Ulyss, Jonathan Lewallen, Malcolm Hegeman, Kendra Hall, Amy Meldrum, Carlea Hazzard, Andrew Winters, Congyi Li. Front row: Amisha Agarwal, Lais Duarte, Arthi Kumar, Shirley Wang, Ridhisha Rughani, Mindy Zhong, Alyssa Coligado, Professor Wang.

## FACULTY &amp; STAFF NEWS

## Chihiro Kikuchi Collegiate Professor recognition

It is a rare privilege for a faculty member to be distinguished with a Collegiate Professorship, but Monday, September 26, NERS department chair, Ron Gilgenbach formally received the Chihiro Kikuchi professorship, given to him by the University of Michigan College of Engineering.

Named for the late UM nuclear engineering professor, Chihiro Kikuchi, this honor recognizes Gilgenbach's 31 years of teaching, research, and mentoring excellence. Gilgenbach feels that Kikuchi embodied everything that this professorship signifies.

"Not only was Dr. Kikuchi a world-renowned nuclear engineer but a good friend as well. Chihiro provided a great example of applying basic physics to solve engineering problems," says Gilgenbach, who gave a lecture on Kikuchi's ruby maser, the original of which is now housed in the Smithsonian Museum, in Washington DC.

Gilgenbach has also been a mentor and friend to his former students, many of whom came to the ceremony. He was



Speakers at the event, left to right: John Booske, Y. Y. Lau, David Munson, Tom Spencer, Michael Cuneo with Ron Gilgenbach.

described as, "an excellent mentor and problem-solver", "a professor with an incredible work ethic and sense of humor", and most of all time and time again the audience heard that he was a "great teacher".

Gilgenbach has supervised the dissertations of 45 Ph.D. graduates and has published over 150 articles in refereed journals and has four patents granted and a fifth patent application filed.

"Appointments to a collegiate professorship is reserved for a faculty member of national and often international stature who has earned a highly distinguished record of teaching, research and publication. The College of Engineering is proud to honor Dr. Gilgenbach's outstanding dedication in this way," says David C. Munson Jr., dean of the College of Engineering.

## Report from the Advisory Board: The state of NERS



Author: Tom Mehlhorn

The Advisory Board of the Nuclear Engineering and Radiological Sciences (NERS) department of the University of Michigan met on September 8-9, 2011. The Advisory Board members represent leaders in industry, academia, and the national laboratories that span the four primary research options in NERS: Fission and Transport, Plasma and Fusion, Nuclear Measurements, and Nuclear Materials. The board were briefed by the Department Chair and a number of faculty members, had discussions over lunch with several undergraduate and graduate students, met with department staff and research scientists, and had an outbrief/discussion with College of Engineering (COE) Dean David Munson and Associate Dean for Academic Affairs Jack Hu.

The Board took some key actions at this meeting in support of the 2011 ABET accreditation of the department. The Board found the state of NERS to be impressively strong including a number one ranked graduate program, all-time high enrollments, a record high ratio of research funding per faculty member, and outstanding faculty and research strength in all four primary research options. The Board continued to be impressed with the "standards of excellence" of the department, the dedication and productivity of the faculty, the commitment of the staff, and the enthusiasm of its students. The

Board made several key recommendations including: 1) the department has an immediate need for additional space for faculty offices, labs, and teaching; 2) the Ford Nuclear Reactor building repurposing plan is a longer-term option that should be pursued; 3) graduate enrollment practices and procedures should be reviewed given changes in the College of Engineering policies; 4) it is time to update the NERS strategic plan; and 5) there are opportunities to work with the COE Alumni Society Board to increase the outreach to NERS alums.

*Dr. Tom Mehlhorn (UM NERS BS '74, MS '76 PhD '78) is the Superintendent of the Plasma Physics Division at the Naval Research Lab (NRL) in Washington, DC. In January 2011 he accepted a two-year appointment to the Panel on the Assessment of Inertial Confinement Fusion Targets (ICF) for the National Academies. He recently became a fellow of the American Physical Society in the Division of Plasma Physics "For scientific leadership in developing physics-based simulation tools, discriminating diagnostics, and validation experiments, producing a predictive capability that contributed to major advances in ion and electron beam physics, Z-pinches, inertial confinement fusion, and dynamic materials." He also served as chair of the 2011 NERS Advisory Board.*



## An afternoon reception to kick off the new academic year

It was a beautiful fall Sunday afternoon. The Wolverines had an impressive win on the football field, the semester was nicely underway and the students hadn't been faced with any tests yet—it was the perfect time for a party. NERS department chair, Ron Gilgenbach and his wife Cathy, opened their home to NERS students, faculty and staff offering a chance for some fun and camaraderie before the business of teaching and learning developed into full swing.

One of the first graduates of the program, Dave Thomas (NERS '57) came in from Washington DC, one of Dr. Gilgenbach's first Ph.D. students, John Booske (NERS '85) now on faculty at the University of Wisconsin wore his UM swag proudly. Even former president Jim Duderstadt and his wife Anne mingled on the deck.

Jay Herman, proud parent of NERS student Neil, got a chance to meet with some of his son's professors learning about UM traditions.

"The University of Michigan has kept my son so busy that he didn't even have time to wait in the long line to meet the president. She found out about it and mentioned him by name in a recent speech," said Herman.

Many students filled themselves with sausages with sauerkraut, cream-filled cake and baked beans. One student, Andrew Gahan, a NERS undergraduate who recently transferred from Kalamazoo Community College and who was a "nuke in the navy" and then a worker in a cast iron foundry said, as he finished a hot dog, "I know that this program is going to be extremely challenging..."

Gilgenbach made a point of talking with the old and the new, student and staff, enjoying his afternoon of being a host.

"NERS department prides itself on the close interaction between faculty and students, so we are glad to have these kinds of events where we can mingle in an informal setting," said Gilgenbach.



## Focus Hope gave UM student hope and more!

As Dallas Manning, 42, works with his team in the Major Enterprise Projects at DTE he feels incredibly lucky. It was just a few years ago he didn't have a direction and certainly never would have dreamed that he would be an associate engineer.

"I went to an interview at a warehousing company that happened to be in the same building as Focus Hope for a job interview," says Manning, "and they told me that I was over qualified and would be bored by the job. They suggested that I look at the CAT (Center for Advanced Technologies) program with Focus Hope that could pay my tuition if I pursued an engineering degree."

So Manning moved his family and began his difficult journey towards a degree. It began with an associate's degree at Lawrence Technological University and then he entered the Nuclear Engineering and Radiological Sciences department at the University of Michigan.

"The University of Michigan was a new partner with CAT so I was one of the first students to enroll. I chose nuclear engineering because I enjoyed physics in high school and I thought it would be easier than mechanical engineering. But it was a lot tougher than I thought," Manning laughs. "I began to struggle. The college of engineering had tutoring resources that I could use and the faculty all opened their doors to me and they were very supportive."

Focus: Hope Center for Advanced Technologies, established in 1993, provides underserved individuals with the opportunity to earn a college degree in engineering and go on to become leaders in industry. The program was developed with support from the National Science Foundation (NSF) and several industry and university partners. Students enrolled in the program work in industry and go to school. They earn a small salary and their tuition is paid. Manning worked for eight hours a day and then attended classes for four hours. He was exhausted after his 12-hour days but he had his eye on the prize: a nuclear engineering degree from the U-M.

"The CAT program was a godsend," says Manning. "I never thought I would have an opportunity like this but it wasn't easy. I am proud to be one of the first graduates from this program. Now I have a great job that allows me to work with all kinds of power including nuclear, wind, solar and hydroelectric."



# FACULTY & STAFF NEWS



**Alex Bielajew**, Professor, Monte Carlo methods, electron transport, dosimetry, dose calculation, and cancer therapy, has just reached "Citation Classic" status. With the citation of his work, "PRESTA, the Parameter

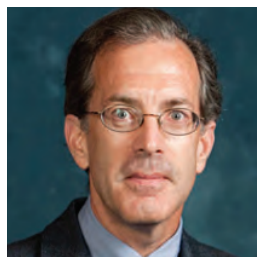
Reduced Electron-Step Transport Algorithm", in The Web of Knowledge with D.W.O. Rogers as second author, Bielajew has 400 citations.



**John Foster**, Associate Professor, is working on an advanced concept designed for rapid development and deployment of the next-generation of high power advanced propulsion for spacecraft of the patent-

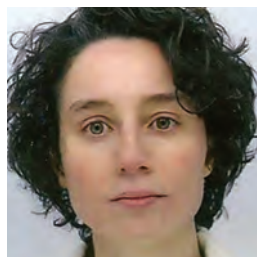
pending Annular-Geometry Ion Engine, or AGI-Engine, under study at The University of Michigan in cooperation with the NASA Glenn Research Center in Cleveland, Ohio. This concept may allow ion engines to be scaled from the 2 kWe power levels used on JPL's Dawn mission to 100's of kWe, at > 3X the power density of existing engines, and do so allowing for long-life. The first proof-of-concept test for the AGI-Engine has been completed (reference photo, courtesy NASA GRC). The test validated the novel design of the plasma discharge and magnetic circuit, which was designed by Associate Professor John Foster and graduate student Aimee Hubble of Nuclear Engineering and Radiological Sciences Department at U of M. This test also provided data supporting operation at high plasma densities. The engine is presently undergoing upgrades at NASA in preparation for a second-round of testing to demonstrate high-thrust operation.

*Annular Ion Thruster operating with diagnostic grid on xenon propellant.*



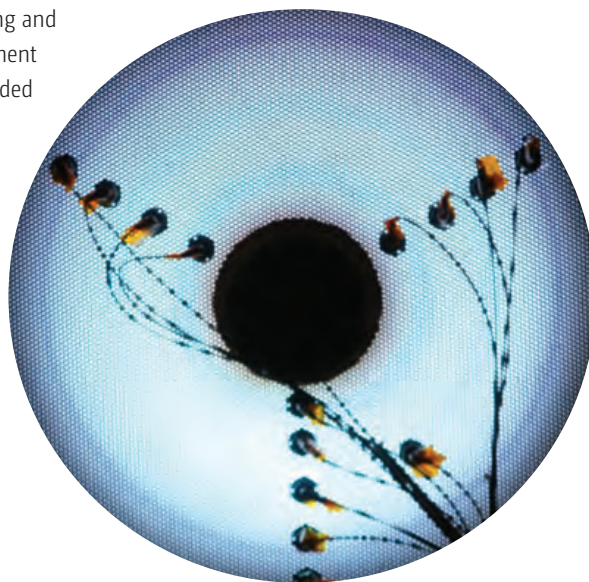
**Mark J. Kushner**, the George I. Haddad Collegiate Professor, has been elected to the National Academy of Engineering. Professor Kushner's NAE citation reads: "For contributions to low-temperature plasmas for

semiconductors, optics, and thin-film manufacturing." Dr. Kushner also serves as the Founding Director of the Michigan Institute for Plasma Science and Engineering (MIPSE) whose membership has recently been expanded to include Michigan State University faculty and students as well as UM.



The University of Michigan, Department of Nuclear Engineering and Radiological Sciences is pleased to announce that **Dr. Annalisa Manera** has joined our faculty as Associate Professor. Manera received her Ph.D. from the

Reactor Physics Department at Delft University of Technology in The Netherlands and her Master's Degree in Nuclear Engineering from the University of Pisa, Italy. Most recently she led the group "Systems Behavior" at the Laboratory of Reactor Physics and Systems Behavior at the Department of Nuclear Energy and Safety, PSI, Switzerland. Manera brings expertise in both experimental and computational thermal hydraulics to the U-M classroom and research labs.







Professor **Sara Pozzi**, leader of the Detection for Nuclear Nonproliferation Group (DNNG), received three new funding awards from the Department of Energy (DOE) National Nuclear Security Administration, Nuclear Energy

University Programs, and Office of Science, totaling over \$2 M. Two of these awards support our collaboration with Los Alamos National Laboratory to develop a measurement system based on organic scintillation detectors and to perform new experiments on the basic physics of fission. The experiments will provide much-needed nuclear data, including the energy spectrum, multiplicity, and angular correlation of neutrons from induced fission events on U-235 and Pu-239. These isotopes are of interest in nonproliferation and homeland security applications. The third award is aimed at developing new digital pulse shape discrimination techniques for measurements with organic liquid scintillation detectors. The work is performed by a team of NERS graduate students under the supervision of Assistant Research Scientists Marek Flaska and Shaun Clarke, and Postdoctoral Fellow Andreas Enqvist. The new awards consolidate and diversify the DNNG research portfolio, which includes collaborative projects with most of the DOE national laboratories.



Assistant Professor, **Alec Thomas**, received \$450,000 from the National Science Foundation and the CAREER Award for bright femtosecond X- and gamma-ray pulse production using ultra-intense lasers. He describes the project:

One way of producing relativistic electron beams is using a technique known as laser wakefield acceleration. The basic principle of is to use an intense, ultrashort laser pulse to displace electrons in a low density plasma, rather like a boat pushing through water leaving waves in its wake. In a manner analogous to a surfer being propelled in synchronization with an ocean wave, the electron plasma waves generated in the wake of the laser pulse can be used to 'surf' an electron beam to relativistic energies. Using the HERCULES laser, we can also generate transverse oscillations of the electron beam in either additional laser fields or the fields of

the plasma wave itself, which results in radiation emission at double Doppler upshifted photon energies extending to the hard x-ray or gamma-ray range. Compared with conventional synchrotron light sources that are used for numerous applications throughout the technical disciplines, such a radiation source can be ultracompact, perhaps even reducing a 2 mile-long free-electron-laser to a tabletop scale.



**Steven Winters** joined the administrative staff in August, where he will be assisting the department with various tasks including NERS publications, human resources, and other departmental support. He received his BA in political

science from the University of Michigan in 2010 and also plans to eventually obtain an MA in higher education administration. Prior to joining NERS, he worked in financial aid at Washtenaw Community College. He joins the department as administrative assistant senior.



Please visit NERS website at

<http://www-ners.engin.umich.edu/>

for our online giving button. Please accept the default "Use my gift where it is needed most (NERS – Nuclear Engineering Special Fund) or choose your areas of support: NERS – Chihiro Kikuchi Scholarship Fund, John S. King Scholarship Fund, William Kerr Scholarship Fund, or Richard K. Osborn Lectureship Fund, or Other Areas (specify).

THANK  
YOU!

## ALUMNI NEWS

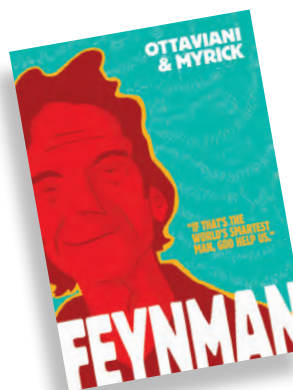


"I first encountered Richard Feynman via his book *Surely You're Joking, Mr. Feynman!*, which somebody in NERS (back when it was just NEI) loaned me while I was working on a masters degree. First, thank you, whoever you are —

If you look inside our book, you'll see I dedicated the graphic novel to you.

For those who don't know much about him, why Feynman? Well, he was a Nobel prize-winning physicist who wrote best-selling books, cracked safes while working on the Manhattan Project, painted professionally, played percussion, and went out of his way to make sure his life and the lives of everyone around him were interesting. He worked with geniuses like Einstein, Bohr, Dirac, and Oppenheimer, and his own genius and curiosity led him to influence and work directly on the atomic bomb, nanotechnology, supercomputing, and the space shuttle.

In short, his fingerprints are all over the 20th century.



And I wrote a graphic novel about him because he's a perfect subject for comics, not only because he lived an interesting life, but because pictures played an important role in his discoveries as well. If you pick up a physics journal, you're likely to run across a few images named after him. He called them 'funny looking pictures,' but the rest of the world calls them Feynman Diagrams and uses them to solve difficult-bordering-on-intractable problems in quantum electrodynamics. They've done so since he introduced them in the 1940s. Feynman thought it would be a kick if serious articles started to feature these funny looking inventions of his. They did."

*Jim Ottaviani got his NE masters in '86, and worked as a consulting engineer doing nuclear power plant modifications for a number of years afterwards. He then switched fields and became a librarian, and his day job is at the University of Michigan's Library, where he pushes bits around all day long as manager of its Deep Blue service. He writes comics late into the night on weekdays and at all hours on the weekends.*

## Academic Genealogy: Memories of a mentor

From great scientists come great scientists. Great teachers come from great teachers. And so the tradition of mentoring talented students has come through the university system for centuries. For Richard Osborn (1919–1987) his academic lineage can be traced all the way back to Friedrich Leibniz who taught science at the University of Leipzig between 1597–1652. Leibniz mentored Jakob Tomasius who mentored Otto Mencke and so forth through Carl Friedrich Gauss at Göttingen over the centuries to Max Born and J. Robert Oppenheimer at Göttingen, to Leslie Lawrence Foldy at UC Berkeley, who then mentored Osborn at the Case Institute of Technology. On Wednesday, June 1 several of the students Professor Osborn had mentored gathered in his memory. The occasion was the newly established Richard K. Osborn Memorial Lectureship endowed by former student and MIT Professor Sidney Yip.

"I wanted to do something that would be a help to the UM Nuclear Engineering Department and be a reminder of the

kind of passion that not only Professor Osborn had but what exemplifies the University of Michigan," says Yip. "When a teacher can inspire people the way Dr. Osborn did, they remember you."

The memories of an astounding person and teacher raced around the room like an atom. Former students came in from Pennsylvania, Florida, Massachusetts and other locales, wanting to share their memories of Dick Osborn.

"Passionate teacher, kind, irreverent to fame, unwavering pursuit of fundamental science, he changed my life," were some of the ways Osborn was described. That he enjoyed a good gossip, maybe, that he liked to instigate intrigue, certainly. Also that before he was a beloved professor he had illustrious careers as a lumberjack, prizefighter and was even a hired hand in a ghost town. As a matter of fact Osborn had a knack of turning everything into an adventure.

What isn't up for debate is that he authored a fundamental monograph on the subject, *The Foundations of Neutron Transport Theory* (Gordon and Breach 1966) with Yip as a coauthor.

Yip has recently retired from MIT and he hopes that he has inspired some of his students the way Osborn inspired him.



**The first Osborn Lecture was given by Ju Li (top), professor at Massachusetts Institute of Technology, department of Nuclear Science and Engineering and a former student of Sid Yip (bottom). He spoke on September 23, 2011 in a talk titled, "Plumber's Wonderland Found on Graphene".**

# ALUMNI PROFILE

## John Kelly

Some things come full circle in a meaningful way. In 1976, then UM student John Kelly received the Undergraduate Award for Outstanding Work in Nuclear Engineering. Now 35 years later he is back on campus to receive another award, the Alumni Award of Merit.

"The email notification arrived right in the middle of the Fukushima crisis and I was buried in 500 other emails. When I finally read it I was delighted! It was a bright spot among all the turmoil," says Kelly.

In 1972, Kelly was an undecided engineering student. He talked to all the departments and decided that nuclear engineering was the most interesting with the best potential for growth. He excelled at UM and then pursued his Ph.D. at MIT.

demanding sport. He brings that same passion to the nuclear industry, where he has taken on several roles (see bio below).

"Nuclear is the only large scale option we have to reduce our carbon footprint. The right engineering can make it safe and save the world!"

Dr. John E. Kelly, NERS '76, was appointed Deputy Assistant Secretary for Nuclear Reactor Technologies in the Office of Nuclear Energy in October 2010. He is responsible for the Department of Energy's nuclear reactor research and development programs for Light Water Reactors, Gas Cooled Reactors, Small Modular Reactors, and advanced reactor concepts. His office is also responsible for the development and production of space nuclear power systems as well as the advanced modeling and simulation program within the Office of Nuclear Energy.

*"I feel that UM gives a better education because of the diverse nature of its curriculum as well as its student body"*

"I got an excellent foundation at UM," says Kelly. "I was inspired by great teachers like Chihiro Kikuchi and John Lee. I feel that UM gives a better education because of the diverse nature of its curriculum as well as its student body." Kelly feels so strongly about UM Nuclear Engineering that he was active on the Alumni Board for many years.

Kelly has been an avid ice and roller hockey coach, even during the time he and his family lived in New Mexico. He has fond memories of his teams playing on the outdoor ice hockey rink deep in a canyon at Los Alamos. He loves the athleticism and the challenge of this

Prior to joining the Department of Energy, he spent 30 years at Sandia National Laboratories where he was engaged in a broad spectrum of research programs in nuclear reactor safety, advanced nuclear energy technology, and national security.

He is an active member of the American Nuclear Society and has served on the Nuclear Installations Safety Division for the last 2 decades in a number of leadership positions. He and his wife Sue (EECS'75) now reside in Arlington Virginia.





*12 companies, laboratories, and government agencies were in attendance. The full list includes:*

**Argonne National Lab**  
**Bechtel**  
**Bechtel Marine Propulsion Corp.**  
**DTE Energy**  
**ERIN Engineering**  
**Oak Ridge National Lab**  
**NNSA's Nonproliferation Graduate Fellowship Program**  
**Nuclear Regulatory Commission**  
**Pacific Northwest National Lab**  
**Terra Power**  
**United States Navy**  
**Westinghouse**

## Career Fair 2011 by Steven Winters

For whatever reason, career fairs have always intimidated me. I'm not sure if it was what seemed like an endless number of potential employers, who probably didn't care who I was, or if it was the exponentially higher number of students that I was competing with. Either way, when I walked in to the NERS Career Fair Friday, October 7, that uneasy, overwhelming feeling was not present. The event, also the department's 15th annual, was fairly intimate—being held in the Baer Room could do that I suppose—but featured an impressive number of companies looking for talent specifically within the NERS department. Twelve companies/labs including the NRC, US Navy, DTE, ORNL, KAPL, and others were in attendance. Some were looking for full time employees, some for interns, but all credited the strength of the University of Michigan's NERS department. A rep. from ORNL credited the department's #1 ranking in USNWR and said, "this is a place to come and meet the next generation of scientists." Additionally, the US Navy whose recruiter spoke of the Navy's pride in never experiencing a nuclear related accident, wanted to find employees from the nuclear program and spoke of their VIP trip, funded by the Navy, which gives students an opportunity to tour the flight deck of an aircraft carrier, or the torpedo room of a submarine. Much of the credit for the strong showing also goes to Pam Derry. I spoke to many visitors whose presence at the event was due to their high regard for Pam. For one individual, who shall remain nameless, he attended because he was, "afraid of what Pam would do to me." He was joking, of course, but I think this shows the irreplaceable importance of Pam to the NERS department.



## PhD Graduates 2010–2011

listed with Thesis Titles and Advisors

### Pantip Ampornrat

Determination of Oxidation Mechanisms of Ferritic–Martensitic Alloys in Supercritical Water.  
*Gary S. Was*

### Stephen Anderson

Event Classification for 3-D Position Sensitive Semiconductor Detectors.  
*Zhong He*

### Paul Barton

Silicon Photomultipliers for Scintillation Detection System.  
*David K. Wehe*

### Edward Cruz

Peer-to-Peer Locking of Magnetrans.  
*Ronald M. Gilgenbach, Yue Ying Lau*

### Benjamin Collins

Multiscale Methods for Nuclear Reactor Analysis  
*Thomas J. Downar*

### David French

Investigations of Novel Configurations for High Power Microwave Generation.  
*Yue Ying Lau, Ronald M. Gilgenbach,*

### Matthew Gomez

Experimental Examination of Plasma Formation and Current Loss in Post-Hole Convolutes.  
*Ronald M. Gilgenbach,*

### John Harvey

Performance of Thermoluminescent Dosimeters Under As-Deployed Conditions.  
*Kimberlee Kearfott*

### Shu-Hui Hsu

Evaluation of Dosimetric Uncertainties and Transit Dosimetry Feasibility in Pulmonary Stereotactic Body Radiotherapy (SBRT).  
*Kimberlee Kearfott*

### Christopher McGuffey

Studies of Laser Guiding and Electron Injection in a High Power Laser Wakefield Accelerator  
*Karl M. Krushelnick, Alexander Thomas*

### Sy Stange

Nanocomposite Scintillators for Neutron Capture Measurements.  
*James P. Holloway*

### Athi Varuttamaseni

Bayesian Network Representing System Dynamics in Risk Analysis of Nuclear Systems  
*John C. Lee*

### Christopher Wahl

Imaging, Detection, and Identification Algorithms for Position-Sensitive Gamma-Ray Detectors  
*Zhong He*

### Weiyl Wang

Techniques and Applications of Compton Imaging for Position-Sensitive Gamma-Ray Detectors  
*Zhong He*

### Brandon Weatherford

Development and Study of an Electron Cyclotron Resonance Waveguide Plasma Cathode for Electric Propulsion Applications  
*John E. Foster*

### William West

Investigations into the Optically Stimulated Luminescence Response of Various Materials.  
*Kimberlee Kearfott*

### Emily Wolters

Hybrid Monte Carlo–Deterministic Neutron Transport Methods Using Nonlinear Functionals.  
*William R. Martin*

### Jinan Yang

A Functional Monte Carlo Method for k-Eigenvalue Problems  
*Edward Larsen*

### Jacob Zier

Ablation Dynamics and Instabilities of Metallic Plasmas Generated Using Mega-Ampere-Scale Current Drivers.  
*Ronald M. Gilgenbach, Yue Ying Lau*

## 2010–2011 CoE Graduate Student Awards

Distinguished Achievement  
Distinguished Leadership

Christopher McGuffey  
Travis Trahan, Yvan “Andy” Boucher

## Place of First Employment of Graduates

September 2010 – August 2011

### Graduate Students

#### Knolls Atomic Power Lab

David Genevich  
Andrew LaCharite  
Timothy Watson

#### Nuclear Regulatory Commission

Jakob Steffes

#### Sciencetech

Michael Hirt

#### URS Safety Management Solutions

Jason Storey

#### Holtec International

Hamdi Fariz

#### General Dynamics, Electric Boat

Sarah Williams

#### Brazilian Navy

Claudio Andrzejewski

#### UM NERS

Mark Bourne

#### West Physics Consulting

David Howard

#### Unknown

Michael Nagy

### PhD Students

#### Los Alamos National Lab

Stephen Anderson  
Sy Stange

#### Bureau of Nuclear Safety Regulations / Thailand

Pantip Ampornrat

#### Lawrence Berkeley National Lab

Paul Barton

#### UM NERS

Ben Collins  
Jinan Yang  
Weiyl Wang

#### UM Radiation Oncology

Shu-Hui Hsu

#### Air Force Research Lab

David French

#### Sandia National Lab

Matthew Gomez  
Brandon Weatherford

#### West Physics Consulting

W. Geoffrey West  
John Harvey

#### University of CA – San Diego

Christopher McGuffey

#### Yale University

Christopher Wahl

#### Argonne National Lab

Emily Wolters

#### Naval Research Lab

Jacob Zier

#### FM Technologies, Inc

Edward Cruz

#### Brookhaven National Lab

Athi Varuttamaseni

#### University of Michigan, NERS

Jeffrey Katalenich  
Continuing for PhD

Sonal Patel

J. Kyle Polack

Jason Jaworski

Michael McMurtrey

Matt Orians

Kapil Sawlani

Travis Trahan

Aaron Wysocki

Cheng Xu

Hao Yang

Peng Zhang

#### University of Michigan, AERO

Adam Shabshelowitz  
Wensheng Huang

#### UC – Berkeley

Kyle McMillan

## Internships

2010–2011

#### Los Alamos National Lab

Mitch Young  
Eva Sunny  
Andrew Pavlou  
Eric Baker

#### Sandia National Lab

Efrain Hernandez-Rivera

#### Pacific Northwest National Lab

Jonathan Wierschke  
Kendra Keady

#### NASA Glenn Research Center

Ben Yee

#### Kirtland AFB, Albuquerque, NM

Geoff Greening

#### Idaho National Lab

Travis Trahan  
Jennifer Dolan

#### Korea Atomic Energy Research Institute

Douglas Fynan

#### Oak Ridge National Lab

Chris Perfetti

#### Brookhaven National Lab

Fariz Bin Abdul Rahman

#### Lawrence Livermore National Lab

Christopher Lawrence

#### Hill Air Force Base

Matt Orians

#### Westinghouse

Fariz Bin Abdul Rahman  
Brookhaven National Lab  
Dan Walter  
Zachary Whetstone

# STUDENT PROFILES

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**Jennifer Steers**, 22 and a fifth year senior in the Nuclear Engineering and Radiological Sciences department has taken a slightly different path. A few years ago she watched both her mother and father struggle with cancer. Having spent a

significant amount of time at the U-M hospital and subsequently losing her father to cancer during high school, she was inspired by the dedicated staff she met and the importance of radiation therapy in her own life.

"Professor Larsen first told me about the field of medical physics, in particular Radiation Oncology, and it just fit me. It spoke to the passion I had found for nuclear engineering and medicine," says Steers.

Steers has thrown herself into her studies and her research. She has been working for two years as a research assistant in the Department of Radiation Oncology at the University of Michigan Hospital. There she participates in assisting with clinically-related projects along with research on novel ways to reduce treatment time for patients. She has had the opportunity to present talks on her research both to the clinicians at the hospital and to other medical physicists within the state of Michigan. Additionally, she has had abstracts accepted at the annual meeting for the American Society of Therapeutic Radiation Oncology and the American Association of Physicists in Medicine's annual conference in Vancouver where she presented her research in a poster display.

Steers plans to get a Ph.D. in therapeutic medical physics and would like to eventually participate in both clinical duties and new research. For someone so young she has a clear direction that is rare.

She is determined to contribute to the medical physics field, not only in the United States, but also overseas in order to help mentor medical physicists in developing countries. "I've seen first-hand the conditions the medical specialists deal with in countries like Nicaragua and the Dominican Republic and I want to use my expertise to help where I can. I am so blessed to have found my passion," says Steers.



**Peng Zhang** was born in China but is most recently from Singapore. He is soft spoken, has a ready smile and when you ask how old he is he responds, "well I was born in 1983. I'm not so good with numbers but

excellent with symbols."

He is focusing his studies on phenomenology of surface and interface sciences, including roughness-induced enhanced surface heating, and electrical contacts. In the future he'd like to find a post doctoral position at a university where he could teach and do research on these areas.

Within the last few months he has won the Rackham/ NERS Presidential Fellowship Award; Best Presentation Award from the Michigan Institute of Plasma Science and Engineering (MIPSE) Graduate Student Symposium; and a MIPSE fellowship (2010)

"This department offers a wide range of multidisciplinary courses. The professors here teach the basic physics so students can see how the physics is applied. It's very hands-on," says Peng.

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University of Michigan American  
Nuclear Society Student Section  
DTE Energy  
Lockheed Martin Corporation



## Infrastructure Award Strengthens Department's Lead in Accelerators for Radiation Damage

**A**n infrastructure award for a 3 MV tandem accelerator will bolster the department's lead in the use of ion accelerators to study radiation damage. The award came through the U.S. DOE NEUP Infrastructure program, designed to maintain and build infrastructure in the nation's nuclear engineering departments.

The loss of research and test reactors in the U.S., coupled with the need to understand radiation damage at high dose has led to a critical situation that could threaten the development of new reactor concepts and the extension of light water reactor operating licenses. The success of all six of the Generation IV advanced reactor concepts hinges on the development of materials to withstand the extreme environments defined by high temperature, aggressive coolant chemistry and high

irradiation since ion irradiation can be conducted quickly (days to weeks to reach the 200 dpa level), with little to no residual radioactivity, and therefore, extremely inexpensively — 100 to 1000x cheaper than a neutron irradiation program. But the technique is not without its challenges as the fundamental processes in ion-solid interaction differ from those of neutron-solid interaction in a number of respects. Nevertheless, research in NERS has shown that the irradiated microstructure and properties of light water reactor core materials can be simulated with great accuracy using light ions. Current research is aimed at using heavy ions to reach the high doses of SFRs.

The 3 MV tandem accelerator will greatly increase the capability to conduct such experiments, providing a higher energy, greater damage rates, better beam stability and

The real advantage of this accelerator is that it is the first step in creating a triple beam facility to allow for simultaneous irradiation damage and impurity ion injection to simulate the transmutation process occurring in core materials from neutron irradiation.

levels of radiation damage. For example, the leading GenIV concept — the sodium fast reactor — will require cladding and core internals to withstand 100–200 displacements per atom over their lifetime. These levels of damage would require 10 years of irradiation in a fast reactor (none are in operation in the U.S.) or close to 20 years in a thermal reactor (with a non-prototypical neutron energy spectrum). Similarly, the extension of operating licenses of the 104 LWRs in the U.S. fleet will require certification that the integrity of core structural components can be maintained to doses well beyond that of their original 40-year licenses.

The department has been leading the nation in the development of ion irradiation as a surrogate for neutron

much greater reliability than the current, 25 year old 1.7 MV tandem accelerator. But the real advantage of this accelerator is that it is the first step in creating a triple beam facility to allow for simultaneous irradiation damage and impurity ion injection to simulate the transmutation process occurring in core materials from neutron irradiation. France and Japan both have triple beam facilities, but no such facility exists in the U.S. Construction of the facility will require significant additional resources beyond the new accelerator, but it is now within reach as the 3 MV tandem, the 1.7 MV tandem and the 400 kV single ended accelerators form the backbone of the effort to create the first triple beam facility in the U.S.



Author: Professor Gary Was

GenIV



# NUCLEAR ENGINEERING AND RADIOLOGICAL SCIENCES

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