

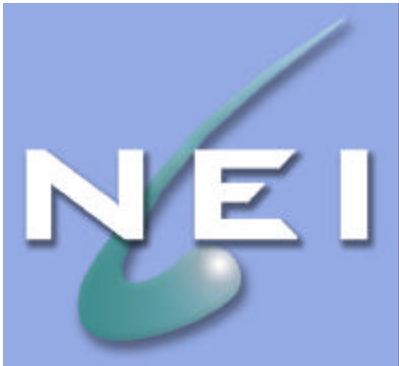
UNIVERSITY CURRENTS

A Newsletter For and About the University Nuclear Engineering and Science Community

U. S. Department of Energy

Spring 2004

NEI Nuclear Energy R&D Summit 2004



On February 25-26, the Nuclear Energy Institute held the fourth Nuclear Energy R&D Summit in Washington, D.C. The Summit was not only an opportunity for the nuclear industry, university, national labs and the Department of Energy (DOE) to meet and discuss the future of nuclear power, but also a chance for the participants to make their views known to national decision makers.

The Summit meeting on the 26th of February began with a keynote speech by Bill Magwood, Director of the Office of Nuclear Energy, Science and Technology. Among his comments, two points of particular interest to the university nuclear engineering programs

arose. First, highlighting a renewal of interest in nuclear engineering, Director Magwood noted that the rate of nuclear engineering students graduating in the U.S. has increased from approximately 500 in 1998 to over 1,400 at present. Second, the Nuclear Energy Research Initiative (NERI) program will be shifting from a broad solicitation of grant proposals to a directed research program for universities.

The Summit also featured three panel discussions on "Future Nuclear Energy R&D Investment", "21st Century Strategic Direction Hydrogen Production", and "Talking about Nuclear Energy R&D". These panel discussions highlighted several themes that persisted throughout the day.

Also the potential for the production of hydrogen from a nuclear co-generation (electricity and hydrogen) plant was discussed at length during the Summit. Also, the formation of Idaho National Lab (INL) as the lead laboratory for nuclear energy research was discussed at length.

The Summit concluded with a speech by Congresswoman Judy Biggert (Illinois) from the United States House of Representatives Science Committee on her views of nuclear energy issues. Representative Biggert has introduced H.R. 3828, a bill entitled, "Department of Energy Nuclear Engineering and Health Physics Act," aimed at advancing students, faculty, facilities and research at universities. At the conclusion of the congresswoman's remarks, the Summit's participants broke up into 3-4 person groups for meetings with congressional staffers on nuclear energy issues.

Two students, Michael Delaney of MIT and Pamela Gondeck of Texas A&M attended the Summit to stay current on the issues facing nuclear engineering students. They are the co-chairs of the 2004 Washington, D.C. nuclear engineering student delegation. The Delegation, as a representative cross-section, seeks to express the views of the nuclear science and engineering student population. The delegation will be heading to Washington, D.C. during the spring/summer of 2004 and is looking for members to get involved in meeting and discussing nuclear issues with decision makers. For more information, contact Michael at delaneym@mit.edu.



William D. Magwood, IV

visit us on the Web at -- nuclear.gov

University of Florida (UF) Nuclear & Radiological Engineering Department

Progress Energy FLA Gives Major Gift To DOE Match Program

Progress Energy Florida (PEF), has made a major contribution — \$45,000 – to UF’s Nuclear & Radiological Engineering Department through the DOE’s Matching Grants Program. “Progress Energy is proud of its continuing association with the University of Florida,” said Mr. William Habermeyer, President & CEO. According to Habermeyer, Progress Energy has enjoyed a business relationship with the University of Florida since 1948.

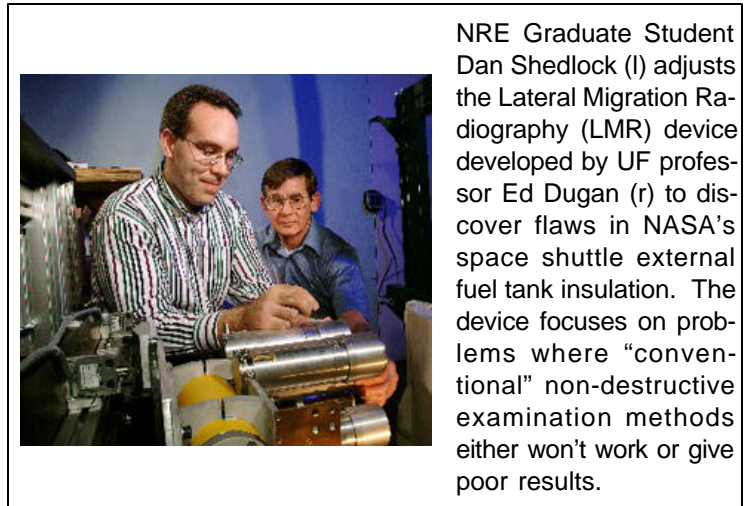


Dr. Alireza Haghghat (l) thanks William Habermeyer, President & CEO of Progress Energy Florida for a donation to the Nuclear & Radiological Engineering Department. The \$45,000 donation will be used, in part, for nuclear engineering scholarships.

“NRE is pleased to receive a grant from Progress Energy Florida,” said Alireza Haghghat, chairman and professor of NRE. “We have a long association with Florida utilities and look forward to strengthening our relationship with PEF. Our department has much to offer PEF in the way of training highly qualified and versatile engineers, and by conducting research for solving industry problems.”

UF Discovers New Applications For Lateral Migration Radiography

Nuclear & Radiological Engineering professor Edward Dugan is conducting research on the detection of flaws and defects using Lateral Migration Radiography. Dr. Dugan and professor emeritus Dr. Alan Jacobs were asked by Lockheed-Martin to revise an existing system, which originally was proved to find buried land mines, and convert it to help find air pockets in insulation foam of the space shuttle external fuel tanks.



NRE Graduate Student Dan Shedlock (l) adjusts the Lateral Migration Radiography (LMR) device developed by UF professor Ed Dugan (r) to discover flaws in NASA’s space shuttle external fuel tank insulation. The device focuses on problems where “conventional” non-destructive examination methods either won’t work or give poor results.

“The X-Ray device focuses on problems where ‘conventional’ non-destructive examination methods either won’t work or give poor results,” Dugan said. In the newest phase, Dr. Dugan and his assistants are building four new scanner systems, all of which will be used for non-destructive examination of space shuttle components. “This new technology is quickly developing and there’s much to be learned and many applications yet to be discovered,” Dugan said.

NRE Hires Two Faculty

Following a year-long faculty search, UF’s Nuclear & Radiological Engineering Department selected two

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(University of Florida)

outstanding individuals from over 50 applicants. Drs. James Baciak and Glenn Sjoden joined the department in January and March, respectively. Brief backgrounds and expertise of the new faculty members are:

- Dr. Jim Baciak earned his doctorate in nuclear engineering at the University of Michigan in January 2004 with a thesis entitled, "Development of Thick



(5-10 mm) HgI₂ Gamma-ray Spectrometers." Baciak accepted NRE's offer to join the department as an assistant professor. His past research includes the development of mercuric iodide room temperature radiation spectrometers. He also used single polarity charge sensing technique to improve the spectral performance of mercuric iodide and developed simulation code using GEANT (and EGS) to measure spectra based on crystal type, electrode configuration, electric field, and charge carrier properties. He earned BS, MS, and Ph.D. in Nuclear Engineering at the University of Michigan.

- Dr. Glenn Sjoden joined the department in March 2004 as an associate professor after completing a 20 year career as an Air Force nuclear engineering officer. During his



military service, his duties spanned a broad range of science and engineering applications, serving as a lead design engineer, nuclear research officer, associate professor, program technical director, and licensed engineering consultant. He is a member of the ANS, Alpha Nu Sigma Honor Society, Tau Beta Pi Honor Society, and is a registered Professional Engineer in Florida. Dr. Sjoden's research interests are in the areas of particle transport methods for design and analysis of nuclear systems for different applications, including medical, power generation, and non-destructive testing and detection, convective heat transfer, computational fluids, and high performance computing and related applications. He earned a Ph.D. at Penn State in 1997, an M.S. from the Air Force Institute of Technology in 1992, and a B.S. from Texas A&M University in 1984, all in nuclear engineering.

Nuclear & Radiological Enrollment Continues To Climb

Undergraduate and graduate student enrollment continues to be high in UF's Nuclear & Radiological Engineering Department. "Our student recruitment last fall was successful," said Dr. Alireza Haghghat, chairman and professor of UF's Nuclear & Radiological Engineering Department. "The fall 2003 enrollment increased once again by about 30%, resulting in a department total of 63 graduate students and 67 undergraduates.

But that's just one facet of student enrollment, according to Haghghat. The other important factor is the quality of students entering the department's programs. "NRE has recruited excellent undergraduates," he said. "Our senior class has an average GPA of 3.5. This is solid proof that we are training highly qualified individuals for the nuclear industry," said Haghghat. The continued addition of new students necessitated adding faculty to the department.

INEEL Fellowship Students Supported by DOE Office of Nuclear Energy, Science and Technology Fiscal Year - 2003

Summary

Twelve students from 8 different universities received 2003 summer fellowship awards at the Idaho National Engineering and Environmental Laboratory sponsored by the DOE Office of Nuclear Energy. Three of the students returned to INEEL for a second summer and one student returned for his third summer. One student is involved in the nuclear engineering partnership program between South Carolina State University and the University of Wisconsin.

Hannah Yount, a nuclear engineering student from University of Missouri-Rolla who received a 2002 summer fellowship award also received an academic fellowship during the spring

DOE-NE Sponsored Participants

James Ambrosek	University of Utah	Junior
Jesse Cheatham	Georgia Institute of Technology	Senior
Benjamin Fischer	University of Wisconsin, Madison	Senior
Mitchell Harkenrider	Purdue University	Sophomore
Paul Humrickhouse	University of Wisconsin, Madison	Senior (3rd summer)
Brandon Miller	Idaho State University	Senior
Luke Olson	University of Wisconsin, Madison	Master's (2nd summer)
Drew Petteway	University of Missouri-Rolla	Senior (2nd summer)
Keyna Riley	Purdue University	Senior (2nd summer)
Alan Seedarsan	South Carolina State University	Junior
Kyle Shelton	University of Missouri-Rolla	Sophomore
Patrick Sloan	University of Illinois	Sophomore

Other Sponsored Participants Associated With Department of Energy Programs or University

Hannah Yount	University of Missouri-Rolla	Senior
Nathanael Hudson	Georgia Institute of Technology	PhD
Marci Przwojski	University of Wisconsin, Madison	Senior
Wade Butaud	Texas A&M University	Junior
Rhett Christensen	University of Utah	Junior
Dr. Robert Witt	University of Wisconsin, Madison	Master's candidate



Bill Magwood, Director, DOE Office of Nuclear Energy, Science and Technology questions Nathanael Hudson, Georgia Institute of Technology doctoral student, about a photo on his poster on Core Group Cross-Sections for the PBMR with MICROX-2.

semester of 2003. She chose to participate in an internship with NRC during the summer of 2003 but plans to return to the INEEL this summer.

Nathanael Hudson, doctoral student from Georgia Institute of Technology, selected the INEEL for his sponsored DOE NE/HP fellowship award administered through SCUREF. As part of his dissertation, Nathan provided results to combine existing computer codes to prepare cross-section libraries of elements being considered for building the New Generation Nuclear Plant (NGNP). He is part of a team developing a Pebble Bed Very High Temperature Reactor to form the power production portion of the (NGNP).

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(INEEL Fellowship Students)

Marci Przwojski, a nuclear engineering senior at University of Wisconsin, Madison, received a fellowship sponsored by her university to complete a senior research project with her colleague Benjamin Fischer. Their senior design project assignment was the assessment of coolant activation in Gen IV Supercritical Water-cooled Reactors was a requirement for graduation. Dr. Jacopo Buongiorno, their INEEL mentor, worked closely with Dr. Michael Corradini, Professor and Chair of the College of Engineering at University of Wisconsin, to complete this assignment.

Wade Butaud and Rhett Christensen received Science Undergraduate Laboratory Internships (SULI) sponsored by DOE Office of Science. They were assigned to projects in the Nuclear Energy organization and participated in the NE student presentations. Both participants want to return to the INEEL and participate in the NE-sponsored program. Another SULI participant, who majored in mechanical engineering, is planning to change his major to nuclear engineering and wants to return to the INEEL next summer. He submitted his application late for the NE program.



Marci Przywojski and Benjamin Fischer, University of Wisconsin, Madison nuclear engineering students, along with Elizabeth Sellers, Manager, DOE-NE-ID, listen to Bill Magwood, Director, DOE Office of Nuclear Energy, Science and Technology, comment on their senior research project poster.



Kyle Shelton, University of Missouri-Rolla, Rhett Christensen, University of Utah, Kevan Weaver, INEEL mentor, Eric Loewen, INEEL mentor, and Mitchell Harkenrider, Purdue University, discuss corrosion activities in respect to Gas Fast Reactor research at the INEEL May Street Lab.

Dr. Robert Witt, University of Wisconsin, Madison received a faculty sabbatical award. He is located at the INEEL to do state-of-the-art nuclear technology research to beef up curriculum in the university's nuclear engineering classes. He chose the INEEL because of the laboratory is the leader in nuclear energy development, particularly in Generation IV nuclear reactor development.

In addition to those listed above, a total of 26 (7 graduate and 19 undergraduate) students and one faculty sabbatical received summer fellowship appointments within the INEEL Nuclear Energy organization. The breakdown by sponsors:

12 DOE Office of Nuclear Energy, 2 DOE Office of Science, 1 DOE NE-HP, 10 INEEL Nuclear Energy Programs organization, and 1 University of Wisconsin, Madison.

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INEEL Activities

- June 18th a summer picnic was held for all summer participants and their mentors. Paul Kerns, Vice President and Deputy Laboratory Director at INEEL welcomed students to the INEEL and Idaho Falls.
- July 15th NE sponsored students were given an all day tour of the INEEL including Experimental Breeder Reactor-I, Radioactive Waste Management Complex, Test Reactor Area, Advanced Test Reactor, Idaho Nuclear Technology and Engineering Center, Gas-cooled Fast Reactor or Lead-cooled Fast Reactor, and Test Area North (Hot Shops). They also toured Argonne National Laboratories-West facilities on Wednesday, July 16th.
- July 30th and August 6th, students were divided into two groups to make presentations to peers and employees in the Nuclear Energy organization. Each student's mentor introduced the presenter. Dr. James Lake, INEEL Associate Laboratory Director for Nuclear Energy, attended both sessions and was very impressed with the caliber of presentations.
- August 5th students participated in the INEEL Scientific Summary poster session with all summer fellowship participants. The poster session is an opportunity for all employees including DOE-NE-ID to visit with students and see what type of projects students were involved with during their summer fellowships.
- August 7th, DOE Office of Nuclear Energy, Science and Technology personnel including Bill Magwood, Betsy Connell, Dennis Miotla, and Randy Scott visited the INEEL. Elizabeth Sellers and other NE-ID employees joined the visitors at a poster session involving NE students. This session gave students the opportunity to meet and discuss project posters with these visitors.



Paul Kearns, Ph.D., Acting Lab Director welcomes INEEL fellowship/internship participants to Idaho Falls at the annual summer picnic hosted by INEEL.



Keyna Riley, Purdue University, feels comfortable being in front of peers presenting her research on "Investigation of Material Corrosion in Pb-Bi Cooled Reactors. This is her second summer fellowship at the INEEL.

All participants completed program evaluations indicating they were very satisfied with their fellowship experience and learned a lot on the projects assigned. All were satisfied with mentor interactions. Mentors indicated this was the best group of students they've had over the past couple of years in the program and would mentor their student next summer if they return. During the exit interview held with Una Tyng, Program Manager, eight of the NE supported students are planning to reapply to the INEEL next summer. Two were not certain what their plans are. Two will definitely not be returning. Benjamin Fisher graduated and will be giving time to the U.S. Navy and Keyna Riley will not return due to planning her wedding, which takes place in August.

Nuclear Engineering Outreach Thrives Under Marshall Plan



Lisa Marshall

“When you hear ‘nuclear engineering,’ what comes to mind?”

That’s the first question Lisa Marshall asks when she enters a classroom. As director of outreach for the nuclear engineering department at North Carolina State University, Marshall gets some interesting responses.

“I usually hear ‘the bomb,’ ‘radiation,’ ‘glow in the dark’ and then some component of the latest Hollywood movie that’s out that has anything to do with nuclear engineering,” she said.

Marshall relies on the idea that if you understand something then you don’t have to fear it. That’s why her main thrust since coming to NC State in fall 2001 has been to reach as many students and teachers as she can and to increase their awareness of the field of nuclear engineering. Through science teacher workshops, classroom visits, open houses and summer programs, Marshall and others have demystified nuclear science for dozens of teachers and more than 4,000 pre-college students in the past three years.

Once initial fears and misconceptions are set aside, Marshall said one can start teaching about nuclear theory, fission and fusion, and the role of nuclear science in our daily lives. “We utilize it on a daily basis but are not necessarily aware of it.”

Take nuclear medicine — one out of three people going into the hospital come into contact with nuclear medicine, whether through barium enemas that help diagnose gastrointestinal abnormalities, therapeutic radiation treatments for prostate and breast cancers or radiation used to sterilize medical supplies and instruments.

Beyond medicine, nuclear technology is found in items that many people come in contact with on a regular basis: campsite lanterns, smoke detectors and polymerized plastics as used for car dashboards. Irradiation also is used to kill dangerous illness-causing microorganisms, such as salmonella and E. Coli, which frequently contaminate meat and poultry.

The main point for Marshall is that nuclear technology has been used safely and successfully for years. At controlled levels, it can be a great benefit in many aspects of our lives, including power generation. Nuclear power currently provides 21 percent of all U.S. energy resources.

The prevalence of nuclear science in North Carolina’s high school curriculum has created a target audience for Marshall.

According to Marshall, science teacher workshops, held each spring at NC State’s nuclear engineering department, are invaluable for those who want to increase their knowledge of and comfort level with nuclear engineering. These workshops include lectures on radiation sources and radioactivity, nuclear reactions, detection and biological effects, combined with hands-on radiation detection and exponential law experiments and tours of the research reactor and neutron activation analysis lab. “When teachers are comfortable with the material, they pass their enthusiasm on to their students,” Marshall noted. She makes several classroom visits a year.

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NC State also hosts the Young Investigators' summer program in nuclear technology, a three-week residential program held every July that provides high school students with an in-depth education in nuclear engineering topics and an opportunity to perform hands-on experiments.

Working so closely with students has made for some interesting revelations, Marshall said. As soon as she brings up forensics or nuclear medicine, she is bombarded with questions concerning the latest television episode of "ER" or "CSI." To Marshall, this reaction points out a group of students not necessarily interested in going to medical school but fascinated with the technology. "I can show them that there are other ways to link their interests to future work or study opportunities."

Understanding the high school mind assists Marshall in another major aspect of her job — undergraduate recruitment — and she goes about it in an unusual way. Marshall uses Geographic Information System (GIS) mapping techniques to identify high schools and individual candidates with the best potential for advancing nuclear studies. "There is a culture around knowledge production in the scientific realm," she explained. "I'll be looking at the environment in which nuclear science is produced." It's her belief that recognizing those students with high PSAT and SAT scores and an expressed interest in engineering, then mapping them by county, will make her a more effective and efficient recruiter.

Marshall said that the national trend shows a growing interest in nuclear science from students, as well as from government and industry. Such unique recruiting methods could quickly become a big advantage in maintaining and building on a strong nuclear engineering program that this year celebrates its 50th anniversary.

"Nationwide, there is an increase in the number of students going into nuclear engineering," she said. "We want to keep in line with that trend — but most importantly, we want to attract the highest quality students."

Visit to Oregon State University (OSU)



Bernadette L. Kirk of the Nuclear Science and Technology Division at Oak Ridge National Laboratory (ORNL) visited Oregon State University (OSU) on February 3, 2004. Kirk was invited by Todd Palmer, associate professor in the Nuclear Engineering (NE) department, as a colloquium speaker. Kirk toured NE facilities at OSU and met with Professors Andy Klein, Steve Binney, Brian Woods, Todd Palmer, and Quiao Wu. She discussed the different NE programs at ORNL and student opportunities in the Nuclear Engineering Student Laboratory Synthesis (NESLS). NESLS is a graduate student internship program of the Radiation Safety Information Computational Center (RSICC) and is funded by the Office of Nuclear Energy.

Office of Nuclear Energy, Science and Technology Hosts Workshop for University Researchers



The Office of Nuclear Energy, Science and Technology (NE) hosted a two-day Advanced Reactor, Fuel Cycle, and Energy Products Workshop for Universities held March 4 and 5, 2004, in Gaithersburg, Maryland. More than 170 faculty from more than 50 universities turned out for the workshop. The workshop provided a thorough overview of the three main programs in the Office of Advanced Nuclear Research: the Generation IV Nuclear Energy Systems Initiative (Generation IV); the Advanced Fuel Cycle Initiative (AFCI); and the Nuclear Hydrogen Initiative (NHI). It succeeded in generating extensive interaction between national laboratory and university researchers.

A new approach to integrating university research into these research programs was introduced. This new program is an outgrowth of the Nuclear Energy Research Initiative (NERI) and will be exclusively for universities. The new program complements NE Director William D. Magwood's long-standing desire to further the relationship with universities and increase the amount of NE funding that goes to universities.

The workshop was designed to familiarize U.S. universities with the research and development (R&D) requirements of the various NE programs – a first step to providing an opportunity for U.S. universities to become directly involved in an integrated teaming relationship with the DOE and its national laboratories through the new program. Program plans and schedules including R&D requirements were presented to attending U.S. universities by DOE and laboratory program leads presented.

Following a full morning of overview presentations on the new university program and each of the three initiatives, the workshop broke into technical sessions led by the laboratory national technical directors and system integration managers of these programs. The sessions were repeated on March 5 to ensure all university participants had the opportunity to be informed about the research opportunities.

According to R. Shane Johnson, keynote speaker at the workshop and the Acting Deputy Director for the Office of Technology within NE, the department wants to start this new university research program small and grow it at a controlled rate. The department has allocated a total of \$3.7M in '04 funds to jump start the new approach. Johnson stated that the FY 2005 funding target is \$7 million in new funding. Funding for this new approach will be provided from the budgets of the Generation IV, AFCI, and NHI programs. The Proceedings of the workshop along with program and research plans of the three programs may be found at the University Workshop web site, <http://comm.gen4forum.org/public>; the sign-on is 'guest' and the password is 'guest'.

A solicitation is expected to be issued in April 2004. The solicitation, which will be open to all U.S. universities, will provide an opportunity for universities to participate in these research initiatives. Applications in response to the solicitation will be due in May 2004 with awards scheduled for September 2004. The applications will be peer reviewed and the relevance of the applications to the needs of the three initiatives will be considered. Funded projects will have a duration of one to three years and will be funded through cooperative agreements.

Rod Bundle Heat Transfer Facility

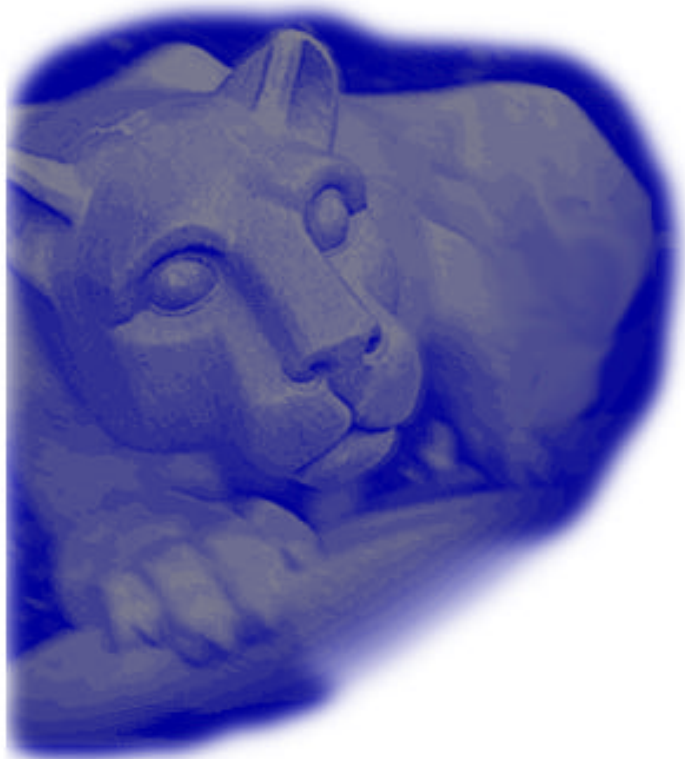
The second series of experiments have been completed on the Penn State/ Nuclear Regulatory Commission sponsored Rod Bundle Heat Transfer (RBHT) Facility. The RBHT program is approximately a \$4 million dollar program being performed jointly between the College of Engineering and the Applied Research Laboratory, at Penn State, for the research branch of the Nuclear Regulatory Commission. The facility consists of a 7x7-rod bundle with 45 electrically heated rods that simulate nuclear fuel rods in a postulated accident scenario. The facility can operate over a range of prescribed pressures up to 60 psia, inlet flow rates, inlet temperatures, heater rod powers, and heater rod temperatures up to 2000^o F. The rod bundle simulates a portion of a Pressurized Water or Boiling Water Reactor fuel assembly that is subjected to different thermal-hydraulic conditions that are calculated for postulated accidents.



Reviewing the PSU/NRC Rod Bundle Heat Transfer Data

The second series of experiments that were completed were two-phase flow level swell and core uncover experiments. The objectives of these experiments were to provide detailed void fraction data along the length of the heated bundle that can be used to validate interfacial drag models in advanced thermal-hydraulics computer codes. The data was also used by the NRC in the review of the AP1000 PWR design. As seen in the photograph, Penn State graduate students and faculty are studying the data that will be used to develop and validate thermal-hydraulic models for advanced safety analysis computer codes. To date there have been five undergraduate students involved in the program; we have completed two MS thesis and one Ph.D. thesis, and there is currently one MS student and two Ph.D. students involved with the program.

The principal investigators are: Dr. L.E. Hochreiter, Professor of Nuclear and Mechanical Engineering, Dr. Fan-Bill Cheung, Professor of Mechanical Engineering, and Dr. Thomas Lin, of the Applied Research Laboratory.



ANS Outreach Program Continues to Disseminate Nuclear Career Information

During 2003, ANS supported participation in a total of 80 events where students, teachers, or other members of the public received information about applications of nuclear science and technology and the many careers available in the field.

University Involvement

In the past year, students and/or faculty at eight universities participated in outreach activities supported by ANS. The outreach efforts targeted teachers and students at the secondary level and entering college freshmen. These outreach activities reached more than 8,500 students and teachers.

The universities included: University of Florida, University of Missouri-Columbia, North Carolina State University, University of Michigan, University of Massachusetts-Lowell, University of Utah, University of Wisconsin, and Texas A&M University



Four university groups conducted workshops that served 77 teachers, providing them with information about applications of nuclear science and technology and career information they could distribute to students.

Four universities conducted career events attended by more than 7000 students, both at the college level and high school level.

Two universities participated in science fairs attended by 950 students and parents. Staff from two universities made classroom visits and talked to more than 480 students.

This involvement by university students and faculty helped assure that high school and college students are learning about career opportunities in

nuclear science and technology. ANS continues to receive reports from nuclear engineering departments that students entering nuclear engineering programs can be traced to these outreach efforts.

Statistics

This past year, more than 600 teachers were served through ANS supported workshops. They received basic information about nuclear science and technology, learned how to use a Geiger counter to detect radiation, received a Civil Defense surplus radiation monitor for use in classroom demonstrations, and took information about nuclear careers back to their classrooms.

A total of more than 2300 students and teachers were impacted by classroom visits where knowledgeable undergraduate and graduate-level students and nuclear professionals made presentations and answered student questions about the exciting field of nuclear science and technology.

Through the year, 17 events were focused strictly on presenting information about career opportunities. The attendance at these events was more than 22000. Meanwhile, exhibits and other events provided as many as 20500 people with access to information about the exciting field of nuclear engineering.

Materials Distribution

Nuclear Careers, a CD-ROM, suitable for middle school through college-freshman audiences is distributed during appropriate outreach events. Copies are available from the ANS Outreach Department. It can be downloaded at <http://www.ans.org/pi/students/careers/>.

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In addition, a specially prepared Career Poster is provided to teachers and counselors, while a Career brochure is made available to students, teachers, counselors, and members of the public. Both offer information about the diverse and interesting career opportunities available for those with a background in nuclear science and technology. These can be previewed at <http://www.ans.org/pi/students/careers/>.

A wide variety of other informative materials produced by ANS are offered to teachers and students. For more information about these materials, contact the ANS Outreach department at outreach@ans.org.

ANS is always eager to assist Nuclear Engineering departments as they plan teacher workshops, classroom visits and career events. Printed materials are available as a result of the special grant from office of Nuclear Energy, Science and Technology to help promote knowledge about NS&T and career opportunities. For information or assistance, contact the Outreach Department by email at outreach@ans.org.

Other News of ANS Student Sections

An ANS Student Section was established at the University of Nevada, Las Vegas, in November 2003. Dr. Anthony Hechanova is Faculty Advisor. The Section's Charter was presented in February 2004 at UNLV by ANS President Larry Foulke.

The ANS Student Section at the University of Missouri-Rolla has been given a grant to help with the review of the "space applications" portion of the ANS web site www.aboutnuclear.org. The task will be completed by June 2004.

About 170 scholarship applications were received at ANS Headquarters by the February 1, 2004 deadline. ANS will announce the award recipients in April 2004.

ANS has more than 900 student members as of December 2003. Faculty Advisors and others will find useful information and materials on the ANS web site at www.ans.org.

Ultra-Low-Noise Magnetrons University of Michigan

A unique magnetic field configuration has been discovered, which completely eliminates the microwave noise in microwave oven magnetrons.

The recent best-selling book, *Tuxedo Park*, describes the crucial role of the magnetron in the radar systems that contributed to the Allied victory of WWII. Magnetrons, and their derivatives, continue to be an important part of today's national defense, including the Navy's Aegis class cruiser and various missile systems. Other applications include maritime radars and industrial heating. Perhaps the most ubiquitous use of magnetrons is as the microwave power source in some 60 million microwave ovens sold each year. However, in the 60 years since its invention, the problem of microwave noise emission from the magnetron has never been solved. This microwave noise,



around 2.45 GHz, causes interference with cordless phones, and could potentially interfere with computers and computer communications systems such as Bluetooth and IEEE 802.11 b,g, which utilize the same part of the unlicensed microwave spectrum as microwave ovens.

A recent breakthrough in solving this crucial problem was achieved in the department of Nuclear Engineering and Radiological Sciences at the University of Michigan (UM). UM graduate student Bogdan Neculaes, with Professors Ron Gilgenbach and Y. Y. Lau, discovered a novel magnetic field configuration that completely eliminates the noise in microwave oven magnetrons. This invention is so inexpensive and simple to implement that it could easily be incorporated into the manufacture of tens of millions of microwave ovens, without alterations to existing assembly procedures. This discovery also allows the magnetron to start oscillation much faster, for potentially higher average power in AC mode, in addition to generation of a cleaner microwave spectrum. The initial results have been published in the September 8, 2003, issue of *Applied Physics Letters*.

College Credit for NANT Accredited Programs – Coming Full Circle



*Dr. Jo-Ann Rolle, Dean
Technology and Business
Excelsior College – Albany, NY*

An effort is under way to assess programs accredited by the National Academy for Nuclear Training (NANT) headquartered at the Institute for Nuclear Power Operations (INPO) in Atlanta that would be applicable to a baccalaureate degree in nuclear engineering technology.

The formal recognition of accredited nuclear industry training programs for college credit will not only expand the educational opportunities of workers throughout the nuclear industry but will also promote the mobility and career opportunities of individuals who seek to have their training applied to a degree program in an allied technical profession.

Getting College Credit:

The estimated utility population, without college degrees, involved in the NANT accredited programs is over ten thousand. Many of these workers will be retiring causing a looming shortage of workers and managers.

As new workers enter the commercial nuclear field they will find new requirements for college degrees in many existing and redesigned jobs as well as management and supervisory positions. The new hires can begin training in accredited utility programs and become candidates for future degrees. Awarding college credit for NANT accredited programs will make it possible for the new workforce and incumbents to fill a broader level of vacancies and have greater job mobility.

Excelsior College (EC) (formerly known as Regents) in Albany, NY, began awarding college credits for the US Navy Nuclear Training in 1984. Many naval personnel went on to earn a Bachelor of Science Degree in Nuclear Engineering Technology (BSNET) largely through taking the remainder of the degree required courses at other collegiate institutions and through distant learning. Beyond the BSNET degree, which is accredited by the Accrediting Board for Engineering and Technology (ABET), Excelsior College also offers a Bachelor of Science in Technology (BST) with a technical specialty, along with other degree programs such as a Bachelor of Science in Electronics Engineering Technology (BSEET) (also accredited by ABET) and Associate in Science in Technology with a specialty in Chemical, Electronic/Instrumentation, Electromechanical or Nuclear Technology.

Michigan Utilizes Dow Chemical TRIGA for Reactor Lab Course

Following the shutdown of the Ford Nuclear Reactor in July 2003, after 46 years of continued operation for research and teaching programs within and outside the University of Michigan, the Department of Nuclear Engineering and Radiological Sciences (NERS) is moving forward with two initiatives. First, the department has gained access to the 200-kW TRIGA reactor at Dow Chemical Company in Midland, Michigan, for several experiments for two lab courses: NERS 445, Nuclear Reactor Laboratory; and NERS 425, Applications of Radiation. Second, effort is underway to build an accelerator-based neutron generator on campus as an alternate source of neutrons for teaching and research.

Through enthusiastic support of two NERS alumni, Reactor Supervisor Ward Rigot and Research

Scientist Siaka Yusuf, at Dow Chemical Company, the NERS 445/425 class performed two experiments at the Dow TRIGA facility in February. The initial set of experiments involved the measurement of the reactivity worths of the control rods and the calibration of rated power level. The students and the instructor, Professor Ronald F. Fleming, were impressed by the efficient operation of the reactor and the well-established procedures in place at a unique reactor facility dedicated to support product development and quality control activities of Dow Chemical. Future experiments at the Dow reactor this semester will include the use of the state-of-the-art neutron activation analysis (NAA) facilities described in a recent paper [S. Yusuf, "Improving the Fluorine Detection Limit in NAA of Polymers Using a TRIGA Reactor," *Trans. Am. Nucl. Soc.*, 89, 683 (2003)].

Big-10 Consortia's Mini-Grant Program Provides Diverse Opportunities For Research And Nuclear Science Technology Outreach

In September 2002, a consortia of Big-10 University schools received a multi-year grant from Department of Energy's Innovations in Nuclear Infrastructure and Education (INIE) program. An innovative section entitled Task 4, included a Mini-Grant Program. This program, now into its second year has provided many promising and worthwhile results toward improving science and technology research and outreach programs with the Big-10 consortia's university research and training reactors (URTR) facilities.

The Big-10 Consortia Mini-Grant Program allows for multi-disciplinary as well as multi-institutional collaborations to allow for innovative research activities for faculty and students in graduate and undergraduate nuclear science and engineering programs. It also encourages collaboration with industrial and national laboratory partnerships plus other scientific and engineering disciplines in colleges and universities and other outreach and even research projects with public and private schools to utilize the consortium's URTR facilities.

In December 2002, Dr. Jack Brenizer, principal investigator for Big-10 Consortia at Penn State called for the first Mini-Grant meeting. Brenizer was able to organize a program staff and bring together many organizations to be the Mini-Grant Governance Committee. On December 9, 2002 and December 3, 2003, the Governance Committee met providing program and administrative guidance to the staff and to review and prepare for the coming program year. A portion of the overall Consortia grant, nearly \$172,000, was allocated annually for Mini-Grants. The 2004 Mini-Grant Award proposal deadline was February 20, 2004. Announcement of the 2004 Mini-Grants are anticipated during June 2004.



CVGS students in Penn State Cobalt Bay



CVGS student in reactor facility computer room with experiment

During the first year of operation, the Mini-Grant Program was able to receive nearly twenty proposals in a short period of announcement time. Thirteen proposal projects were awarded from \$1,690 to \$25,000.

Dr. Brenizer attributes the success of the first year to team work—including our Governance Committee; a knowledgeable program staff, many excellent reviewers who make valuable recommendations on proposals to our Governance Committee, and finally but most importantly the close and cooperative working relationship between the Big-10 Consortia and the Department of Energy. "We believe that Task 4 will not only meet its goals for multi-disciplinary as well as multi-institutional collaborations but create and allow for even more innovative research and outreach nuclear science and technology activities."

Capstone Design Course

The Penn State Nuclear Engineering capstone design course, NE 431 W has taken on a new look. Drs. Ivanov and Hochreiter have been working with Westinghouse Electric Company to provide more realistic design problems and calculations which are state-of-the-art for nuclear reactor reload analysis. Westinghouse has given Penn State its production nuclear design computer codes under a proprietary agreement and is working with Drs. Ivanov and Hochreiter to provide challenging, real-life design problems for the students.

Penn State faculty provides lectures on the theory behind the core analysis computational methods. Westinghouse Core Engineering engineers then come to Penn State and present prepared lectures on the Westinghouse reactor physics and analysis design computer programs. The class is then broken into small teams, each of which has a different but related design project. A Westinghouse Core Engineering, lead engineer, comes to Penn State one day a week to work with each of the teams on the design project.

The third portion of the course is the introduction of Three-dimensional core thermal-hydraulic analysis that is used to confirm that the chosen loading pattern will meet the core thermal-hydraulic core limits. The COBRA-IV code is being used for these calculations in which the students will model the reactor core and will determine the most limiting, "hot channel". The forth area of focus for the course is fuel cycle economics which is one of the key driving forces for reload analysis.



Dr. Hochreiter (right) indicates the type of core loading pattern that the design class will calculate for the semester project

At the conclusion of the semester project, the students prepare a written design report that is reviewed by the Westinghouse engineers as well as the faculty. They also prepare a summary poster that is then displayed in the hallway of the Mechanical and Nuclear Engineering building, as seen in the photograph. The students also prepare a presentation on the results of the project to the Nuclear Engineering faculty.

Thus far the program has been well received by the students. Westinghouse has made a significant investment of time in preparing for these classes as well as the time to work with the students. We believe that this type of direct collaboration with industry will help integrate the student's knowledge in Nuclear Reactor Engineering and will be a unique feature of the Penn State Nuclear Engineering Program

Department of Nuclear Engineering NC State University, Raleigh, NC

Four undergraduate nuclear engineering students have been selected for the University Undergraduate Research Program 2004. The Division of Undergraduate Affairs and the Honors Program provide \$2,000 stipends to 12 undergraduate Honors students and \$500 stipends to 12 supporting faculty members for creative and research projects. The purpose of these awards is to give undergraduate students the opportunity to work one-on-one with faculty on projects related to the student's majors, minors, or curricular interests.

Shang Du and Chris Kennedy
Magnetic Divergence of Laser-Produced Plasma for
Diamond-Like Carbon Films
Adviser: *Mohamed Bourham*

Andy Li
High Accuracy Calibration of HPGc Detectors
Adviser: *Ayman Hawari*

Kristy Perez
Thermal Management of Atmospheric Plasma
Sterilizing Device
Adviser: *Mohamed Bourham*

Paul Swaney
Enhancing Properties of Nonwoven Fabrics Using
Atmospheric Plasmas
Adviser: *Mohamed Bourham*

SPOTLIGHT



**Oregon State University's
José N. Reyes, Jr.**

Oregon State University Nuclear Engineering Department Gets a New Chair

Passion for nuclear engineering as a long-term source of electrical power, and research into its beneficial uses, brought over 150 people together for a dinner at the CH2M Hill Alumni Center at Oregon State University (OSU) November 10th. The event honored Jose N. Reyes, Jr. in becoming the first Henry W. and Janice J. Schuette Chair in Nuclear Engineering & Radiation Health Physics at OSU. Thanking the Schuettes for their generous and visionary gift of \$3 million to endow the chair, Dr. Reyes said, "Your gift is a signal to the nation Energy independence and a clean environment are not only noble goals, they are achievable outcomes . . . this vision of Eddington and Einstein is still very much alive."

"I have the very important task of setting a high standard for future (endowed chair) holders," Reyes said. And, "because saying I am eternally grateful isn't enough," Reyes listed several projects he plans to continue or to develop in his new position:

- Expanding the Advanced Thermal Hydraulics Research Laboratory (ATHRL) to include international research, increasing ATHRL's collaboration with other national laboratories.
- Expanding the laboratory's mission to include entrepreneurial endeavors.
- Establishing an Instrumentation & Flow Imaging Laboratory, which will use MRI technology and neutron radiography for industrial purposes. "It will push our understanding of multi-phase fluid transport and our computational capabilities beyond what we ever thought possible."

Reyes was introduced by Dr. Andrew Klein, head of the department of Nuclear Engineering and Radiation Health Physics, and director of the Radiation Center at OSU. Klein described how Reyes has long been a great asset to OSU and the field of nuclear engineering. After graduating from the University of Florida, Reyes went on to work at the Nuclear Regulatory Commission for 10 years. While holding positions of ever increasing responsibility, he also managed to get his M.S. and Ph.D. from the University of Maryland. In 1987 Reyes arrived at OSU, where he leveraged an initial \$4,000 grant of a senior design project glass reactor into \$14 million and the 4,000 spare foot stainless steel model reactor now known as the Advanced Plant Experiment. During his tenure at OSU, Reyes has won all three of the major College of Engineering faculty awards -- awards for advising, teaching, and research.



Important Dates to Remember

2004

- ⇒ American Nuclear Society Meeting
June 13-17, 2004
Pittsburgh, Pennsylvania
- ⇒ Test, Research and Training Reactor Meeting
October 12-15, 2004
Columbia, Missouri

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