

# UTNEUPDATE

A Publication from the Department of Nuclear Engineering at the University of Tennessee



**Remy DeVoe and Justin Knowles** Receive ANS Distinguished Service Award



**UT NE Graduate Students** Receive Three NEUP Fellowships



**Ms. Jessie Hill Roberson,** Alumni Profile

## NE Governor's Chair Brian Wirth Receives US Department of Energy's E.O. Lawrence Award

US Secretary of Energy **Ernest Moniz** (left) presents the Ernest Orlando Lawrence Award to **Dr. Brian Wirth** (right).



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**T NUCLEAR ENGINEERING**

## Department Head's Message from Dr. Wesley Hines



I am excited to share with you the many successes of our Department of Nuclear Engineering. This past year we once again experienced improvements in all facets of our department. Our students were of the highest quality, our faculty exceeded their prior success in research productivity, and our staff grew and became more efficient to meet the demands of our expanding department.

This last year, we had record PhD student enrollments that can be attributed to successful research grants written by the faculty, successful fellowship applications written by our top students, and the continuing success of our interdisciplinary program in Energy Sciences with Oak Ridge National Laboratory (ORNL). Our last fall count was ninety-one engineering students pursuing a nuclear engineering degree and ten students pursuing the degree in Energy Sciences for a total of one-hundred and one PhD students. This growth is a result of our recent focus on PhD education and is being pursued to progress our scholarly achievements, which are primarily made by PhD level research. We are now tied with MIT for the largest nuclear engineering PhD program in the country.

Our student recognition continues to grow as evidenced by their continued leadership in national awards. Our undergraduate students were awarded eleven of the fifty-nine Nuclear Engineering University Program (NEUP) scholarships funded by the Department of Energy. We again led the country for the fourth consecutive year. Additionally, for the second year in a row, our graduate students were awarded three graduate fellowships, which is the maximum allowed for one university. We also had undergraduate students win thirteen American Nuclear Society (ANS) scholarships and our graduate students were awarded several prestigious multi-year fellowships from DHS, NASA, and NNSA. Perhaps the most significant honor was that our ANS student section earned the Glasstone award for having the most outstanding student section in the country. This was the first time our students earned that recognition since it began in 1970.

With all of this great news, it saddens me to announce the retirement of Dr. Larry Miller after thirty-nine years of service to the department. However, there is a bright side: Dr. Miller has agreed to continue teaching, conducting research, and leading key programs through a post-retirement agreement. I look forward to his continued success as a key member of our faculty.

Our externally funded research expenditures continue to grow and outpace the university. This past year we conducted over \$10 million in externally funded research. These resources fuel our faculty and students to make research breakthroughs and bring national recognition to our department. A prime example of this is that recently one of our NE Governor's Chairs, Dr. Brian Wirth, was awarded the prestigious E. O. Lawrence Award by the Department of Energy for his visionary contributions to fission and fusion energy.

With all of this great news, I would like to add that we were once again recognized by *US News and World Reports* as one of the top five nuclear engineering departments in the country. These continuous improvements are directly attributed to the hard work by our students, faculty, staff, and administration.

Our alumni continue to engage the department and influence our directions and success. Their investments in our department through endowments and gifts continue to propel us forward.

We continue on our mission to become an exemplary department and need your continued support to share our story. Our image is important to our rankings, our ability to recruit the best and brightest students and faculty, and our ability to secure external funding to solve the nation's scholarly challenges. Please continue to partner with us to meet our lofty goal of becoming the top nuclear engineering department in the country.

Sincerely,

**Wesley Hines**  
Charles P. Postelle Distinguished Professor  
in Nuclear Engineering and  
Department Head of Nuclear Engineering

## Faculty News

### Governor's Chair Brian Wirth Receives Top DOE Honor



Dr. Brian Wirth (right) receives the Ernest Orlando Lawrence Award from US Secretary of Energy Ernest Moniz (center) and Acting Assistant Secretary for the DOE Office of Nuclear Energy John Kotek (left) at the ceremony in July 2015.

The US Department of Energy (DOE) has named Dr. Brian Wirth, Governor's Chair in Computational Nuclear Engineering, an Ernest Orlando Lawrence Award winner for 2014.

Awarded by the DOE in recognition of research supporting science, energy, or national security, it is considered the highest achievement that a mid-career researcher can receive. Established in 1959, the award honors Ernest Orlando Lawrence, a 1939 Nobel laureate and inventor of the cyclotron—an accelerator of subatomic particles. A total of nine academics and researchers from across the country were designated to receive the award.

"These researchers, now at mid-career, have made significant contributions to the national, economic, and energy security of the United States," said Secretary of

Energy Ernest Moniz. "I congratulate the winners, thank them for their work on behalf of the department and the nation, and look forward to their continued excellent achievement."

Wirth has spent his career studying aspects of nuclear fuels and materials performance in current and future nuclear energy technologies. He and his research group are striving to produce the safest nuclear energy possible while extending the life of the key reactor components and structures. Wirth describes their work as being at the intersection of nuclear energy, materials science, and high-performance computing.

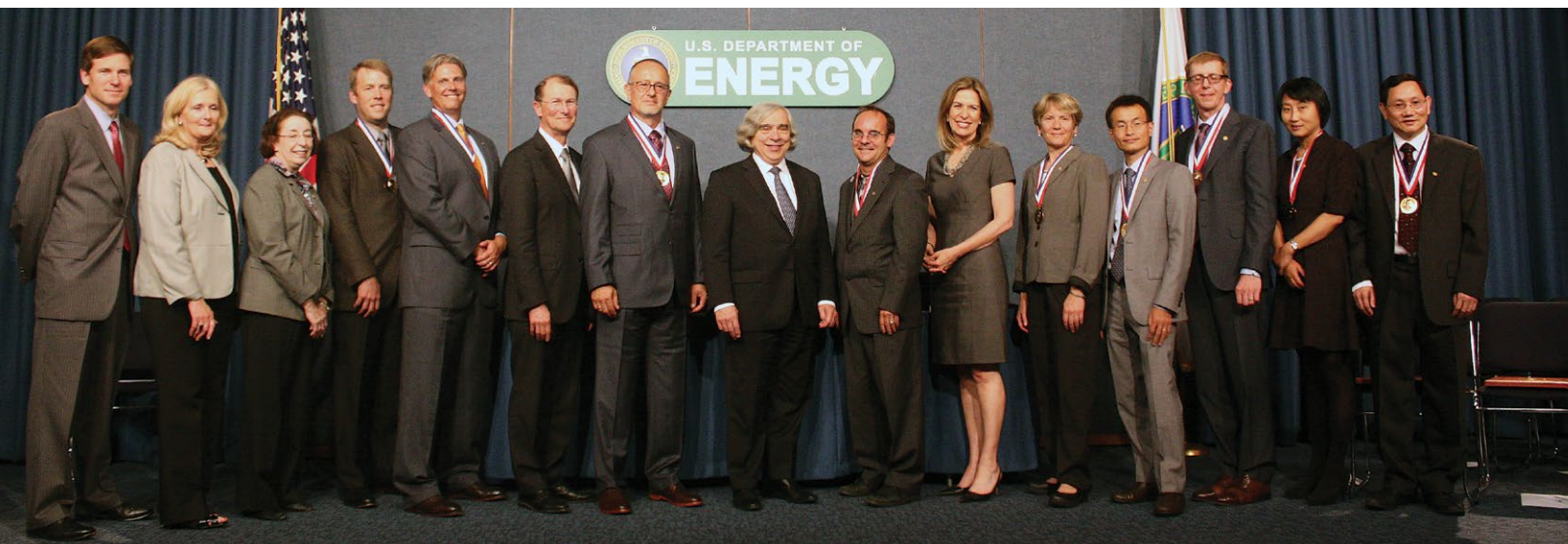
Wirth gives credit to the partnership between the university and Oak Ridge National Laboratory for provided a valuable partnership that enhances his group's research initiatives.

"UT and ORNL are increasingly becoming go-to centers for nuclear studies, materials research, and computing—the three critical areas this group studies and upon which our research relies," said Wirth. "The UT-ORNL partnership has created an interdisciplinary environment where collaboration between the two institutions is a 'world-class research and educational opportunity.'"

"ORNL joins UT in congratulating Dr. Wirth on this well-deserved honor," ORNL Director Thom Mason said. "His accomplishments in computation modeling, nuclear technology, and materials science illustrate the importance of crosscutting research to the nation's energy mission."

The nine award recipients were each presented with a medal and \$20,000 honorarium at a ceremony in Washington, DC, in July of this year in recognition of their achievements.

Wirth has also been recently appointed to a three-year term on the Department of Energy, Office of Fusion Energy Sciences Advisory Committee (FESAC). For more details, visit <http://science.energy.gov/fes/fesac/>.



Dr. Brian Wirth (fifth from left) at the Department of Energy awards presentation.

### NE Department Head Elected Fellow of ANS and ISEAM

Dr. J. Wesley Hines, Charles P. Postelle Distinguished Professor in Nuclear Engineering and head of the Department of Nuclear Engineering, has been elected as a Fellow of the American Nuclear Society (ANS).

The ANS honors members for outstanding accomplishments in nuclear science or nuclear engineering. Criteria for consideration include having "compiled a professional record of experience marked by significant contribution to the advancement of one or more of the various disciplines served by the Society."

Hines was recognized for his scholarly accomplishments as a leader in the discovery and development of reliability enhancing condition monitoring technologies for the nuclear industry.

The selection makes Hines the fourth full-time faculty member in the department to become an ANS Fellow, along with Condra Chair and Chancellor's Professor Lawrence Townsend, Professor Belle Upadhyaya, and Governor's Chair Steven Zinkle, with several other part-time and emeritus faculty also holding the distinction.

Hines, who also served as UT's interim vice chancellor for research and engagement before becoming department head, received the award at the ANS banquet in San Antonio in June 2015.

For more information, visit <http://www.ans.org>.

The ANS honor is one of several that Hines has received this year.

Hines was elected as a Fellow of the International Society of Engineering Asset Management (ISEAM) in June 2015. The ISEAM is a multidisciplinary professional society dedicated to the development and recognition of asset management as an integrated and important body of knowledge. The international society provides thought-leadership and influence on a global basis to coordinate the discipline's advance with academics, practitioners, and policy makers in the emerging trans-discipline of engineering asset management. Hines joins Dr. Belle Upadhyaya as two of only seven ISEAM Fellows from the United States.

He was also appointed to the board of the Nuclear Energy Institute (NEI) in May of 2015. NEI is the nuclear energy industry's policy organization. For more details, visit [www.nei.org](http://www.nei.org).

Hines recently graduated from the inaugural class of the Academy for Innovative Higher Education Leadership at Georgetown University. This group of twenty administrators from across the country spent the last eight months studying higher education challenges.



Dr. J. Wesley Hines

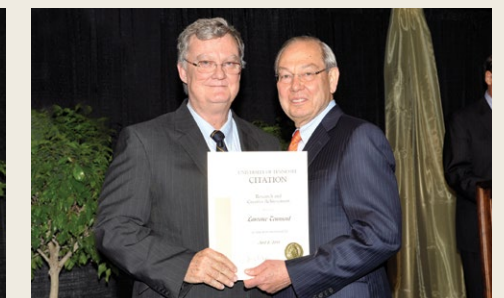
### Engineering Faculty Members Recognized at the Annual Chancellor's Honors Banquet



Dr. Belle Upadhyaya (left) is awarded the Alexander Prize by Chancellor Jimmy G. Cheek (right).



Chancellor Jimmy G. Cheek (right) presents the Research and Creative Achievement Award-Professional Promise Award to Dr. Lawrence Heilbronn from the Department of Nuclear Engineering.



Chancellor Jimmy G. Cheek (right) presents the Research and Creative Achievement Award to Dr. Lawrence Townsend (left), a professor in the Department of Nuclear Engineering.

Chancellor Jimmy G. Cheek celebrated faculty, staff, and students for their accomplishments and service on Wednesday, April 8, 2015 at the annual Chancellor's Honors Banquet. The banquet is the university's largest recognition event of the year, and several outstanding engineering faculty members were recognized.

Dr. Belle Upadhyaya, a professor in the Department of Nuclear Engineering, was honored for superior teaching and distinguished scholarship with the Alexander Prize at the Chancellor's Honors Banquet in April.

Upadhyaya is an elected fellow of both the American Nuclear Society and the International Society of Automation. He is also a senior member of the Institute of Electrical and Electronics Engineers.

Upadhyaya helped establish the National Science Foundation-funded Reliability and Maintainability Center at UT. He has developed state-of-the-art technologies such as smart field devices and has helped bring

national recognition to the nuclear engineering program, particularly for its roles in reactor control, instrumentation, system monitoring, and diagnosis research and development.

His expertise has led him to visiting lecturer positions throughout Europe, South America, and Asia, including national nuclear energy institutes in France, the Netherlands, and South Korea.

Upadhyaya has published more than three hundred and twenty five articles and helped author more than one hundred and thirty research reports. He has mentored more than fifty doctoral and master's students.

The Alexander Prize is named for former UT president and now US Senator Lamar Alexander and his wife, Honey. The award recognizes superior teaching and distinguished scholarship.

Additional awardees from NE included Dr. Lawrence Heilbronn and Dr. Lawrence Townsend.



Dr. Ivan Maldonado

### NE Faculty Members Win Three Grants Totaling \$2.6 Million

Professors in the Department of Nuclear Engineering are part of three separate nuclear energy research projects that collectively have been awarded \$2.6 million.

The US Department of Energy's Nuclear Energy University Programs has made the three allocations:

\$800,000 to a team led by Associate Professor Ivan Maldonado and including Governor's Chair Brian Wirth that is looking at nuclear reactor safety and performance

\$1 million to a team including Assistant Professor Jamie Coble that is developing new ways of monitoring and calibrating sensors at nuclear facilities.

\$800,000 to a team including UCOR Faculty Fellow Jason Hayward that is developing a new imaging system capable of monitoring dry storage casks

Maldonado's team will try to analyze and evaluate fuels that are more tolerant to accidents, helping with overall safety and easing some of the concerns the public has about nuclear energy.

Additionally, the team—including Oak Ridge National Laboratory researchers Jeff Powers and Andy Worrall—will study how those fuel ideas perform in an effort to increase efficiency.

The project Coble is working on is being headed by Pacific Northwest National Laboratory but features UT as a collaborating institution, for which the university's share will come to around \$290,000 over three years.

The Nuclear Energy Enabling Technologies Advanced Sensors and Instrumentation program will oversee the project, which will improve plant economics and reduce worker radiation exposure.

In addition to UT and PNNL, the team will include Knoxville-based Analysis and Measurement Service Corporation, run by UT alumnus Hash Hashemian,



Dr. Brian Wirth



Dr. Jamie Coble



Dr. Jason Hayward

and researchers from the Korea Atomic Energy Research Institute and Chosun University.

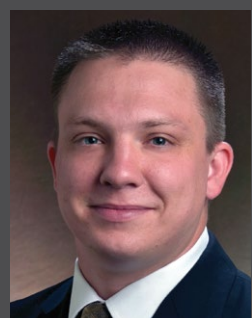
The third project, on which Hayward will serve as a collaborator, is headed by Oregon State University.

Currently, massive amounts of plutonium are housed in dry cask storage facilities, but the technology to accurately monitor it isn't readily in place.

The team hopes to use cosmic ray muons, a type of particle, to more effectively and yet inexpensively monitor the facilities.

The research could have a massive impact on nuclear energy and safety worldwide, since teams could more easily track nuclear fuel.

### Project Involving Two NE Assistant Professors An R&D 100 Nominee



Dr. Eric Lukosi

*R&D Magazine* recently named two research groups to its list of finalists for the R&D 100, including researchers from the Department of Nuclear Engineering.

The lithium indium diselenide thermal neutron imager project (LISE)—a joint UT-Y-12 project—includes Dr. Eric Lukosi, an assistant professor, and Dr. Ashley

Stowe, a joint assistant professor with UT and Y-12, both faculty members in the NE department.

The designation was selected by a panel of judges and editors for inclusion, based off the magazine's determination of the "most technologically significant products introduced in the past year."

For the LISe team, the goal was to develop an imaging device that can render high-contrast, high-resolution thermal neutron images in a compact, flexible, and low cost package.

Along with Y-12's Brenden Wiggins, Daniel Hamm, and Elan Herrera, and Arnold Burger of Fisk University, the team utilized recently developed lithium indium diselenide semiconducting neutron detection crystals.

Those crystals can either serve for light collection (scintillation) or to measure current (semiconduction), and can be used as a single item or in an array.

The team utilized these crystals by developing a technique where changes in the neutron beam intensity as it passes through an object could be measured. This results in an image, allowing researchers to study anything from polymers to fuel cells.

In addition, Lukosi and the team pointed out that the data could also be used to reconstruct a 3D rendering of the object being studied.

"This system will allow for researchers to study things in very high resolution, while at the same time getting feedback and data faster," said Lukosi. "Couple that with the longevity of the crystals and the design of the system and it offers many advantages to scientists."

The winners will be announced at the 2015 R&D Awards in Las Vegas in November. For more information on *R & D Magazine*, visit <http://rdmag.com>.



### Professor Emeritus Dodds Appointed to International Advisory Council



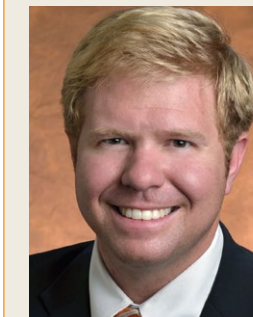
Dr. Lee Dodds

Professor Emeritus H. L. Dodds, former head of the NE department, recently returned from Harbin, China where he participated in the inaugural meeting of the International Advisory Council for the Harbin Engineering University College of Nuclear Science and Technology (HEU CNST). The purpose of the Council is to provide advice and recommendations to HEU CNST on their research and instructional programs. Other members of the Council include representatives from academia (Massachusetts Institute of Technology, University of Michigan, Texas A&M University, Kyoto University, and Khalifa University) and the nuclear industry (Westinghouse Electric Company, China

National Nuclear Corporation, Fortum Power Company, Paul Scherrer Institute, and the Plasma Physics Institute of the Chinese Academy of Sciences). Professor Dodds has been appointed to a five year term on the Council, which will meet annually in Harbin, China.

Dodds also gave a series of lectures in China last year, based on a seminar course that he developed and currently teaches in the UT Honors program. The first presentation was at the New Energy Forum 2014 Conference in Qingdao, China with a group of speakers that included three Nobel Laureates. Dodds also presented to students and faculty at City University of Hong Kong, where he was an invited special guest of Dr. Way Kuo president of CityU and former dean of the UT College of Engineering.

### Auxier Joins NE Faculty



Dr. John Auxier

Dr. John D. Auxier II has joined the Department of Nuclear Engineering as a research assistant professor. Auxier received his PhD from the University of Tennessee

and is a member of the American Chemical Society, the American Nuclear Society, and the American Physical Society. He is a Strategic Planning Advisor for the ACS Chemistry Division.

Auxier's research areas include advanced radionuclide separations, nuclear forensics for post-detonation analysis, and advanced imaging techniques for pre-detonation forensic samples.

### Upadhyaya Scholarship Endowed

Dr. Belle R. Upadhyaya, PhD, PE, and his wife, Nirmala B. Upadhyaya, MD, MPH, have strong ties to the University of Tennessee. Belle is a professor of nuclear engineering and has been working at the University of Tennessee for forty years, while his wife has been with the University of Tennessee Medical Center, Knoxville, for her career.

"It has been a privilege working at the University, and we appreciate very much the support given to us by colleagues, students, and staff over the years," the Upadhyayas explained.

During his time at UT, Belle's research and teaching have focused on nuclear system dynamics, instrumentation and control, next generation reactors, power plant monitoring and diagnostics, advanced information processing, and reliability and maintainability engineering. He has enjoyed his time with the Department of Nuclear Engineering and finds the opportunity for interaction with students and professionals both internal and external to UT rewarding.

This past spring, the Upadhyayas created the Upadhyaya Family Endowed Engineering Scholarship. This scholarship is available to juniors and seniors in the Department of Nuclear Engineering who have demonstrated successful academic performance.

Belle and Nirmala wanted to give back to the institution that has been so good to them. They chose to create an engineering scholarship for nuclear engineering students because they wanted to support deserving students in the College of Engineering in achieving their goals.

"The students in engineering have to dedicate their efforts and spend long hours to excel in their technical areas of interest," explains Belle.



Dr. Belle Upadhyaya and Dr. Nirmala Upadhyaya

The Upadhyayas hope this scholarship will encourage promising nuclear engineering students as they pursue their academic career goals.

As the nuclear engineering graduate program currently ranked #4 among all nuclear engineering programs at public universities in the United States, it is a great time to be involved with the department. Belle plans to continue teaching and researching in the department. He hopes to develop new areas of research for the future, complete a textbook focused on Nuclear System Dynamics, Instrumentation, and Controls, and continue to impact our future engineering leaders.

## Special Feature: Dr. Larry Miller Retires from NE Department



Dr. Larry Miller

Dr. Laurence "Larry" Miller joined the Department of Nuclear Engineering (NE) faculty in 1976 and retired in June 2015. He will still be found on campus, though, as he continues with NE under a post-retirement agreement that will include teaching, research, and service responsibilities.

Miller will teach the undergraduate capstone design class and a graduate class on radiological assessment and measurement, and his service will involve support of ABET and other department related endeavors. He plans to submit proposals on scanning and imaging of used nuclear fuel casks and on molten salt reactor development to a recently announced DOE funding opportunity.

These continued activities cap off a career Miller began in the 1960s.

"After receiving my MS in nuclear engineering from Kansas State University in 1966, I accepted a position with the Westinghouse Electric Corporation, where I spent several years with the Astronuclear Laboratory (ASTRO) and with Bettis Atomic Power Laboratory at the Naval Reactor Facility in Idaho," said Miller. "My work with Westinghouse involved neutronics, computer programming and reactor operations."

He wanted to continue his education after working in the industry for a few years and had an opportunity to begin PhD studies at Texas A&M University in 1972.

"I worked part time as a US NRC qualified senior reactor operator in the AGN-201 facility, where I supervised students in reactor experiments, helped maintain the facility, and completed my research and academic programs in 1976," said Miller. "I was pleased to receive an offer from The University of Tennessee Department of Nuclear Engineering, and have found my career here to be very rewarding."

Miller taught reactor physics and nuclear engineering laboratory for around twenty-five years, and organized UT's radiological engineering program in 1988.

"I worked in collaboration with Oak Ridge National Laboratory (ORNL) professionals to define an academic program in radiation protection that included graduate courses in radiation protection, nuclear instrumentation,

and radiological assessment," said Miller. "We later implemented a course in radiation biology. Classes were initially taught at the Oak Ridge DOE facility on Laboratory Road for about ten years."

Demand for health-physics related courses was strong, so the graduate classes might have twenty students or more.

"The number of students working on graduate degrees was high relative to the size of our faculty," said Miller. "As a result I was supervising about thirty MS students for several years in the early 1990s, with a few going on for PhD degrees."

While integral in establishing this program, Miller considers his record as a mentor for more than 100 graduate students to be his most notable achievement. He has mentored eighty-three MS and twenty PhD students, and still currently directs the work of two students, one PhD and one MS. His students have found success with the launch offered by Miller and UTNE.

"One young lady, Margaret Kurtts, was a Black Hawk helicopter pilot who served in Iraq during the surge and subsequently had funding to continue her education at UT NE," said Miller. "She wrote an impressive thesis on practical ways to use nuclear energy to make DOE facilities more energy independent."

Other PhD students who worked with Miller include Loong Young, who founded Spectra Tech, now a 250-person, Top 500 engineering design company; Alan Icenhour, now the associate director of the Nuclear Science and Engineering Division at ORNL; Eric Abelquist, the executive vice president of Oak Ridge Associated Universities (ORAU); and Mohammad Khan, who transitioned from NE to medical school and is on the faculty at Emory University in Atlanta.

"A MS student, Robbie Hakeem, founded a company with a staff of about fifteen employees that supports radiation treatment at several cancer facilities," said Miller.

Moving forward, Miller will continue to contribute to research, as he has done throughout his career. Recently, he was the lead PI, along with Dr. Dayakar Penumadu and Dr. Chuck Melcher, on a \$2,000,000 National Science Foundation (NSF) Academic Research Initiative, funded by the Department of Homeland Security, on transformational scintillation materials for neutron and gamma detectors and education integration (2008-2013). He is currently included in a Department of Energy integrated research project on advanced accident-tolerant ceramic coatings, with funding of \$3,500,000 through December 31, 2016. Dr. Kurt Sickafus is the lead PI, and Dr. William Weber, Dr. Yanwen Zhang, Dr. Brian Wirth, and Miller are PIs.



Dr. Larry Miller (left) and a nuclear engineering student in 2006.

## Facilities

### NE Department Begins Funding and Acquisition of Equipment for New Building

As the Department of Nuclear Engineering (NE) anticipates moving into a new building in the future, it has begun efforts in developing new irradiation facilities to be used for both research and teaching in that building. Led by Dr. Jason Hayward, the department has secured a 9-MV Linac through a Cooperative Research and Development Agreement (CRADA) with Department of Homeland Security's Domestic Nuclear Detection Office (DNDO).

The total worth of the accelerator and detector components obtained through this agreement is estimated to be \$1 million. Under the agreement, DNDO will cooperate with the University of Tennessee to develop and test materials, detectors, and imaging devices and algorithms for high-energy imaging and cargo screening applications, as well as acquire new nuclear data regarding photo fission, photon interrogation, and photo-neutron interrogation.

Additionally, the accelerator will be used for materials irradiation and damage studies, and graduate and undergraduate student training. Collaborating institutions include ORNL, Varian, and Rapiscan Systems.

Hayward was also able to secure large amounts of lead and borated polyethylene shielding. This will be utilized in the accelerator facility, not only for shielding of the facility, but also for use with the development of methodologies for the detection of shielded radiological materials.

Governor's Chair Professor Howard Hall has secured a Raytheon Corporation portal monitoring system, also donated to the University by the DNDO. The total system is estimated to be worth \$2.7 million, and will be used for the department's nuclear security research, as well as training the next generation of US security professionals.

A number of faculty members have expressed the need for a DT (deuteron-tritium) neutron generator to support detector development and nuclear security research. To that end, Hayward has led efforts to secure a DT generator and accompanying shielding through grant proposals. These efforts will continue over the next few years as the department prepares to equip state-of-the-art laboratory facilities for faculty and students.



From left, Dr. Jason Hayward and Dr. Lawrence Heilbronn show borated polyethylene and lead shielding bricks that will be used for shielding in the Department of Nuclear Engineering's planned accelerator facility.



From left, Dr. Lawrence Heilbronn and Dr. Jason Hayward present a highway portal monitor from the Raytheon Corporation, donated by the Department of Homeland Security's Domestic Nuclear Detection Office. The monitor will be used for nuclear security research.

## Nuclear Engineering Research and Scholarship Feature: The Radiochemistry Center



Dr. John Auxier II (right) and graduate student Nicholas Earle (left) performing cadmium salt experiments in the argon glovebox.

In 2013, the NNSA's Stewardship Science Academic Alliance Program established the Radiochemistry Center of Excellence (RCoE) in the University of Tennessee-Knoxville College of Engineering and the UT Institute for Nuclear Security. Radiochemistry and nuclear chemistry are key scientific areas that support a number of NNSA mission areas. Funding for the center was provided by the US Department of Energy's National Nuclear Security Center.

The support was obtained via a proposal created by Governor's Chair in Global Nuclear Security Howard Hall, assisted by Dr. Lawrence Heilbronn, a professor in the NE department; Governor's Chair in Computational Nuclear Engineering Brian Wirth; Dr. Kurt Sickafus, a professor in the Department of Materials Science and Engineering; and Dr. Peter Counce, a professor in the Department of Chemical and Biomolecular Engineering.

The primary focus of the RCoE is to train undergraduate and graduate students in methods relating to nuclear

science and engineering by providing opportunities to perform cutting edge research. The center's research is divided into four major areas: advanced radiochemical separations, nuclear cross-section measurements, bulk actinide oxide materials processing behavior, and radiochemical probes for physical phenomena.

"The research aims are derived from the major thrust areas," said Dr. John Auxier II, a research assistant professor in the NE department who is associated with the center. "In the advanced radiochemical separations efforts, we are trying to change how we perform separations of elements. Instead doing separations in the traditional sense where we use a beaker with solutions, we are trying to use chemical compounds that allow us to volatilize the species of interest. In this way the separations can be performed much more rapidly, and in a more environmentally friendly way. These efforts seek to support the other area of interest, which is the

development of surrogate nuclear melt glass. The surrogate nuclear melt glass is designed to simulate the material that is formed after a nuclear weapon detonation. The purpose of the surrogate nuclear melt glass project will allow scientists and engineers to gain insight to the effects of a nuclear weapon on an urban environment, such as New York City, which will in turn allow first responders insight into how to sample in the extremely unlikely event of a nuclear detonation in a city. Furthermore, if such an event were to happen this project seeks to bolster current analytical techniques by helping to improve the speed at which data is obtained, which ultimately feeds the responses of decision makers."

"The research efforts of the nuclear cross sections measurements are influential in helping researchers design materials that allow for the later development of better reactors to be used in nuclear reactors for clean energy generation, advancement of the science needed to understand fusion energy as a possibility, and finally to help design materials for use in advanced space travel applications", Auxier added.

The bulk actinide materials processing seeks to understand the movement of fission products produced as a result of nuclear power generation in a variety of material matrices. The project uses first principles to derive how the movement of fission products in uranium metal and uranium oxides may contribute to difficulties in processing. This project will allow the center's research team to create useful computational models of the behavior of this material to support efforts at the Y-12 National Security Site's Uranium Processing Facility and the Savannah River Site's Mixed Oxide Reprocessing Center (MOX).

The research work with radiochemical probes for physical phenomenon uses radioactive particles immersed in a fluid such as water, and positron emission tomography (PET) to track the particle flow through a series of pipes. These experiments will help reactor engineers validate the fluid flow reactor codes, which will in turn lead to improved reactor design. The technology can also be harnessed to help identify tumors in the body with a higher degree of accuracy.

The RCoE currently provides research opportunities for approximately thirteen graduate students and six undergraduate students. Student researchers are each mentored by one of the five professors who contributed to the center's original proposal.

"The RCoE's goal in the coming years is to continue to progress with research in the main thrust areas," Auxier said. "Additionally, some of the research projects, particularly the surrogate nuclear melt glass project, has generated a large amount of interest from Los Alamos National Laboratory (LANL), Pacific Northwest National Laboratory (PNNL), Savannah River National Laboratory (SRNL) and Lawrence Livermore National Laboratory (LLNL), as well as the National Institute of Standards and



Dr. John Auxier II (left) and graduate student Nicholas Earle (right) performing an air filter change in the high efficiency particulate arrestance (HEPA) filter.

Technology (NIST). As a result of these efforts, some of our students have gone to national laboratories as interns, including Ms. Emilie Fenske to PNNL, Mr. Ian Stewart and Dr. Daniel Hanson (staff) to SRNL, and Mr. Jerrad Auxier to LANL. We're planning to improve and expand potential collaborations in this area and increase the national profile of the center. The project has also helped to initiate projects at Oak Ridge National Laboratory, so it will be important to continue to pursue those collaborations. We are excited about what the future holds for this center"

For more information, visit <http://nuclear.utk.edu/radiochemistry-center-of-excellence/>.



Dr. John Auxier II works with the argon glovebox.

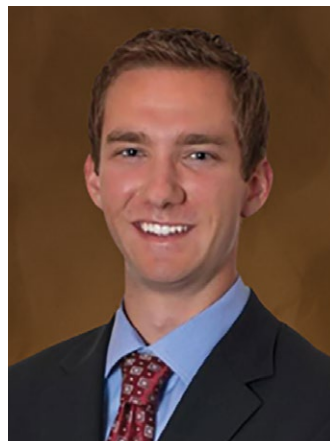
## NE Professor, Students Receive Award from American Nuclear Society for Analysis



Dr. Steven Skutnik



Remy DeVoe



Justin Knowles

Remy DeVoe and Justin Knowles, students who are working with NE assistant professor Dr. Steven Skutnik, recently were recognized by the American Nuclear Society (ANS) for their insightful analysis of the Environmental Protection Agency (EPA) Clean Power Plan Rules.

"The analysis of the EPA Clean Power Plan rules came about during Remy and Justin's time with the Nuclear Engineering Student Delegation (<http://www.nesd.org/>), a group of students from universities around the U.S. who come together for a week in Washington to meet with policymakers to discuss issues important to nuclear engineering university programs," Skutnik said. "During this time, the student group comes together to evaluate current issues facing both the nuclear industry as well as university nuclear engineering programs, such as federal allocations to nuclear R&D, etc. At the time, the EPA had just released its draft rules for the Clean Power Plan, and it was assumed that given that nuclear energy emits no carbon dioxide during its operations and that it provides over 60% of the nation's carbon-free energy, this would be an unalloyed good for the nuclear industry."

A major "red flag" was the realization that things weren't as simple as they were being made out to be originally. In particular, under the draft rules, existing nuclear plants were barely counted—in fact, the EPA had

largely discounted existing nuclear plants from the rule, offering a token 5.8% of existing plant capacity toward state compliance goals. What was even worse, the EPA assumed that plants under construction in Tennessee, South Carolina, and Georgia were baked in to states' future energy plans, meaning these plants wouldn't count

toward compliance either. This was a major issue—in essence, states were being penalized for being early movers in moving to nuclear energy as a zero-carbon baseload option in anticipation of future carbon dioxide abatement rules.

As Skutnik and the two students evaluated the situation, they realized that if existing plants only counted for 5.8% of their existing capacity, states could shut these plants down and replace them with natural gas-fired units, accelerating a process that is already happening due to the presently low price of natural gas. It would be a disaster for both the nuclear industry and for climate goals, and yet these rules were essentially giving states the thumbs-up to do so; in fact, under the group's calculations, the states would come out ahead under compliance goals if they did so.

"One of the things I had Remy and Justin do was to go through the EPA's state calculations on a state-by-state basis, looking at what they gave as the existing nuclear and natural gas capacity and play around with their numbers to calculate compliance," Skutnik added. "This was such a counter-intuitive finding that I wanted to make absolutely sure we were on solid footing. What we found confirmed the worst of our fears: the EPA draft rules were written—intentionally or not—in a way that created perverse incentives for existing nuclear generating units, encouraging states to allow these plants to be prematurely shut down in favor of being replaced by natural gas units (or worse, such as in the case of Vermont, actively driving these plants off the grid)."

One of the first things the team did to publicize these findings was to participate in EPA public hearings on the rule. DeVoe, along with two other UT nuclear engineering students, Daniel Tenpenny and Greg Meinweiser, went to Atlanta, Georgia, to participate in a public hearing on the rules and testify as to their disparate impact on nuclear energy. Beyond this, the team took their findings directly to ANS, alerting ANS members through the ANS Blog, the ANS Nuclear Cafe (<http://ansnuclearcafe.org/>). The blog post, which DeVoe, Knowles, and Skutnik worked together on, "Unintended Anti-Nuclear Consequences Lurking in the EPA Clean Power Plan" (<http://ansnuclearcafe.org/2014/08/20/unintended-consequences-lurking-in-epa-clean-power-plan/>), sounded the alarm to ANS members, kicking off a movement by ANS to encourage a mass public comment campaign, called "Nuclear Equality," to the EPA to correct the deficiencies that had been identified in the plan, specifically stressing the need to treat nuclear energy on equal footing with other non-emitting forms of energy generation like renewables and hydropower (the latter of which, incidentally, received equally bad or worse treatment under the draft rules.)

ANS took up the cause with their "Nuclear Equality" campaign, a high-profile campaign to the ANS membership to alert them to the flawed ways in which the EPA rules were structured toward nuclear energy and encouraging them to submit public comments

during the public comment period on the draft rules. As a result of this campaign, some of the more glaring problems were fixed in the final rule—for example, new plants under construction will now be credited toward state compliance goals, rather than being assumed to already have been built—a big win for Tennessee, South Carolina, and Georgia; and some helpful clarifications were issued (for example, power uprates at plants, in which a plant applies to the NRC to run at higher power than its original license, thereby generating more electricity, are now counted as "new capacity" and are eligible to be counted toward compliance). On other fronts, Skutnik's team did not fare as well; for example, existing nuclear plants were now completely struck from the rule (i.e., they don't count at all toward a state's zero-carbon portfolio).

In recognition of their work on analyzing this high-impact rule, the ANS awarded DeVoe and Knowles their Distinguished Service Award, recognizing outstanding contributions to public understanding of nuclear science, leadership on behalf of the ANS, and outstanding non-technical contributions to the aims of the ANS. The award was specifically for their service in analyzing the details of the Clean Power Plan and in their efforts to alert the Society about its potential adverse effects—again, in the context that at the time of the rule's drafting (where few had actually read the 300+ page draft rules), it was naively assumed that these rules would come as an unqualified benefit for nuclear energy.

"Remy and Justin really did the heavy lifting on this analysis," Skutnik said. "I'm proud of the work that they did and the honor that they received."

## Outstanding MS Student Researcher: Zach Welz

Zach Welz, winner of the Master's Graduate Research Excellence Award, is the lead student researcher for the prognostics division of research within the NE department. He is cited for his initiative in the operation of a heat exchanger test bed, as well as his continued work towards the development of predictive maintenance codes for nuclear power plants.

"My projects teach me how to bridge the research world with commercial industry," said Welz. "My current project involves the extraction of nuclear process data for predictive maintenance efforts and risk mitigation. Our goal is to provide research techniques for the commercial industry with developments in efficiency, safety, and overall improvements to the nuclear maintenance process."

Welz spends much of his personal time expanding the borders of his technical knowledge. Besides getting outdoors for backpacking trips and hikes, he is currently involved with operating-system programming, cyber-security, and internet-protocol independent work. Last year, he built his own computer to use for CPU intensive algorithms and gaming.

"It's running great," said Welz. "I've shifted my focus towards coding such as Linux, TCP-IP, and cyber security. I still spend some time working on my desktop whenever I get a chance, though."

Welz completed his Bachelor's degree in May 2014 and his Master's in May 2015. With his focus shifted from model development to algorithm development, he now spends time designing the functions and code that he utilized as an undergraduate.

"My current research is exciting because I am responsible for the development of tools that may have an impact on the nuclear industry in the near future," said Welz. "The work I am doing has the potential to revolutionize maintenance work within the existing and future US nuclear fleet."

He is now working directly towards his PhD, with his sights on completing it in spring 2018.



Zach Welz was one of the first recipients of the Outstanding Undergraduate Research award and is now being honored as this year's choice for the Master's Graduate Research Excellence Award for his recent efforts.

## Outstanding Undergraduate Student Researchers: Mikah Rust and Cody Walker



Mikah Rust (left) and Cody Walker (right)

Mikah Rust and Cody Walker are the 2015 winners of the Department of Nuclear Engineering (NE) Outstanding Undergraduate Research Award, designed to recognize students making strides in research early in their academic careers. Both are now enjoying their progress into their first year of graduate studies in NE.

Rust, a native of Oak Ridge, Tennessee, began working with Dr. Eric Lukosi in September of 2014. In his first project, he investigated a novel semiconducting material, including several properties that have never been reported in literature.

"I have investigated the charge generation and transportation properties of lithium indium diselenide," he said.

The publication under preparation for this work is expected to be a first-tier journal article. Since completing this study, Rust has been working on research with homeland security implications.

"I have simulated the intrinsic background of  $\text{KSr215:Eu}$ , due to the K-40 content," said Rust. "My current work is looking at how this intrinsic background affects detection capabilities of this scintillator."

Rust started on the engineering path in high school, where he enjoyed learning about physics.

"My father, being an electrical engineer who worked at LANL, ORNL, and with the Superconducting Super Collider, also sparked an interest in engineering in me from a very young age," he said.

In his time at UT, Rust has earned ANS scholarships in 2013 and 2014, and a Department of Energy (DOE) Nuclear Engineering University Partnership (NEUP) scholarship in 2014. The NE department and faculty have helped him maintain progress in his studies.

"I am very fortunate to be mentored by Dr. Eric Lukosi, and am thankful for all of the time he has spent with me," said Rust. "I am also very thankful to the entire UT nuclear engineering faculty for their hard work and dedication."

When not delving into nuclear engineering matters, Rust enjoys fishing, hiking, and generally spending time outdoors with his wife, Casey Rust.

It was also a curiosity about physics that turned Cody Walker toward nuclear engineering.

"My first roommate in college, John Bridges, was an aerospace engineer," said Walker. "His physics homework looked 100 times more fun than my biology homework. After doing a quick search through the engineering catalogue, I settled on nuclear engineering. Although, I do not recommend changing majors during finals week—too stressful."

Walker has excelled since changing majors, and he enjoys telling people about it.

"Like Dr. Ronald Pevey once said, 'It's fun just to see other people's reactions when you say you're studying nuclear engineering,'" said Walker.

In addition to the 2015 Outstanding Undergraduate Research award, Walker has earned a DOE NEUP Fellowship, UT's Nuclear Engineering Junior of the year award (twice), and NRC's scholarship for academic performance. While earning these accolades, the Columbia, Tennessee, native has connected with several members of the NE faculty during his undergraduate years.

"My favorite professor as an undergraduate has to be Dr. Arthur Ruggles," said Walker. "His teaching style resonated very well with me, and I have never worked harder in a class for an A."

He cites Dr. Jamie Coble, his faculty mentor, as being the most influential on his career so far.

"She has given me the opportunity to pursue undergraduate research and has helped me focus my goals as I continue towards my master's degree," said Walker. "She has nurtured me into the engineer that I am today, and I am lucky to be working for her."

Walker currently works for Coble as a research assistant, and has also worked for Dr. Belle Upadhyaya. He is noted as a student who consistently goes beyond expectations for an undergraduate researcher. He began in November 2013 when he developed a MATLAB/Simulink model of the Experimental Breeder Reactor (EBR)-II primary system. He unearthed technical reports from the late 1980s to guide development.

"We developed a nodal-based model in MATLAB's Simulink environment that primarily focused on heat transfer through the core and heat exchangers," said Walker. "These models simulated the reactor's operating conditions and control response as we tested multiple control schemes."

This work led to funded research with TerraPower, a company backed by Bill Gates to develop a next-generation liquid metal reactor. Walker worked directly with TerraPower engineers to understand and run their existing TWR-P simulation model to support the validation of a Simulink model.

## Special Feature: NE Graduate Success Story

Daniel Clark, a Department of Nuclear Engineering graduating master's degree student and a graduate research assistant with Governor's Chair in Nuclear Materials Steven Zinkle, has just been accepted into a probationary internship program as acting Program Manager for the Materials and Fusion Nuclear Science Program at the Office of Fusion Energy Sciences (FES) for the Office of Science (SC) at the US Department of Energy (DOE). Clark will begin the job in mid-September of this year and will transition into the program manager position officially after his first year with the FES.

The FES program mission is to expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundation needed to develop a fusion energy source.

Clark's strengths growing up were in math and science, and he was encouraged by both his parents and his teachers to pursue a career in engineering.

"I have always had an inherent interest in the nuclear field," Clark said. "I believe this stemmed from the mystery associated with both nuclear power and weapons. If you look in pop culture (such as comics and movies), nuclear stuff tends to be the enigmatic source of both power and destruction, and I guess you could say that I was always interested in conquering and understanding its secrets. So when the time came to choose a major right before college started I thought it would be a good choice both in terms of interest and potential employment."

Clark grew up in Kingsport, Tennessee, but when the time came to make a decision for college, he wanted to move to another area. After considering several of the top rated engineering schools, he visited Texas A&M and loved it, so he attended the university for his undergraduate degree in nuclear engineering. During Clark's time at Texas A&M, he joined the Naval NUPOC (Navy Nuclear Propulsion Officer Candidacy) Program to help his parents pay for his education, since they had three kids in college at the time.

Clark was supposed to have a five-year commitment on a nuclear sub following graduation. However, due to government spending cutbacks in early 2013, he was honorably discharged two weeks before his graduation. Since he had always planned on going back to school to get his masters at some point, he decided to go ahead with pursuing the degree. Shortly after his discharge, he took the GRE and then applied to both Texas A&M and the University of Tennessee, but had trouble finding financial support for his studies.

During the summer of 2013, he kept in contact with both UTNE department head Dr. Wes Hines and the NE department head at A&M trying to find some funding. When Zinkle was hired as a new Governor's Chair, he had a graduate research assistant position available and offered it to Clark. After his funding was in place, Clark started the master's program in nuclear engineering at UT and completed his degree in the spring of 2015.

In his new role at FES, Clark's responsibilities as the materials program manager will be to support and advise senior program managers in areas related to fusion nuclear science as it pertains to materials research. His duties include providing technical guidance on assigned research projects and programs in fusion nuclear science and materials research; assembling essential information on assigned areas of responsibility through site visits, study of scientific and technical literature, and participation in discussions with scientists, engineers, and technical program managers within DOE; providing advice, assistance, and recommendations concerning portions of assigned research projects and/or programs; assisting in reviewing project proposals for design, costs, and scheduling to evaluate selected aspects of such proposals and to increase program and technical knowledge and awareness of constraints on programming and budgeting; and reviewing, analyzing, and preparing documents to communicate with senior program managers, management, DOE officials, universities, and private industry on the status of program/project progress and performance.

Clark is excited about the challenges of his new job. "My goal for the coming years is to become a competent, self-sufficient program manager that is a productive member of the FES management team," Clark said. "The majority of the other program managers had significantly more managerial experience than I do coming into the job, so I will have a lot of growth and learning to do in the immediate future, but I remain optimistic that I will be a good addition to the team."

Clark plans to make a long-term commitment to the FES to help develop fusion energy for the coming generations.

"At the admission of the Chief of Staff Gene Nardella, the management team at the FES is predominantly comprised of an older generation, a group that in the next ten to fifteen years will be retiring," Clark added. "He has mentioned the need to begin hiring some younger managers that want to stay at the FES longer term to help it transition to the up and coming generation of nuclear engineers. I believe that this is one of the reasons that I was chosen for the position, and it is my hope to make a career in the FES so that I can help it move successfully forwards in the coming future."



Daniel Clark



## Outstanding PhD Student Researcher: Pi-En Tsai

Graduate student Pi-En Tsai received the Department of Nuclear Engineering's 2015 PhD Graduate Research Excellence Award, along with other honors for her work and approach. Dr. Lawrence Heilbronn, her faculty advisor, describes her as a very intelligent and skilled experimentalist, with the ability to identify research needs and develop experiments that will address those needs.

Tsai's current enthusiasm for nuclear engineering wasn't so strong when she first left her hometown of Kaohsiung, Taiwan, for studies at her country's National Tsing Hua University.

"I was a little anti-nuclear when I entered the college," she said. "My first thought for beginning to study nuclear engineering was that I wanted to understand more about this industry, particularly the safety features and the waste management of nuclear power plants. Then I started to understand that my original bias about nuclear energy mainly came from my fear of something unknown. The more I learned, the more I was into it."

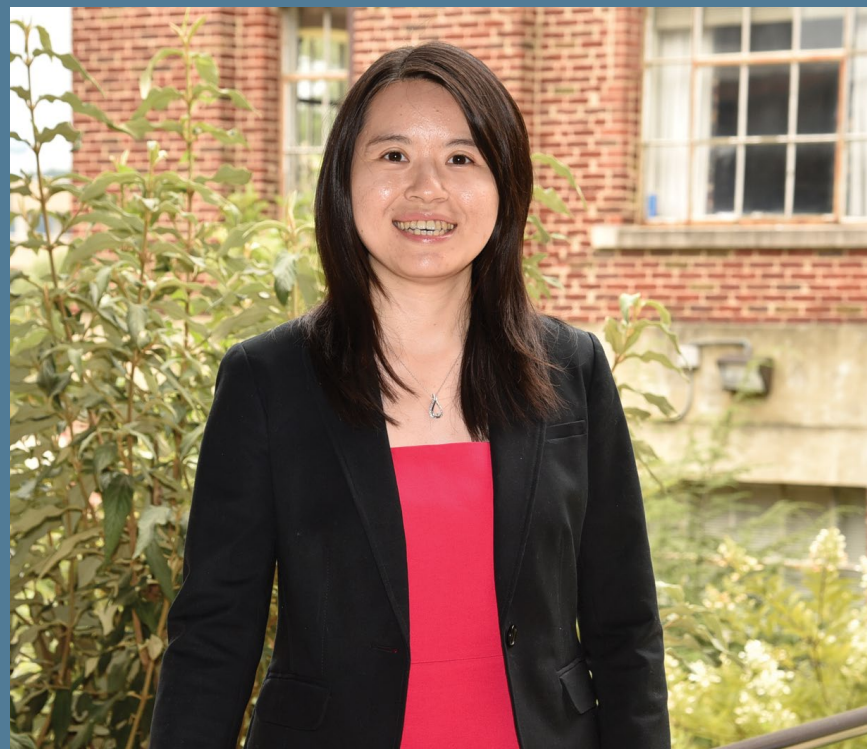
Tsai learned that nuclear engineering applies not only to nuclear power plants, but also to many radiological applications, from radiotherapy in medical fields to space radiation.

"Although I did not conduct research on the waste management and assessment later on—which was the first thing I wanted to do—I continue working on radiological engineering," she said.

Tsai likes to do experiments and enjoys the hands-on working experiences of electronic modules and radiation detectors.

"The majority of the nuclear society focuses on the theory and simulation," she said. "But I selected to work on the radiation measurement since getting my master. I like the feeling of actually measuring something that I can't see, but does exist in another form. In addition, the experiments can provide critical data for validation of theories or simulations."

Tsai's research accomplishments include being first author on one peer-reviewed journal article and four refereed conference papers and co-author on three other refereed conference papers. She has presented her work at national ANS conferences and IEEE conferences. Her paper at the recent 18th Topical Meeting of the Radiation



Pi-En Tsai

Protection & Shielding Division (RPSD) of ANS, held in Knoxville, was selected as the "Best of Session" and she was invited to present that work at the ANS Annual Meeting in June 2015 in San Antonio, Texas.

She was also selected as one of the "Rising Stars in Nuclear Science and Engineering" for 2015 and was honored in April 2015 at MIT for her award.

When not applying her enjoyment of hands-on research to nuclear topics, Tsai enjoys other activities, such as a

weekly game of tennis. Her hobbies offer a different sort of investigation, as well.

"I also like gardening, cooking and baking," she said. "For gardening, in addition to herbs, I like to grow plants from leftover fruit's seeds, or seeds I collect from street trees. For example, I have successfully grown tomatoes, bell peppers, kiwis, lemons, pomegranates, avocados, melons, grapes, maples, etc., at my apartment patio. Cooking and baking have been my new hobbies since I came to the US five years ago. I believe these two are also the same hobbies that many international students have."

Tsai might have a bit of time for these pursuits for the moment, having defended her dissertation over the summer of 2015. She will receive her PhD in December 2015. Her thesis was based on a set of measurements and simulations of secondary particles produced from heavy-ion interactions.

"I wish to continue conducting research after finishing my PhD," she said. "I plan to work on the accelerator-driven system (ADS) as a physics model developer for radiation transport codes in Japan, which is tightly related to my PhD work."

The ADS technique can be employed to several applications, including the production of radioisotopes for medical purposes, the transmutation of long-lived fission products and minor actinides in spent fuel, and also in generation of electrical power.

"I believe this technique would be extremely helpful for treatment and management of the high-level radioactive nuclear waste, and thus the continuous utilization of nuclear energy," said Tsai.

## UT Nuclear Engineering Student Group Named Top in US



Members of the UT American Nuclear Society Student Chapter

National success came for the Department of Nuclear Engineering when the American Nuclear Society (ANS) choose UT's student chapter to receive the prestigious Samuel Glasstone Award for the best student chapter, a first for the university.

"I think this shows that we are becoming a recognized leader for what we do," said assistant professor Steve Skutnik, the group's faculty advisor. "The ANS makes its selection on the passion, influence, and activity of the groups, so to be selected is huge."

The acknowledgement of the group—which numbers more than forty—was rewarding for the students as well, even if it came as a surprise.

Previous section president Jerrad Auxier said he'd constantly checked the Internet to see how the group had fared, but never saw an indication that they had been selected as the top overall group until the news appeared in the ANS newsletter.

Gregory Meinweiser, who took over as the group's president this semester, pointed out that as nice as it is to be chosen, the real satisfaction came because it validated the group's efforts.

"A lot of really hard work went into us getting to this point," said Meinweiser. "They didn't just simply pick us because we'd never been picked, they did it because they saw the things we'd done, the efforts we'd made."

"It says a lot about that and also about our department and the direction we've taken the last few years."

Skutnik talked about some of the growth made in recent years, gains that have seen the department rise to become the fourth-ranked public nuclear engineering department in the country.

Collaboration with Oak Ridge National Laboratory is a major factor for faculty and students alike when choosing UT, but he pointed out some of the more subtle changes that have also made a huge impact.

Having the chance to work with the Bredesen Center for Interdisciplinary Research and Graduate Education, in particular, is seen as a particular plus, given the center's strength in energy education.

"That's another opportunity that can't be overlooked," said Skutnik. "For students, it puts them in the mindset of considering things from a number of standpoints. That, in turn, gets them to look at implications and possibilities for nuclear power that they might not have otherwise considered, and the result is seen when some of our students actually influence public policy."

In the most notable example of that, graduate students Justin Knowles and Remy DeVoe presented a case to ANS documenting how the EPA's proposed Clean Power Plan (intended to reduce carbon dioxide emissions from the electricity sector) could actually produce potentially negative incentives for nuclear power plants, given the way the rules were structured.

Knowles and DeVoe were jointly awarded the ANS Distinguished Service Award for their work on this topic, presented to them at the ANS Annual Meeting in June.

"It has been exciting to watch the department transform into a well-structured and competitive department," said Auxier, who now works at Los Alamos National Laboratory in New Mexico. "Although this makes the curriculum more complex and the work load on the students harder, it is rewarding to have companies, national labs, and agencies seeking you as an employee."

Skutnik added that having Governor's Chair for Nuclear Materials Steve Zinkle, Governor's Chair for Computational Nuclear Engineering Brian Wirth, Governor's Chair for Nuclear Security Howard Hall, and a host of other faculty members has elevated UT to the level of being a leader in some of the big topics of the day.

"Energy concerns, environmental issues such as climate change, the risk of nuclear terrorism, all of those are some of the major concerns around the world today, and they just happen to be things in which this department has expertise," said Skutnik. "The growth that we have had is nice, but we are also well positioned to be a leader moving forward."

## Student News



NEUP graduate fellowship winners, from left: Cody Walker, Cody Wiggins, and Kaitlyn Darby.



DOE Nuclear Engineering University Partnership (NEUP) scholarship award winners are, sitting from left: Alyx Wszolek, Rachel Gaudet, and Saya Rutherford. Standing from left are: James Brackett, Peyton Lara, Eric Nelius, and Travis Laboissiere-Hickman. Additional winners not pictured are Carl Britt, Adam Hasse, Whitney Smith and Dane de Wet.



ANS scholarship winners, from left sitting, are Alyx Wszolek, Ashlyn Jones, Rachel Gaudet, and Saya Rutherford. Standing, from left, are Zach Welz, Carl Britt, Adam Stratz, and Travis Laboissiere-Hickman. Additional winners not pictured are Erik Walker, Austin Mullen, and Colton Oldham.

### Nuclear Engineering Students Honored for Awards

The Department of Nuclear Engineering (NE) held its annual awards dinner on Monday, April 20, 2015. Students in the department won eleven DOE Nuclear Engineering University Program (NEUP) scholarships and three NEUP graduate fellowships.

This year's NEUP scholarship winners are James Brackett, Carl Britt, Dane de Wet, Rachel Gaudet, Adam Hasse, Travis Laboissiere-Hickman, Peyton Lara, Eric Nelius, Saya Rutherford, Whitney Smith, Alyxandria Wszolek.

Kaitlyn Darby, Cody Walker, and Cody Wiggins won the 2015 NEUP graduate fellowships.

The 2014-2015 ANS Scholarships were also recently released, with UT students winning eleven of them.

**Alyx Wszolek:** ANS Undergraduate scholarship

**Saya Rutherford:** Angelo F. Biseti Scholarship

**Ashlyn Jones:** ANS Vogt Radiochemistry Scholarship

**Travis Laboissiere-Hickman:** ANS Reactor Physics Division Scholarship

**Erik Walker:** ANS Graduate Scholarship

**Zach Welz:** Uhrig I&C Graduate Scholarship

**Austin Mullen:** Undergraduate Scholarship - Sophomore

**Adam Stratz:** ANS Decommissioning & Environmental Sciences

**Rachel Gaudet:** ANS Undergraduate Scholarship

**Carl Britt:** ANS Undergraduate Scholarship

**Colton Oldham:** ANS Undergraduate Scholarship

### Nuclear Engineering Students Take Major Honors at Conference

The nuclear engineering department at UT built on a series of successes recently by bringing home eight top awards at a conference hosted by the American Nuclear Society at Texas A&M University.

"We are so proud of the research success our students continue to have and the recognition they are receiving for themselves, their faculty, and UT," said Dr. Wes Hines, head of the department.

Justin Knowles and Seth Langford each claimed two awards.

Knowles—who is also a student in the Bredesen Center for Interdisciplinary Research and Graduate Education—received Best Graduate Presentation in Detection and Measurement Technical Session and Service Commendation Award honors, the latter for alerting the ANS about an energy law that the EPA was trying to pass that it deemed unfair.

Like Knowles, Remy DeVoe also received the Service Commendation Award for alerting the ANS about the proposed energy law.

Langford won awards for Best Graduate Presentation in Thermal Hydraulics and Fluids as well as Best Graduate Paper.

Other UT winners included Jerrad Auxier for Best Graduate Presentation in Nonproliferation and Nuclear Safeguards, Hannah Hale for Best Graduate



ANS award winners and contributors, from left: Jerrad Auxier, Daniel Tenpenny, Kelsa Benensky, Remy DeVoe, Seth Langford, and Cody Wiggins. Additional winners not pictured are Hannah Hale and Justin Knowles.

Presentation Special Session: International Applications, and Kelsa Benensky for Best Graduate Presentation in Aerospace, Nuclear Science and Technology Technical Session.

More than five hundred students and two hundred professionals attended the conference.

The past year has been a time of remarkable success for the department, including being ranked in the top five of all nuclear departments in back-to-back years to signing an agreement with Czech Technical University in Prague.

### DeVoe Among Winners of 2015 Innovations in Fuel Cycle Research Award

Remy DeVoe, an MS student in the Department of Nuclear Engineering, has been awarded a second place prize in the Innovations in Fuel Cycle Research Awards sponsored by the US Department of Energy, Office of Fuel Cycle Technologies. DeVoe's award is in the open competition in the category of Used Fuel Disposition. His award-winning research paper, "COBRA-SFS Dry Cask Modeling Sensitivities in High-Capacity Canisters," was presented at the International High-Level Radioactive Waste Management Conference in April 2015.

The Department of Energy has long recognized that university students are an important source of breakthrough solutions and a key component in meeting its long-term goals. The Innovations in Fuel Cycle Research Awards program is designed to: 1) award graduate and undergraduate students for innovative fuel-cycle-relevant research publications, 2) demonstrate the Department of Energy's commitment to higher education in fuel-cycle-relevant disciplines, and 3) support communications among students and DOE representatives.

The program awarded eighteen prizes in 2015 for student publications relevant to the nuclear fuel cycle. In addition to cash awards, award-winning students will have a variety of other opportunities. For information on the Innovations in Fuel Cycle Research Awards program, visit [www.fuelcycleinnovations.org](http://www.fuelcycleinnovations.org).



Remy DeVoe

## Alumni Profile: The Honorable Jessie Hill Roberson



Jessie Hill Roberson

Jessie Hill Roberson (BS/NE '81) has over thirty years of distinguished involvement in the nuclear engineering field, with diverse and expansive experience in low-level waste management, environmental restoration, reactor operations and project management.

Roberson was the first minority female to receive a degree in nuclear engineering from UT. During her years at the university, Roberson was a member of Group 5 in the Minority Engineering Scholarship Program (MESP), a precursor of the current Engineering Diversity Programs (EDP).

"The opportunities afforded me through the UT Engineering Diversity Programs gave me the technical foundation, social maturity, and professional direction to make many distinguished contributions to my industry, my family, and the broader good of the nation," Roberson said.

President Barack Obama nominated Roberson in July 2015 as a commissioner of the U.S. Nuclear Regulatory Commission.

"The nuclear energy industry congratulates Ms. Roberson," said NEI President and Chief Executive Officer Marvin Gertel in a statement. "Her relevant experience with nuclear energy technology aligns well with NRC's mandate to ensure the safe operation of the nation's nuclear energy facilities."

Roberson, originally a native of Evergreen, Alabama, is currently serving her second tour with the Defense Nuclear Facility Safety Board (DNFSB), where President Bill Clinton initially nominated her as a member of DNFSB in September 1999. The U.S. Senate confirmed Roberson's nomination in January 2000. Roberson was nominated by President George W. Bush and confirmed by the U.S. Senate in July 2001 to serve as assistant secretary for the DOE, providing governance of the agency's Environmental Management Program. President Obama appointed Roberson vice chairman of the DNFSB in 2010.

Prior to and after her first appointment to the Board, Ms. Roberson served with the Department of Energy (DOE) in a variety of challenging positions. In 1996 she became the youngest individual and first female manager of DOE's Rocky Flats Field Office at the Rocky Flats Environmental Technology Site in Colorado, with the responsibility for integration and performance of all environmental cleanup activities on the site. She served with distinction in this position until December 1999. In her ten years with the DOE, she has held numerous technical and managerial positions at DOE's Rocky Flats Environmental Technology Site and the Savannah River Site in Aiken, South Carolina, including environmental cleanup, waste management, safeguards and security, as well as nuclear reactors and weapons.

Prior to joining the DOE, Roberson worked with Georgia Power Company as a system engineering specialist from 1987 to 1989. At Georgia Power, Roberson focused on maintenance, testing, upgrades, and performance reliability of electrical and mechanical plant systems and equipment. She has extensive experience in nuclear reactor operations and successfully completed the testing requirements for reactor operations with E. I. DuPont in 1982. In later years during her tenure with DuPont, she trained nuclear reactor operators and supervisors in both nuclear and field operations. Prior to leaving DuPont in 1987, Roberson worked as a nuclear reactor operations manager at several sites.

From 1977 to 1980, Roberson completed work assignments as a student engineer for Westinghouse at the Clinch River Breeder Reactor in Oak Ridge, Tennessee, and the Nuclear Center in Monroeville, Pennsylvania.

Roberson is encouraged by the increasing numbers of young women who choose engineering as a career, although she still sees room for progress.

"There are certainly more females in engineering than when I was in college," Roberson said. "But the rate of increase of women enrolling and graduating with engineering degrees is too low. There are not enough women choosing this path. I think there are a myriad of reasons not enough women are pursuing science, engineering, technology, and math (STEM) related fields in spite of the national initiatives to address it. What I do know is I have had the opportunity to work with many young women over the last decade who have chosen engineering careers, and they are awesome."

Roberson currently lives in Alexandria, Virginia, and her spare time activities include power walking, running, and gym classes. She also enjoys trying different foods and spice combinations, although she adds, "cooking is not my craft."

Roberson also enjoys spending quality time with her 26 year old daughter, Jessica, who works for a financial regulator and is pursuing an advanced degree at Johns Hopkins University.

Roberson said her years as an engineering student at UT have been important to her success.

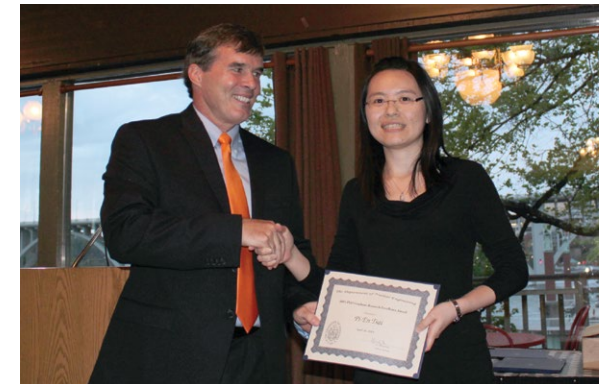
"I honor those at the university who committed their resources and professional careers to creating possibilities for so many students like myself," she added. "I am proud to be a Volunteer!"



Professor and Department Head Wes Hines begins the awards presentation at the annual NE Awards Banquet.



Mikah Rust (right) receives the Outstanding Undergraduate Research Award from Dr. Hines (left).



Pi-En Tsai (right) receives the PhD Graduate Research Excellence Award from Dr. Hines (left).



Dr. Hines (left) presents the Masters Graduate Research Excellence Award to Zach Welz (right).



Student inductees into the Alpha Nu Sigma Honors Society were inducted by NE professor Dr. Martin Grossbeck (far right).

## Faculty, Staff, and Students Honored at NE Awards Banquet

The Department of Nuclear Engineering hosted its annual awards banquet on April 20, 2015. The banquet was established to honor students who had outstanding accomplishments during their academic year and was held at Calhoun's On the River Restaurant.

The American Nuclear Society (ANS) inducted over fifteen students into the Alpha Nu Sigma Society; Dr. Martin Grossbeck presented each student with their certificate as well as the white cords symbolizing their participation within the society.

As the evening continued, Dr. Wes Hines, NE department head, presented outstanding research awards to a student within each program offered in the nuclear engineering department. Pi-En Tsai was presented with the PhD Graduate Research Excellence Award; Zach Welz was presented with the Masters Graduate Research Excellence Award; Mikah Rust and Cody Walker were presented with the Outstanding Undergraduate Research Award; and Brandon Perlov received the Outstanding GTA Award.

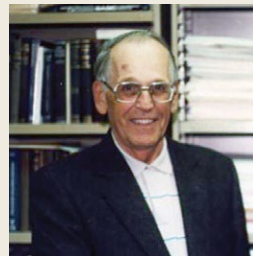
Awards were also given to students within each program that exemplify outstanding contributions to their program of study and showed remarkable achievements as a student. Kaitlyn Darby, Brady Miller, and Michael Welch all received the Outstanding Senior Award. Matthew Buttery, Kacie Breeding, and Dane de Wet were all awarded with the Outstanding Junior Award. Eric Nelius was awarded the Outstanding Sophomore Award, and Jacob Cooper, Caleb McHugh, and Robert Vradenburgh were presented with the Outstanding Freshman Award.

One of the highlights of the evening was when ANS officers presented the nuclear engineering faculty with superlatives that provided much entertainment for the attendees present. The awards banquet proved a success as always and recognition was given to students who work hard throughout the academic year and deserve a show of appreciation for their efforts as well as the prestige they bring to the Department of Nuclear Engineering.

## History of the NE Department

Article by Professor and Former NE Department Head H.L. "Lee" Dodds

In the early 1950s, nuclear engineering was taught at special schools located at US Atomic Energy Commission (USAEC) national laboratories. A good example was the Oak Ridge School of Reactor Technology (ORSORT), which was located at the Oak Ridge National Laboratory. Many people in the nuclear community nationwide thought that the growing discipline of nuclear engineering would be better served if located at major research universities rather than at national laboratories. Eventually, with support and encouragement from the USAEC, nuclear engineering departments across the country were founded in the mid to late 1950s, one of which was the University of Tennessee Nuclear Engineering (NE) Department, which was founded in 1957.



NE's first department head, Dr. Pete Pasqua

The 'founding father' and first UTNE department head was Dr. Pietro F. Pasqua (often affectionately referred to as 'Pete'), who was previously a professor in the UT Department of Mechanical Engineering. Pasqua served as NE Department Head from 1957 until his retirement in 1988. The first NE faculty member that Pete hired was Hall C. Roland, which was followed by the hiring of several other early

faculty members including Paul N. Stephens and Julian E. (Ted) Mott.

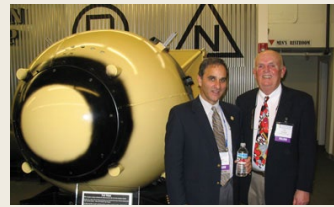
NE's first BS graduating class occurred in 1960, which consisted of transfer students from other UT departments and included Bruce Deering, Jim Humphreys, Jim Robinson, and Ed Straker. Bruce Deering eventually became an executive with Black and Veatch, a large architectural, engineering, and construction company. Jim Robinson later became a NE faculty member after receiving his PhD and working in the nuclear field for several years. Ed Straker also earned a PhD and eventually became a senior vice president of Science Applications International Corporation (SAIC). Jim Humphreys, the 'smart one,' became a practicing cardiologist after graduating from UT medical school.



Dr. Tom Kerlin, NE's second department head.

NE's first MS graduate was Tom Kerlin, who graduated in 1959. Kerlin eventually became the second NE Department Head after earning his PhD and working in the nuclear industry for several years. He served as department head from 1988 until his retirement at the end of 1996. NE's doctoral program began in the early 1960s via the then existing engineering science doctoral program, but

soon became a standalone doctoral program in nuclear engineering. NE's third department head was Dr. Lee Dodds, who assumed the role in early 1997 retired on August 1, 2011. Dr. J. Wesley Hines, a PhD graduate of the Ohio State University and a recipient of the ASEE Glen Murphy Award in 2014, the UT Chancellor's Research



Former NE department head Dr. Lee Dodds with a colleague in 2004.



Dr. Larry Townsend conducts a demo with a nuclear engineering student in 1999.

six full-time research faculty members, thirty adjunct faculty members (part-time), and approximately three hundred and thirty-five students (approximately two hundred and thirty-five undergraduate and one hundred and thirty-five graduate students). More significantly, NE's graduate program is ranked number 5 in the country by *U.S. News and World Report* (number 4 among public universities) and is the highest ranked department in the University of Tennessee system.

Award in 2007, and College of Engineering Research Fellow designations in 2006 and 2009, was named department head after Dodds' retirement and currently serves in that role today.

During its fifty-eight year history, NE has produced over twelve hundred graduates, many of who have become highly respected members of the nuclear community worldwide. Currently, the department has seventeen tenure/tenure track faculty members,



NE professor and current department head Dr. Wes Hines works with a student in a lab in 2008.



Dr. Belle Upadhyaya in a lab with students in 2013.

## Hashemian Gift Advances Undergraduate Research



Dr. Hash Hashemian

The College of Engineering received an important gift from an influential alumnus this fall in the form of the newest endowment for the Department of Nuclear Engineering. Dr. Hash Hashemian (MS/NE '77) committed the funds to create the Hashemian Family Nuclear Engineering Undergraduate Research Endowment.

This endowment will allow the Department of Nuclear Engineering to name a Hashemian Family Undergraduate Research Scholar each year.

The undergraduate nuclear engineering student will be selected by the department and paired with a faculty member to complete research on the faculty member's research project. The Hashemian Family Undergraduate Research Scholar will gain hands-on research experience and will accompany the faculty member to a conference or similar meeting to present their research and gain research insight for the future.

Hashemian and his family understand the crucial role of research in higher education and the importance of giving students opportunities to be immersed in research early in their academic careers. The Hashemians—Hash, Nazy, Alex, and Nikki—are all strong supporters of the University of Tennessee and continue to show their loyalty each year.

Hash Hashemian is the President and CEO of Analysis and Measurement Services Corporation (AMS). Hashemian and his mentor, Dr. Tom Kerlin, conceived AMS while Hash completed his nuclear engineering master's degree at the University of Tennessee. Headquartered in Knoxville, AMS is the leading supplier of equipment, training, and services for in-situ response time testing and online calibration of temperature and pressure instrumentation in nuclear power plants. Alex (BS/ME '12, MS/ME '14) and Nikki (BS/Management '14), the Hashemian children, are also UT graduates and are part of the leadership at AMS.

Hashemian and his family continue to focus on how to make a difference with the future generation of engineering leaders. Thanks to the Hashemian's stalwart support, the department will be better able to serve future nuclear engineering students and provide necessary research experience to them during their undergraduate career.



Dr. Hashemian (center) with his family, wife Nazy (center) and daughter Nikki (left) and son Alex (right)

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**Alumni News**

Please send us your career announcements so we can share them with other NE alumni. Send your information to [utne@utk.edu](mailto:utne@utk.edu) and include your name, degree, and year of graduation.



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