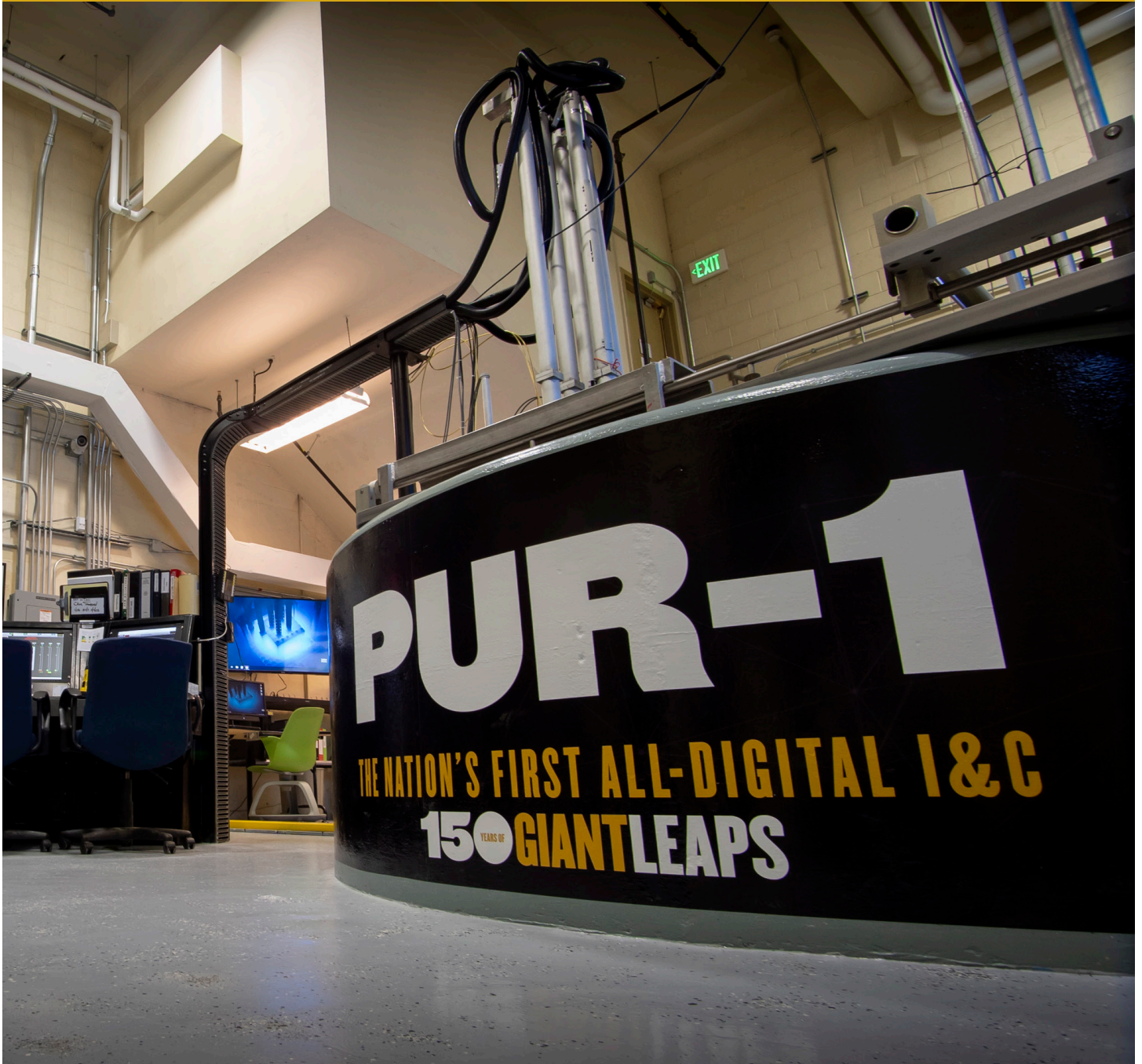


NUCLEAR ENGINEERING NEWSLETTER

FALL 2019





MESSAGE FROM THE HEAD

What an exciting year it has been since we last communicated!

As featured on the cover page, we opened the 2019 Fall semester with the grand dedication of our PUR-1 for its first-in-the-nation all-digital instrumentation & control system, where President Daniels and Dean Chiang together with our students, faculty, staff, and alumni, as well as many significant guests from outside Purdue, joined to celebrate this great achievement. The impact that PUR-1 has brought to the nuclear engineering community has been broadcasted by more than 130 domestic and international media outlets, which is estimated to have reached more than 240 million readers. We look forward to leading many educational and research opportunities with our unique digital capability.

The PUR-1 dedication was followed by the unprecedented three-day Atoms for Humanity Summit to celebrate nuclear energy. Industry leaders, policymakers, scientists and innovators convened to discuss how nuclear energy is essential for the sustainable future of humanity and how nuclear innovation can change the world through the lens of sustainability, space, healthcare and AI & robotics.

Earlier this year, Purdue announced the construction plan for the Gateway complex, campus' largest academic facility to date. It consists of two new buildings spanning the current footprints of the Nuclear Engineering (NUCL) Building and Michael Golden Laboratories. While it is sad to learn that our long-beloved NUCL Building will be torn down, we look forward to our new home suite on the top floor of the state-of-the-art Gateway complex in 2022. On October 2, we reminisced about all of the wonderful time we had in our NUCL Building with our students, alumni, faculty and staff in a special event. It was made even more special by Mrs. Birgit Ott, who joined us all the way from Germany to commemorate the late Professor Karl Ott and his named conference room in the NUCL Building, which will be re-dedicated when our Nuclear Engineering suite is completed. Our students, both current and past, are truly living up to the high standards set by Purdue and what it means to be a Boilermaker by having a great impact on the community. We hope you enjoy reading stories on some of the remarkable achievements made by our current students and alumni that are featured in the newsletter.

As I close my message, I am happy to report that, as of Fall 2019, we have a total of 192 students, comprised of 92 undergraduate and 50 graduate students, which is an approximate 7% increase from last year.

The year 2020 will mark the 60th anniversary for our School, so please stay tuned. As we continue to strive toward the pinnacle of excellence, I look forward to our communications with more exciting activities. Boiler up and hail Purdue!



Seungjin Kim
Capt. James F. McCarthy, Jr.
and Cheryl E. McCarthy Head
and Professor
School of Nuclear Engineering

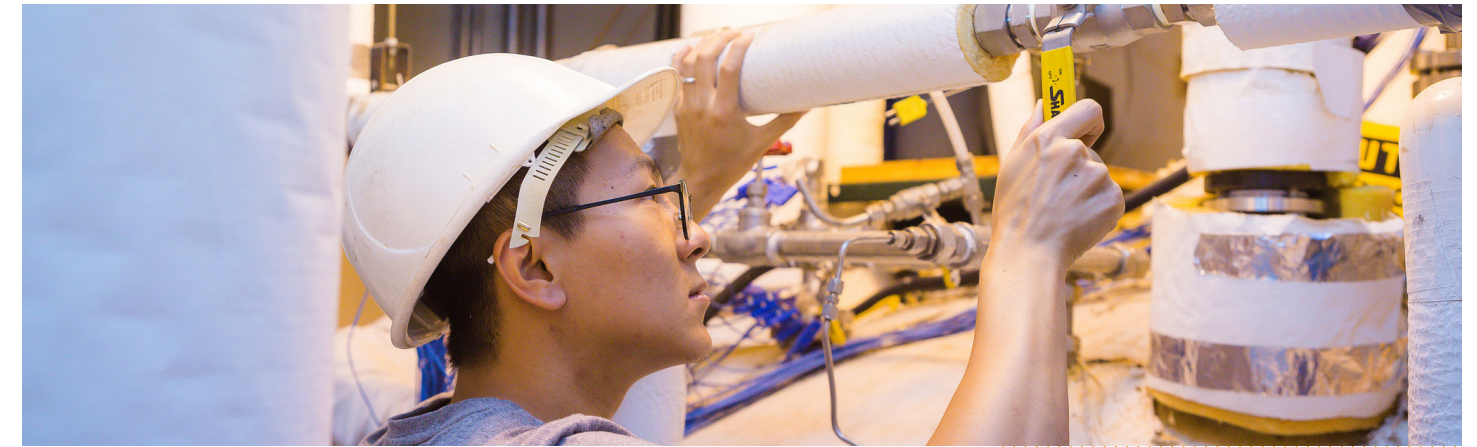


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ON THE COVER

Purdue University Reactor 1 (PUR-1) in Duncan Annex.

Cover photo by Vincent Walters

PUR-1: FIRST LICENSED ALL-DIGITAL REACTOR

THE ONLY DIGITAL INSTRUMENTATION AND CONTROL SYSTEM REACTOR IN THE U.S.

The U.S. Nuclear Regulatory Commission has licensed Purdue University Reactor Number One (PUR-1) as the first entirely digital nuclear reactor instrumentation and control system in the nation. The upgraded reactor and facility, originally built in 1962, paves the way for widespread implementation of digital technology in both research and industry reactors.

“Modern control technology in the nuclear sector will allow for big data applications and increased reliability,” said Clive Townsend, the supervisor for Purdue’s reactor. “We’re going from the vacuum tubes and hand-soldered wires of the ‘60s, to LEDs, ethernet cables and advanced electronics.”

The digital conversion of PUR-1 began in 2012, when the U.S. Department of Energy awarded Purdue a grant through its Nuclear Energy University Program to replace the reactor equipment with a state-of-the-art instrumentation and control system. Purdue developed and built the fully digital control system in collaboration with Mirion Technologies and the Curtiss-Wright Corp.

“The reactor’s use in recent years had shifted from fundamental reactor physics research to serving primarily as an educational support facility,” said Seungjin Kim, the Capt. James E. McCarthy Jr. and Cheryl E. McCarthy Head of the School of Nuclear Engineering at Purdue.

“Now, we can return to that impactful research while also significantly expanding the reactor’s teaching capabilities,” he said.

PUR-1 now includes a 150-square-foot video wall, which enhances data display and engages prospective nuclear engineering students.



IT IS SIMPLY NOT POSSIBLE, IT IS NOT INTELLECTUALLY CREDIBLE, AND IT IS NOT ARITHMETICALLY JUSTIFIABLE TO PROFESS CONCERN OF CO₂ AND NOT BE AN ADVOCATE OF NUCLEAR ENERGY.

PRESIDENT MITCH DANIELS

“The nuclear reactor with fully digitized instrumentation and control is a milestone for Purdue’s School of Nuclear Engineering,” said Mung Chiang, the John A. Edwardson Dean of Purdue’s College of Engineering. “The research and teaching enabled by the new PUR-1 will also contribute to the next chapter of nuclear energy, safety and security in the country.”

U.S. NRC licensing of the PUR-1 control system is unprecedented in other ways, as well: Some of the parts are certified under the German Nuclear Safety Standards Commission (KTA), rather than under domestic standards.

Historically, the U.S. NRC has accepted only parts certified under domestic standards, which are generally cost prohibitive for use. The U.S. NRC accepted these parts in PUR-1 through the agency’s initiative for a risk-informed and performance-based regulatory process.

“The fact that the NRC is accepting a digital console for a small research reactor, with parts certified under the KTA standards, signals the regulatory body moving toward approval in a large industry reactor,” Townsend said.

A digital university reactor offers several benefits both to industry players and educational settings. As a cyber physical testbed, collaborators and corporate partners will be able to evaluate simulations of industry reactors using Purdue’s facility as a model and apply lessons learned and best practice improvements to their own reactors.

“Testing code and simulations in smaller university facilities allows more flexibility, ease of access and quicker development cycles than would be available at larger industrial partners,” said Robert Bean, the PUR-1 facility director and an assistant professor of nuclear engineering at Purdue. “At low cost, researchers will be able to quickly evaluate their work and achieve full-scale deployment.”

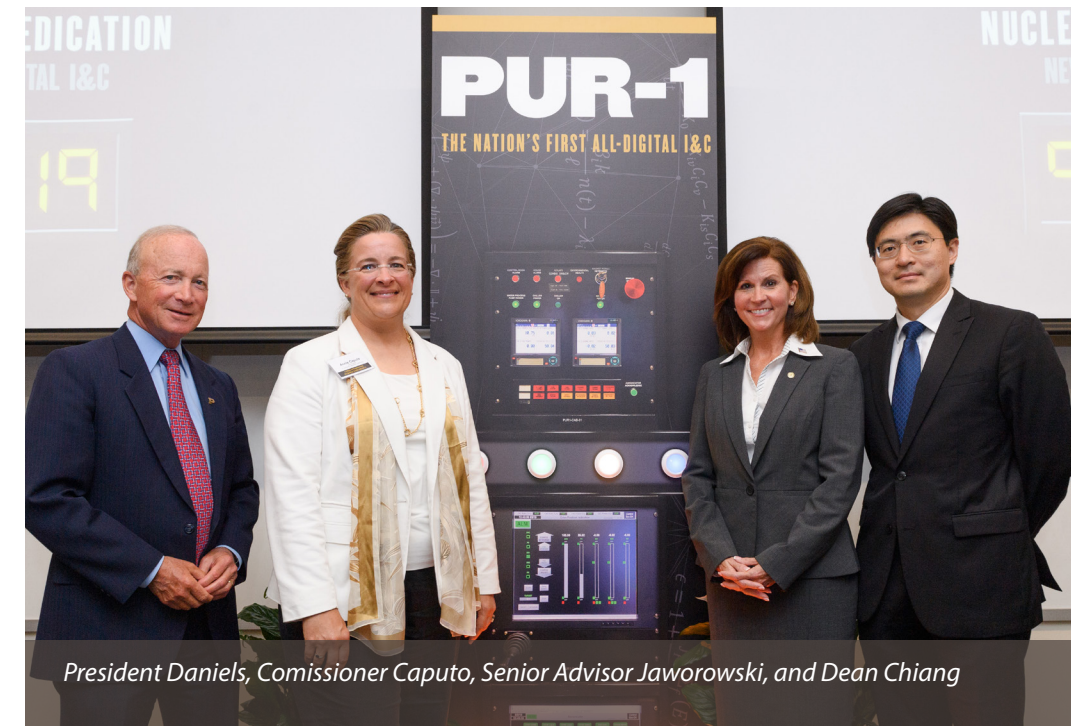
Digital technology also means that Purdue can utilize the reactor to send live data to remote locations, helping researchers to match reactor status in real time to their experimental results, and students to visualize from their monitors how a reactor responds.

“We can send signals to areas, such as schools in developing countries, that do not have the luxury of their own nuclear reactor facility and the associated educational infrastructure. As long as they have internet and this partnership with Purdue, they can see and study how the reactor works,” Kim said.

The School of Nuclear Engineering together with the University was proud to celebrate the dedication of PUR-1 with a ribbon cutting ceremony attended by distinguished members from both the community and the nuclear energy field. Our speakers included Mung Chiang, Purdue’s John A. Edwardson Dean of the College of Engineering; Seungjin Kim, Capt. James F. McCarthy, Jr. and Cheryl E. McCarthy Head and Professor of the School of Nuclear Engineering; U.S. Senator Todd Young; Purdue

President Mitch Daniels; Annie Caputo, Commissioner of the U.S. Nuclear Regulatory Commission; Suzanne Jaworowski, Senior Advisor, Office of Nuclear Energy, U.S. Department of Energy; and U.S. Representative Jim Baird.

Seungjin Kim believes “this is a small step for the nuclear power community in transitioning from analog to digital, but it could lead to a giant leap in nuclear power system controlling and monitoring in the near future.”



President Daniels, Commissioner Caputo, Senior Advisor Jaworowski, and Dean Chiang

WHAT IF NUCLEAR INNOVATION COULD CHANGE THE WORLD?

ATOMS FOR HUMANITY SUMMIT AT PURDUE

The Atoms for Humanity Summit at Purdue University kicked off Tuesday, September 3 with a flip of the switch for PUR-1 as the first all-digital nuclear reactor. The summit continued with a chat between Miles O'Brien, PBS Science Correspondent, and Mark Peters, Director of Idaho National Laboratory, in Fowler Hall. Peters is responsible for the management and integration of a large, multipurpose laboratory whose mission focuses on nuclear energy, national and homeland security, and energy and environmental science and technology. In the face of an accelerating climate crisis, nuclear power is at a crossroads. While the industry is an important source of carbon-free energy in the U.S., old plants are getting shuttered and new plants are struggling to gain financial footing. Enter next generation nuclear. Peters said, "If the existing fleet [of nuclear reactors] fails, it's hard to imagine an advanced nuclear future."

Day one closed with an interesting panel to continue the discussion of forecasting the future of nuclear. O'Brien moderated the conversation between Annie Caputo, Commissioner of Nuclear Regulatory Commission; Mark Peters, Director of Idaho National Laboratory; Chris Levesque, President and CEO of TerraPower; Tomás Díaz de la Rubia, Vice President for Discovery Park at Purdue University; and U.S. Representative Jim Baird. Baird and Levesque both agreed that the public and political



Cirtain, Mason, Dankanich, and Mitchell take questions from the audience during their space exploration panel.

perception of nuclear power is shifting in part because of the urgency of climate change. There was a general consensus of needing advanced nuclear reactors in the U.S. for clean energy.

Day two opened with a panel focusing on the need for next generation nuclear energy to propel and power deep space missions and habitats. Miles O'Brien moderated the discussion between John Dankanich, Chief Technologist at NASA Marshall Space Flight Center; Lee Mason, NASA Deputy Chief Engineer for Space Technology Mission Directorate; Jonathan Cirtain, President of Advanced Technology Programs at BWX Technologies; and Cary Mitchell, Professor of Horticulture at Purdue University. Mason pointed out that while NASA has done some amazing missions already, future missions will be much harder because of their power requirements. He believes nuclear is an option and gave an insider account of Kilopower, an experimental mini nuclear reactor, that could make life on Mars possible. Mitchell discussed how next gen nuclear could make food production easier in these very harsh environments with especially long nights. Cirtain believes it is a "very exciting time to be in nuclear."



Colbert, Hamilton, Kim, Dewan, and Kempfer after their climate & clean energy panel.

Day two continued with a panel discussion about climate and clean energy. The question of nuclear energy's role in a world weaning itself off carbon has become an essential element of the growing debate over how to mitigate the near- and long-term effects of global warming. Jackie Kempfer of Third Way moderated the discussion between Leslie Dewan, Founding Principal of Nucleation Capital; Ian Hamilton, Purdue Alumnus and Founder/CEO of Atlas Energy Systems; Chris Colbert, Chief Strategy Office for NuScale Power; and Seungjin Kim, Head of the School of Nuclear Engineering at Purdue University. Dewan believes "nuclear energy is exceptionally suited to where power use is going." The panel agreed that nuclear is comparable to renewables. Kim stated that an energy source must be "scalable, renewable, sustainable, economical, reliable, safe, clean, and have a small footprint. Nuclear meets all of those criteria."



Hirose, Klein, Barret, and O'Brien discuss what happened the day a massive tsunami hit Japan's coastline.

Day two closed with Fukushima Forward, a keynote speech with Naomi Hirose followed by a panel discussion. Hirose served as President of Tokyo Electric Power Company from 2012 to 2017 leading the company as it addressed a number of highly complex issues in the aftermath of the 2011 plant accident. He shared his insights on the current situation in Fukushima, lessons learned and implications from the accident. Some of the key lessons learned included instilling a safety culture, more effective communication, and building "solidarity." Miles O'Brien moderated the discussion between Hirose, Dale Klein, Former Chair of the Nuclear Regulatory Commission; and Lake Barrett, Former senior manager at the Department of Energy and the Nuclear Regulatory Commission.

The final day of the summit opened with a panel discussion moderated by Miles O'Brien focusing on the successes

and challenges facing the field of nuclear medicine. Panelists included Kara Duncan Weatherman, Clinical Associate Professor of Pharmacy Practice at Purdue University; Mychaela Coyne, Ph.D. candidate in the School of Health Sciences at Purdue University; Stephen Merrick, President and CEO of NorthStar Medical Radioisotopes; and Chad Lee, Director of Clinical Development at TAE Life Sciences. The panelists discussed how nuclear diagnostics and treatments are advancing personalized medicine. Weatherman pointed out "as soon as you say nuclear, [patients] automatically think Chernobyl even though that is no where close to what is happening."

That afternoon Jackie Kempfer moderated a panel discussion focusing on how digital technology promises to revolutionize the nuclear power industry. Kempfer was joined by Lefteri Tsoukalas, Professor of Nuclear Engineering at Purdue University; Joel Fetter, Consultant to ARPA-E, Booz Allen Hamilton; Jason Harris, Director of Purdue's Center for Radiological and Nuclear Security; Tom Gruenwald, COO of Blue Wave AI Labs; and Mitch Pryor, Research scientist and co-founder of UT-Austin Nuclear and Applied Robotics Group. According to Tsoukalas "AI promises to be the bridge between the nuclear and digital age."

Next up was a keynote conversation with U.S. Senator Mike Braun and Dr. William Bookless of the National Nuclear Security Administration moderated by Miles O'Brien. They discussed what America's role is in the new nuclear age. These questions come at an urgent time with implications for the future of energy, of global security, and the planet.

This highly informative three-day summit ended with a recap discussion between Jackie Kempfer, Leslie Dewan, and Miles O'Brien. Interestingly, CNN held a Climate Crisis Town Hall with ten democratic candidates the second day of this summit. Nuclear energy played a minor role in the seven-hour conversation, but Kempfer noted "there is a policy gap when it comes to many politicians and advanced nuclear." Over these three days, presenters from vastly different fields came together to talk about one thing: nuclear innovation and how it will shape our future.

NEXT GEN NUCLEAR POWER AND PURDUE NUCLEAR'S ROLE

Faculty in the School of Nuclear Engineering, together with their graduate students, are striving to help the nation move forward in carrying out the mission of developing the next generation of nuclear reactors. Three projects in particular currently backed by grants from the U.S. Department of Energy and the Office of Naval Reserach include research on High Temperature Gas-Cooled Reactors (HTGR) by Dr. Revankar, Versatile Test Reactors (VTR) by Drs Kim and Ishii, as well as investigating the resiliency of digital reactors through an Artificial Intelligence (AI) approach by Dr. Tsoukalas.

Dr. Shripad Revankar was awarded a grant through the Nuclear Energy University Program (NEUP) by the U.S. Department of Energy (DOE). Revankar will investigate the accident scenario of a break in the primary coolant boundary for a high-temperature gas-cooled reactor (HTGR). In this scenario the main concern is air entering the primary coolant circuit and causing severe damage to the graphite structures via oxidation. Revankar proposes to conduct experiments in a well-scaled test facility to determine how much oxygen is left and where it goes. He will test breaks at different locations and sizes and examine the flow paths. By conducting these experiments Revankar hopes to achieve better predictability leading to better designs and ultimately safer reactors in this next generation of reactors.

The U.S. Department of Energy established the Versatile Test Reactor (VTR) program to modernize the nuclear energy infrastructure for developing transformational nuclear energy technologies in the U.S. In 2019, the Thermal-hydraulics and Reactor Safety Laboratory (TRSL)

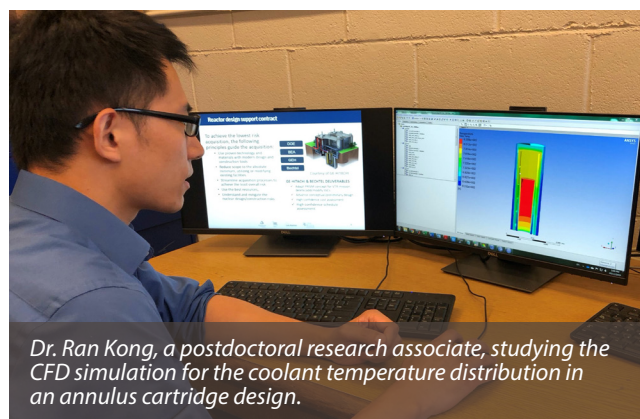
run by Dr. Mamoru Ishii and Dr. Seungjin Kim was selected by U.S. DOE to investigate the overall functionality and performance of the cartridge loop design of the VTR. Of particular interest is the hydrodynamics and heat transfer characteristics of the in-reactor annular heat exchanger design. Experiments will be performed to validate the annular heat exchanger design in the cartridge concept. The experimental data acquired in the study will be employed to evaluate Computational Fluid Dynamics (CFD) codes and to improve the models. The results obtained from the study will help develop and assess the cartridge loop design and contribute towards the development of the VTR.

In the AI Systems Lab (AISL), Dr. Lefteri Tsoukalas and his team conduct theoretical and experimental research



Stella Pantopoulou (front) and Lydia Lagaris review some of their research from working with Dr. Tsoukalas.

on intelligent systems and their applications to Nuclear Science and Technology. They focus on interdisciplinary research dedicated to advancing intelligent problem-solving techniques for modeling complex systems with emphasis on nuclear applications and in particular nuclear nonproliferation. Tsoukalas and his team are investigating the resilience of PUR-1 through a novel AI approach funded by the Office of Naval Research (ONR) and conducted in collaboration with scientists and Engineers from ONR. The results are promising and encouraging. They suggest that physical properties of PUR-1 provide unique features that function as "digital fingertips" quickly eliminating any deliberate or unintentional confusions resulting in compromised resilience and reliability.



Dr. Ran Kong, a postdoctoral research associate, studying the CFD simulation for the coolant temperature distribution in an annulus cartridge design.



CELEBRATE THE PAST, FUTURE, AND NEW HOME OF NUCLEAR ENGINEERING AT PURDUE UNIVERSITY

Nuclear Engineering has a rich history at Purdue University and the year 2020 marks the 60th anniversary of the school's founding. The past four decades in the Nuclear Engineering Building (NUCL) have been full of discovery, laughter, and maybe even an office chair race or two.

To make way for bigger and better things to come, NUCL along with Michael Golden Laboratories (MGL) will be torn down. During this process, Nuclear Engineering has temporarily moved to Seng-Liang Wang Hall. On October 2, alumni, students, faculty, and staff gathered to reminisce about the past sixty years of Nuclear Engineering. We laughed as we were entertained by stories from our wonderful alumni, and we fondly remembered the contributions of Dr. Ott to our school as well as the field of nuclear engineering.

The Gateway Complex, which will replace NUCL and MGL with a new facility to serve both the College of Engineering and the Purdue Polytechnic Institute, was originally planned to be delivered in two phases. A recent \$40 million Lilly Endowment grant will allow both phases to commence as one project. Panagiota Karava, Acting Associate Dean of Facilities and Operations, made

the exciting announcement at our October 2 event that nuclear engineering will officially have a home on the fifth floor of the building.

We look forward to the completion of the Gateway Complex in 2022 and being able to provide students with the very best education opportunities in this new building.



Dr. Lefteri Tsoukalas, Birgit Ott, and Demetra Evangelou outside the Nuclear Engineering Building.

STUDENTS



PURDUE UNIVERSITY CHAPTER OF INSTITUTE OF NUCLEAR MATERIALS MANAGEMENT (INMM) HOSTS CONFERENCE

The inaugural Purdue Conference on Active Nonproliferation hosted by The Institute of Nuclear Materials Management (INMM), the INMM Central Region Chapter (CRC), Purdue University's Center for Radiological and Nuclear Security (CRANS) and INMM Affiliated Technical Division: Nonproliferation and Arms Control (NAC) was held on Purdue University's campus March 22-23, 2019.



INMM Central Region Chapter attending the conference.

Participants included students and faculty from University of Michigan, University of Tennessee Knoxville, University of Illinois Urbana-Champaign, and Purdue University. Cadets and active duty officers from the U.S. Army, Naval and Air Force Academies presented their research. Multiple U.S. National Laboratories presented significant ongoing research in the field of Nonproliferation.

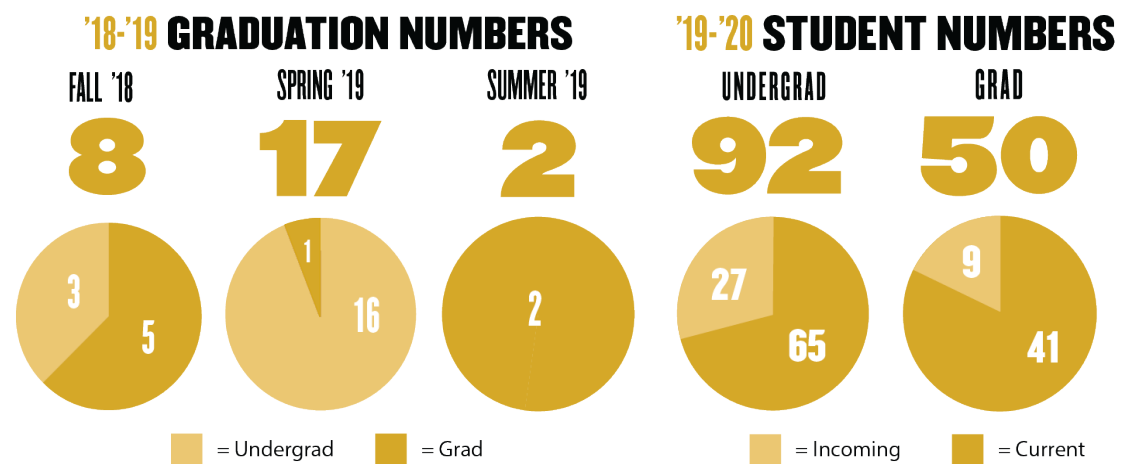
explored radiation measurements, nuclear security/terrorism, and nuclear policy.

Purdue's INMM Chapter is proud to announce that the second conference is already in the planning stages and is scheduled for February 2020.

The national INMM organization is dedicated to the safe, secure and effective stewardship of nuclear materials and related technologies through the advancement of scientific knowledge, technical skills, policy dialogue, professional capabilities, and best practices.

Dr. Sara Kutchesfahani and Dr. Hector Santos-Villalobos opened and closed the conference as keynote speakers. Technical sessions

NEW BY THE NUMBERS



SENIOR ALYSSA GRANITO PUTS CLASSROOM KNOWLEDGE INTO PRACTICE

Alyssa Granito, a senior Nuclear Engineering student and President of the Purdue chapter of Women in Nuclear, completed an internship this past summer at the Nine Mile Point Nuclear Power Plant in Oswego, New York. The plant is operated by Exelon Generation. This was her second summer working for Exelon. Over the course of this internship, she worked as a member of the Balance of Plant Systems Engineering team and performed statistical analysis for testing and calibration of off-gas systems. She gained exposure to the plant atmosphere, operations and functionality of systems, observing and contributing to troubleshooting efforts, and technical writing of project write ups and issue reports.



Alyssa used knowledge and habits acquired at Purdue to assist her during both internships. She worked on a cooling tower optimization project that used thermal-hydraulic analysis and computational fluid dynamics. Alyssa utilized her knowledge of flow patterns and the heat transfer principles of cooling towers gained in the Nuclear Thermal-Hydraulic classes and lab at school. Her nuclear coursework required team and group projects that helped prepare her for the teamwork aspect key to making the plan run smoothly as well as the technical writing required during the internship.

She recently accepted a position in the Nuclear Operations Program with the Naval Nuclear Laboratory after graduation where she will be operating a naval prototype reactor and training naval sailors at their location near Albany, NY. This will put her on the path to becoming a qualified shift supervisor later in the program. During her internship, Alyssa became interested in and shadowed operations at the nuclear plant leading her to pursue this employment opportunity. Alyssa's education and internship experiences have definitely prepared her for her future career in Nuclear Operations.



Top photo: Alyssa exiting the cooling tower at the Nine Mile Point Nuclear Power Plant. Bottom photo: Alyssa standing in front of the reactor core map in the control room simulator.

STUDENTS CONTINUED

PURDUE NUCLEAR TEAM WINS ANS STUDENT DESIGN COMPETITION

A team comprised of undergraduate students from the School of Nuclear Engineering has successfully won the 2018 American Nuclear Society (ANS) Student Design Competition.

Competing against the University of Tennessee, the two teams delivered their design project presentations at ANS Winter Meeting held in Orlando, Florida. The winning students are Adam Darr, Antony Damico, Robby Kile, Christopher Copeland, Corey Ohneck, and Anna Biela. The faculty advisors for the team are Dr. Chan Choi and Dr. Martin Lopez-De-Bertodano.

“Getting a chance to share our work at the ANS Winter Meeting was a really great opportunity,” said Robby Kile, a student on the Purdue team. “I’m honored that, with the help of some great advisers, we were selected as winners of the undergraduate design competition.”

The Purdue team won for their project for the Hydrogen Production Electrolysis Reactor (HYPER). This reactor was designed to produce electricity and hydrogen for industrial applications. By exploring the possibility of refueling a reactor without shutting down, HYPER is capable not only of generating hydrogen and electricity with a 62 percent efficiency -- about twice that of modern power plants -- but also of preventing the release of 800,000 metric tons of carbon dioxide per year.

“Winning at the national ANS senior design project competition is a remarkable achievement, and yet another testimony on the excellence of our students,” exclaimed Dr. Seungjin Kim, McCarthy Head and Professor of the School of Nuclear Engineering. “I congratulate Team HYPER for an excellent job and teamwork. I would also like to thank the faculty instructors, Dr. Chan Choi and Dr. Martin Lopez-De-Bertodano for their dedicated mentoring.”



The School of Nuclear Engineering Senior Design Team poses with faculty advisor, Dr. Chan Choi (left) and School Head, Dr. Seungjin Kim (right).

NATIONALLY RECOGNIZED ORGANIZATION FOR WOMEN NOW AT PURDUE

The School of Nuclear Engineering is proud to have a nationally recognized chapter of U.S. Women in Nuclear (U.S. WIN) effective Summer 2019. U.S. WIN is an inclusive organization formed to support women and men working in nuclear-related fields and to create a network for the professional development of those women. The organization celebrates its 20th anniversary this year.



Dressed in their personal protective equipment, Purdue WIN members are ready to tour the Monticello Nuclear Power Plant.

At the end of August, four members of Purdue’s WIN chapter traveled to Minneapolis to attend the Region III Women In Nuclear Conference. The theme was Empowering You! and many of the presenters shared stories and advice for women in the male dominated nuclear industry. A recurring message was women’s importance to the industry and how diverse perspectives will help the industry thrive. “It was really inspiring to be in a place with so many driven women,” said Izzy Lindsay, NE junior. Session topics included legislation and policy, the future of nuclear industry, work-life balance, being brave, the power of laughter, and emotional intelligence. Even though all of the topics didn’t directly apply to these young women as college students, they provided great insight into the world they will be entering in the next few years.

Tim O’Connor, a Senior Vice President and Chief Nuclear Officer for Xcel Energy, took time to personally speak to the four attendees from Purdue during lunch the first day. They learned more about the large need for a new generation of nuclear workers as more than half of the nuclear workforce is projected to retire in the next five years. The Purdue chapter thought it was “very helpful to get the opportunity to network with someone with so much experience and expertise in the nuclear industry.”



Attendees for the Region III Women in Nuclear Conference

Lindsay to see that the nuclear industry is more than just reactors. There’s also “economics, work dynamics, and a culture” to the industry.

This conference gave Alyssa Granito, NE senior and WIN chapter president, a more complete picture of what it actually means to be a woman in nuclear. Granito learned “what it was like to really listen and not just to respond.” She hopes to bring all of the new pieces of information back to Purdue’s chapter of WIN.

Kim Randolph, Vice President of Engineering and Construction for Xcel Energy, shared that only 30% of women stay in engineering in college. The four members realized this is one area their Purdue chapter can impact. By making sure their members feel supported and by reaching out to other young women on campus, this chapter can help mentor their fellow female boilermakers. This conference helped Izzy

STUDENTS CONTINUED

Mark D'Aloia is nearing the end of his undergraduate time at Purdue University, and he is finishing strong. This October, he was honored with two different awards.

During halftime of the Homecoming football game, D'Aloia was presented with a Homecoming Pillars of Excellency award. This award recognizes students for three specific areas and is open to juniors and seniors. D'Aloia earned the Service of Leadership Pillar for his work with Purdue Student Engineering Foundation and Old Masters.

Not even a week later, D'Aloia was selected as one of five first-ever Purdue Engineering Fellows. This award was made possible by the generosity of alumnus Robert Buckman and his wife Joyce Mollerup. Each student selected for this award will receive \$10,000 after they graduate from Purdue in 2020. They can use the money to pursue any future endeavors, and Buckman hopes his gifts will allow them to realize whatever dreams they may have.



Mark D'Aloia (center) receives his Homecoming Pillars of Excellency Award.

Mung Chiang, the John A. Edwardson Dean of the College of Engineering, reflected that the process was extremely selective and was not based simply on academics. "The criteria of the fellowship is not just about a GPA. That would have made the selection a lot easier," Chiang said. "This particular recognition is not just for academic performance. It includes that important dimension, but also encompasses community impact, leadership, initiative, and respect by your peers and by your faculty and staff."



Mark D'Aloia (first row, second from left) at the Purdue Engineering Fellows Award Presentation along with the other fellows, Dean Chiang, the donors, and Purdue Research Foundation Staff.

D'Aloia exemplifies all of the qualities necessary for this award. He also says, "Purdue lights me on fire. I love this place with a burning passion, and I lead with that love in everything I do." This passion was evident in the multitude of leadership roles D'Aloia took on while at Purdue such as the president of the Purdue Student Engineering Foundation, co-president of the Purdue Engineering President's Council, co-chair of selection for Mortar Board, and Evening and Publicity co-chair of the Old Masters Central Committee.

D'Aloia has accepted a job at H3D, a radiation detection startup in Ann Arbor, Michigan, as a technical sales engineer. It is clear that the passion D'Aloia demonstrated at Purdue will carry on in all that he does in life.

NURETH-18 BEST PAPER

Doctoral candidate Yang Zhao received the Best Paper Award for the paper titled "Experimental Investigation of Seismic Vibration on Subcooled Boiling Flow" at the recent International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-18) in Portland. NURETH-series meetings have been the largest international forums to present and discuss advancement in research, development, and applications of topics related to nuclear reactor thermal hydraulics and related fields. A total of 8 out of 600 papers were selected for the Best Paper Award after a rigorous review process by a panel of world's foremost experts. Zhao's paper studied the effects of seismic vibration on two-phase flow local structure, which provides valuable data for safety evaluation of operating boiling water reactor under earthquake scenarios.

Zhao is currently working with his research advisor, Walter Zinn Distinguished Professor Mamoru Ishii. While at Purdue, he has received Ross Fellowship and a secondary MS in Mathematics. He earned his MS (2012) in Nuclear, Plasma and Radiological Engineering (NPRE) from University of Illinois at Urbana-Champaign, and BS (2010) in Nuclear Engineering and Science (NSE) from Xi'an Jiaotong University, China.



Zhao at NURETH-18 with his award plaque.

ICONE27 BEST POSTER



Mitchell Hemesath from the School of Nuclear Engineering attended the 27th International Conference on Nuclear Engineering (ICONE). Hemesath submitted a paper and poster on the "Qualification of tensioned metastable fluid detectors for spectroscopic radon & progeny detection under range of environmental conditions." Of all the students presenting their posters, Hemesath's was selected as the ICONE27 Student Best Poster.

ICONE is the premier global conference on nuclear reactor technology. Leaders from industry, government and academia gather each year to present and explore cutting edge technical issues and solutions for the challenges that the

nuclear industry faces today. Through the ICONE student program, the conference also fosters the development of future nuclear professionals. It has been jointly sponsored by ASME (The American Society of Mechanical Engineers) and the Japan Society of Mechanical Engineers and the Japan Society of Mechanical Engineers (JSME) since 1991—and co-sponsored with the Chinese Nuclear Society since 2005.

NUCLEAR ENGINEERING GRADUATE RECEIVES DISTINGUISHED ENGINEERING ALUMNI/ALUMNAE AWARD

Dr. Terry Grimm (BSNE '87) is selected as one of the recipients for 2019 College of Engineering Distinguished Engineering Alumni/Alumnae (DEA) Award. The honor is presented to "men and women who have distinguished themselves in any field in ways that reflect favorably on Purdue University, the engineering profession, or society in general," and is the highest honor that the College bestows to an Engineering alumnus/alumna.

Grimm received his Bachelor of Science with the highest distinction in Nuclear Engineering from Purdue University in 1987. He attended the Massachusetts Institute of Technology, where he received his Ph.D. in Nuclear Engineering and Plasma Physics in 1992.

Grimm developed particle accelerators for the Department of Energy and NSF (Superconducting Super Collider, National Superconducting Cyclotron Laboratory and Facility for Rare Isotope Beams). In 2005, Grimm founded Niowave, Inc., a worldwide leader in research, development, and deployment of superconducting particle accelerators, to commercialize superconducting electron linear accelerators in fields as diverse as healthcare and national security. Niowave, for example, produces radioisotopes to cure cancer.

In 2010, Niowave, Inc. was named as a Department of Energy Small Business of the Year and Grimm received the IEEE Entrepreneurship Award for Applied Superconductivity. Niowave is fully licensed to build and test superconducting linear accelerators in its own facility, as well as deliver and commission complete accelerator systems for its customers.

Grimm has said that Purdue provided him a solid foundation in engineering, something he has cherished his entire illustrious career. "I found my education at Purdue to be truly world-class," Grimm said, "With my undergraduate experience at Purdue, I found I could compete with the brightest minds at MIT and at government research labs worldwide."

"Grimm has been a great supporter of our school in many ways, including providing funding for graduate research, participating as graduate faculty, and serving as a member of Nuclear Engineering Advisory Board," said Dr. Seungjin Kim, Capt. James F. McCarthy, Jr. and Cheryl E. McCarthy Head and Professor of the School of Nuclear Engineering. "We are also grateful for his support toward our undergraduate education," Kim added, "Niowave has been one of our co-op employers and is currently an industry sponsor of our senior design projects for the second year in a row."



Seungjin Kim with Terry Grimm after he received his DEA award.



From left to right: Corey McDaniel, Olga Simbalista, Mary Lou Dunzik-Gougar, Art Wharton, Marilyn Kray, Margaret Harding, Patricia Paviet, Peter Lyons and Miriam Kreher.

Corey McDaniel (BS NE '93) was sworn in as a member of the board of American Nuclear Society (ANS), a not-for-profit, international, scientific and education organization. The mission of ANS is "advance, foster, and spur the development and application of nuclear science, engineering, and technology to benefit society." McDaniel is also the chief commercial officer of science & technology for Canadian Nuclear Laboratories.



Vivek Agarwal (PhD NE '11) was awarded The Presidential Early Career Award for Scientists and Engineers (PECASE). The PECASE is the highest honor bestowed by the United States Government to outstanding scientists and engineers who are beginning their independent research careers and who show exceptional promise for leadership in science and technology.

Agarwal says, "The decision to select Purdue for my PhD turned out to be one of the transformational aspects of my professional career and personal life. I enjoyed my time at Purdue and have many fond memories to cherish for rest of my life. I was surrounded by excellent friends and colleagues."

Currently, Agarwal is a senior research scientist at Idaho National Laboratory (INL) working on a variety of projects including online monitoring of active and passive components in nuclear power plants, intelligent plant configuration management using wireless sensors, risk-informed condition-based predictive maintenance, wireless sensors, communications, and cyber-security.

FACULTY OPPORTUNITY

The School of Nuclear Engineering at Purdue University invites applications for two tenured/tenure-track faculty positions at assistant and associate professor ranks. Purdue University seeks to attract exceptional candidates with interests and expertise in nuclear power, advanced reactor technology, nuclear materials, fuel cycle and non-proliferation; however, other areas will also be considered. Successful candidates must hold a Ph.D. degree in Nuclear Engineering or a related discipline and demonstrate excellent potential to build an independent research program at the forefront of their field, as well as potential to educate and mentor students. The successful candidate will conduct original research, advise graduate students, teach undergraduate and graduate level courses, and perform service both at the School and University levels.

For more information and to apply, visit bit.ly/nefaculty

ALUMNI CONTINUED

NUCLEAR ENGINEERING FEATURED ON TWO COVERS OF NUCLEAR NEWS

The School of Nuclear Engineering is proud to be featured on two covers of Nuclear News published by the American Nuclear Society. A special section on Health Physics and Isotopes & Radiation in the June 2019 issue focuses on researchers at Purdue University and Oak Ridge National Laboratory collaborating on a DOE-funded project to produce and test a low-cost, lightweight neutron spectrometer/dosimeter.

In the same section of the June 2019 issue, Niowave, owned by Dr. Terry Grimm (BSNE '87), is also highlighted as being one of four U.S. companies leading the way in providing a commercial supply of the widely used medical radioisotope, Mo-99.

In the February 2019 issue, PUR-1's fully digital I&C installation was featured.

"PUR-1 is now poised to pave the way for future nuclear engineers in teaching and research. The College of Engineering is driven to deliver in three principal areas, all of which PUR-1 is now in a position to perform. At the interface of virtual and physical engineering lies the principal source of efficiency improvements, concentration of cybersecurity vulnerabilities, and potential failure modes. PUR-1 will study and develop ways in which this interface can become an asset to the resiliency and risk assessment engineer."



The large pool of premier engineering talent is growing rapidly through online learning, diversity of background, and innovative cross-discipline studies. From this expansive population of students, nuclear engineers will grow and thrive to deliver solutions to today's most pressing issues. Finally, as the university continues to strengthen its industry partnerships in all areas, including curriculum innovation, workforce development, research impact, and entrepreneurship, the work being done at PUR-1 will have a rapid and lasting impact in the field."

OUTSTANDING NUCLEAR ENGINEERS AWARD



TIMOTHY K. HANLEY

**SENIOR VP, OPERATIONS SUPPORT, EXELON GENERATION
B.S., NUCLEAR ENGINEERING, PURDUE UNIVERSITY, 1987**

Mr. Hanley is currently the Senior Vice President, Operations Support. He is responsible for the corporate functional areas that provide governance and oversight to the 23 reactors in the Exelon fleet. Prior to his current role, Hanley was Exelon's operations lead on matters related to public policy issues associated with nuclear plant operations.

For his outstanding accomplishments, visionary leadership, and remarkable contributions to nuclear power engineering, The School of Nuclear Engineering is proud to present 2019 Outstanding Nuclear Engineers Award to Mr. Timothy Hanley.



ROBERT B. WEBSTER

**DEPUTY DIRECTOR FOR WEAPONS,
LOS ALAMOS NATIONAL LABORATORY
PH.D., NUCLEAR ENGINEERING, PURDUE UNIVERSITY, 1988
M.S., NUCLEAR ENGINEERING, PURDUE UNIVERSITY, 1986**

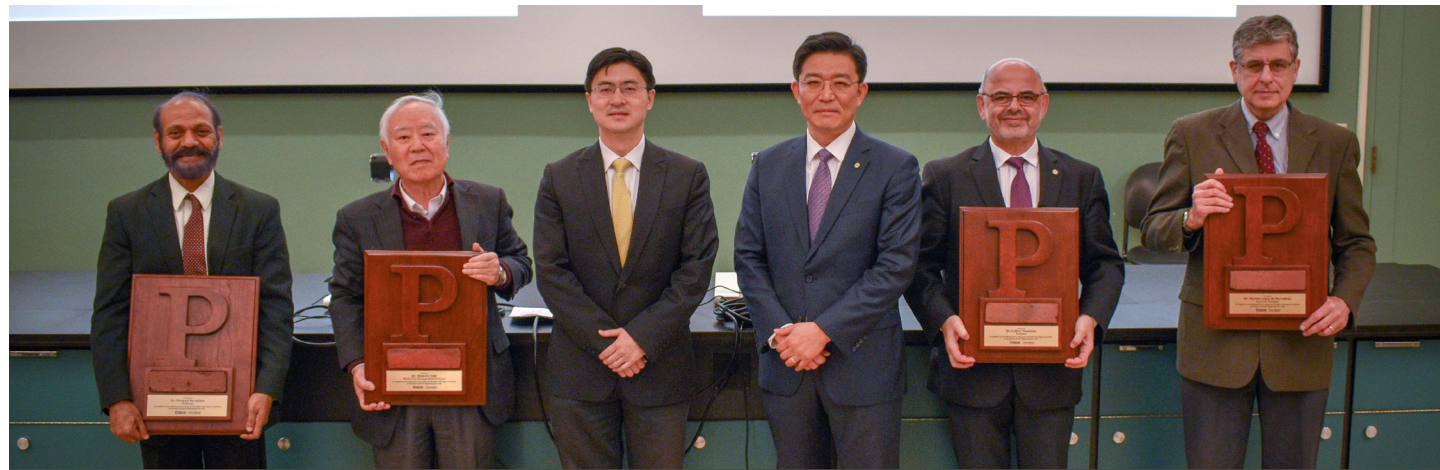
Webster has had a 30 year career at the Los Alamos National Laboratory. As the Deputy Director for Weapons, Webster has direct line management responsibility for planning, coordinating, integrating and overseeing the directorates of Weapons Engineering, Weapons Design and Weapons Production.

For his seminal contribution in the applied physics for thermonuclear applications and the national and international leadership in global nuclear security, The School of Nuclear Engineering is proud to present 2020 Outstanding Nuclear Engineers Award to Mr. Robert Webster.

RECOGNITION OF 20+ YEARS OF DEDICATED SERVICE

During a special seminar, the School of Nuclear Engineering recognized five outstanding and loyal individuals who have been with the School for 20 or more years. People are one of the most essential elements for a program to be successful and we are happy to show our sincere appreciation to those individuals who had and will continue to excel toward a pinnacle of excellence at scale.

Each faculty member received a plaque from Mung Chiang the John A. Edwardson Dean of the College of Engineering, which read, "In recognition of your dedicated service, laying one brick higher in the legacy of excellence for the School of Nuclear Engineering".



From left to right: Shripad Revankar, Professor: Since 1987; Mamoru Ishii, Walter Zinn Distinguished Professor: Since 1988; Dean Mung Chiang, Dr. Seungjin Kim, Lefteri Tsoukalas, Professor: Since 1994; Martin Lopez de Bertodano, Associate Professor: Since 1992; Chan Choi, Professor: Since 1983 (unable to attend ceremony).

DR. ALLEN GARNER PROMOTED

Garner has been promoted to Associate Professor with tenure. Since joining us in 2012, he has done an outstanding job teaching, researching, and engaging. He has successfully secured research funding from various sponsors including AFRL, DARPA, U.S. NRC, ONR, NASA, U.S. DOE and private industries. He has been instrumental in teaching and advising at both the undergraduate and graduate levels. This summer, Garner was also promoted to the rank of captain within the U.S. Navy.

In September, Garner was also selected by the College of Engineering for their Celebrating Our Associate Professors. These events allow recently tenured associate professors an opportunity to give a 10 minute presentation on some aspect of their teaching, research, or engagement activities. Then there is also a chance for conversations about the presented work with other colleagues in attendance.



PURDUE NUCLEAR ENGINEERING FACULTY INVITED TO OECD, NEA

The Global Panel of Universities on Nuclear Energy Technology, Policy and Education, took place July 24-25, 2019, in Paris, France, where 16 elite universities from NEA's member countries were invited to attend. Purdue was represented by Seungjin Kim, the Capt. James McCarthy Jr. and Cheryl E. McCarthy Head of the School of Nuclear Engineering, and Lefteri Tsoukalas, professor of Nuclear Engineering.

"When I saw the invitation letter, I was elated. This is a great honor," said Kim. "Personally, I'm humbled and feel a great responsibility."

NEA is an international organization consisting of 33 countries in Europe, the Americas, and the Asia-Pacific regions. Its mission is to provide safe, environmentally sound, and economical use of nuclear energy for peaceful purposes.

In its invitation letter, NEA explained that Purdue was chosen "because of your university's record of excellence in nuclear engineering studies." This is a unique initiative in which the NEA will seek the advice and views of elite academic institutions to address the complex issues faced by global governments.

"The world has entered a critical period that may determine the future of energy," writes William D. Magwood, IV, the Director-General of the OECD/NEA in his invitation letter. "There is a growing recognition around the world that nuclear energy can play an important role in future, low-carbon energy systems, but also that long-term, creative thinking is needed to address today's challenges."

"We have in-depth technical expertise and infrastructures, with which we can provide advice to the NEA to address all future issues of nuclear energy," said Kim, referring to the invited universities. "We need to address climate change, how nuclear energy technology can be sustainable for the future of humanity, and how we can provide the world with a clean, safe and resilient energy source."

Kim said Purdue's invitation makes perfect sense. "Purdue Nuclear Engineering has been recognized for its nuclear power engineering and has been a leader from the get-go in the development of nuclear power.

"With its state-of-the-art research and educational infrastructures, Purdue is in a great position to provide a roadmap for the NEA and the rest of the countries in the world," Kim said. "This invitation is yet another testimony that Purdue Engineering is at the Pinnacle of Excellence."



The Organisation for Economic Co-operation and Development / Nuclear Energy Agency (OECD/NEA) at Boulogne.

WHAT A YEAR!



Nuclear Engineering

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