



National University Programs
2022 Annual Report

Director's Message



*Michelle Thiel
Bingham
MBA, CCP University
Partnerships director*

As the workforce enters the post-pandemic era and celebrates a return to normality, Idaho National Laboratory continues to grow. It currently employs more than 5,700 researchers and mission-enabling employees. INL's National University Programs directorate has the important role of building and fostering meaningful relationships with universities and colleges across the nation to empower the lab to attract the scientific and technical talent needed to address the Department of Energy's mission needs.

In fiscal year 2022, INL registered consistent growth with a rise of 8.5% in our internship program and 7.4% in the postdoctoral research programs. There was a notable increase in our visiting researchers, with a jump of 161.5%. INL hosted a total of 721 program participants from 180 institutions from the U.S. and around the globe.

With the ever-increasing number of interns, INL's skilled recruiters and technical staff helped improve candidate pools for the already robust intern program while also ensuring that colleges' and universities' undergraduate and graduate students were aware of employment opportunities upon graduation. This helps INL address workforce needs.

INL has earned a top spot in the Firsthand/Vault Best Internships rankings nationwide for the last five years.

The updated internship rankings place INL as the third in engineering internships and 14th in energy and renewables. Once again, INL was the only national laboratory to make the list.

Firsthand, the premier career-building website that releases a list of the most prestigious and best companies for internships each year, surveyed more than 11,400 current and former interns in the summer of 2022 to compile its 2023 rankings.

National University Programs' purpose remains constant: to expand the lab's resources and widen its impact. Bringing in talented faculty, interns and postdocs matters. Since 2014, 17% of former interns became INL employees, and 72.4% of postdocs who finished their assignments joined the lab. At the end of fiscal year 2022, former INL National University Programs participants accounted for 8.7% of full-time staff and 13% of staff in mission directorates.

The laboratory actively sustains inclusion and diversity efforts.

INL is home for many cultures that contribute to the future talent pipeline and bring new ideas and perspectives. During this fiscal year, INL had 12% increase in people of color and 63% overall growth since FY 2017. We are also increasing female participation in all levels at the lab and keeping a solid number of women among our intern (33%) and postdoc (20%) populations. We are preparing undergraduate students, graduate students and postdocs to be part of our team. We use professional

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development activities to inspire INL's future collaborators and science, technology, engineering and math workforce, which in turn positively impacts students, faculty and their communities.

Our continuous partnerships with organizations such as the American Indian Science and Engineering Society, Advancing Minorities' Interest in Engineering, Minority Serving Institutions Partnership Program, Society for Advancement of Chicanos/Hispanics & Native Americans in Science, University Industry Demonstration Partnership and others are examples of how far and broad our reach goes to include everyone in our search for the energy workforce of the future.

INL's commitment to advance energy and enhance life pushes our exceptional scientific team to work on extraordinary technologies from the celebrated microreactor to the aggressive net-zero mission. We are always thinking ahead and preparing the next generation to help us create a safer and cleaner world.



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Our Team



Michelle Thiel Bingham
208-526-7830
michelle.bingham@inl.gov
Director



Tiffany Carlson
208-526-1443
tiffany.carlson@inl.gov
Lead Administrative
Assistant



Emi Walker
208-526-6508
emi.walker@inl.gov
Communications Specialist



Jimi Burtenshaw
208-526-0399
jimi.burtenshaw@inl.gov
Student Programs
Specialist



Afton Coles
208-526-6530
afton.coles@inl.gov
Administrative Assistant



Dayna Daubaras
208-526-7152
dayna.daubaras@inl.gov
NUC Deputy Director/
Regional Liaison



Jessica Dixon
208-526-9087
jessica.dixon@inl.gov
Senior NUP Specialist



JR Ratliff
208-526-7289
jason.ratliff@inl.gov
Postdoctoral Specialist



Brian Rucks
208-526-2741
brian.rucks@inl.gov
Data Analytics



Lisa Scott
208-526-2834
lisa.scott@inl.gov
Postdoctoral Program
Administrator



Monica Towner
208-526-7435
monica.towner@inl.gov
Visiting Scholar & Academy/
Military Liaison



Emma Varghese
208-526-0024
emma.varghese@inl.gov
Administrative Assistant



Michael Walker
208-526-0604
michael.walker@inl.gov
NUP Relations Specialist

Highlights

In fiscal year 2022, INL hosted 721 National University Programs participants from 180 colleges and universities.

Accomplishments

- At the end of fiscal year 2022, former National University Programs participants accounted for 8.7% of INL's full-time staff and 13% of staff members in mission directorates.
- INL has built its cohort of postdoctoral researchers to 101 in many fields including nuclear engineering, mechanical engineering, materials science, chemical engineering and civil engineering. They represent 23 nationalities and 56 universities in the U.S. and five from institutions in other countries
- We welcomed 511 interns. Of these, 61% worked on-site, 11% worked a hybrid schedule and 28% teleworked. This is a stark difference from the previous year when more than 70% worked completely online.
- In January 2022, INL held its first Early Career Days. National University Programs developed the concept to connect with select universities and help raise awareness of the important work done at INL, opportunities for faculty/researcher collaborations, and intern and career opportunities. Over three days, INL engineers and scientists from Nuclear Science and Technology, National and Homeland Security, Materials and Fuels Complex, Advanced Test Reactor and Energy and Environment Science and Technology mission directorates provided seminars on their projects and discussed the many opportunities available for students and faculty to collaborate with INL researchers. The interactive event was held virtually with 408 registrants from 36 universities.
- INL postdoc Daniel Molina Montes de Oca was part of the team that developed Electrochemical Leach, one of three INL technologies that won an R&D 100 Award in 2022.

**INL hosted 721
National University
Programs
participants**



Strategic Programs

MORE THAN
2,000
people



applied
for an INL
internship

INL Graduate Fellows

RECEIVE
UP TO

\$80,000

in annual salary

73% of postdocs

converted to full-time employment

INTERNS

In fiscal year 2022, the number of undergraduate and graduate interns increased 8.5% from FY-21, with most working on-site with their mentors. INL internships build confidence, introduce students to possible career fields, and complement their academic curriculum. More than 2,000 people applied for an INL internship last year.

PRACTICUMS

Practicums allow students to apply classroom knowledge in a professional environment under the supervision of INL leaders who will evaluate their potential for a career at the lab.

INL GRADUATE FELLOWSHIPS

The Graduate Fellowship program is a competitive opportunity for outstanding Ph.D. students. INL is committed to integrating students with projects at the laboratory to fulfill their thesis research requirements by providing financial tuition support, mentoring and an annual salary up to \$80,000.

POSTDOCTORAL RESEARCHERS

INL's postdoc community continued to grow and beat the record of the previous year when it leapt 41%. This year, the number of postdocs increased by 7.4%. In the last two years, 48 of 135 postdocs have converted to full-time employment at INL. Between

2014 and 2022, 73% of the postdocs who finished their assignments converted to regular hires.

FACULTY RESEARCHERS

These are collaborators from universities who intend to work on specific projects at the lab. This program is funded internally by INL.

VISITING RESEARCHERS

International researchers and academic visitors collaborate with INL researchers and scientists. They also participate in educational and cultural exchanges at the laboratory. The program builds strong relationships between universities and lab scientists. It also encourages collaboration with cross-cultural exchange and perspectives. INL's international researchers are part of the Department of Energy's Visitor Program.

JOINT APPOINTMENTS

This program is a bridge between INL and university scientists to conduct research in both ends, resulting in collaborative efforts to benefit both institutions.

	FY-18	FY-19	FY-20	FY-21	FY-22
Faculty Researchers	8	12	18	8	2
INL Graduate Fellowships	8	22	29	26	25
Interns	368	469	469	471	511
Joint Appointments	29	37	38	42	40
Postdocs	54	68	67	95	102
Practicums	8	13	8	14	7
Visiting Researchers	17	12	13	13	34
Total	492	633	642	669	721

**INL builds
its talent pipeline
while supporting
the lab's research
objectives.**



Intern Accomplishments



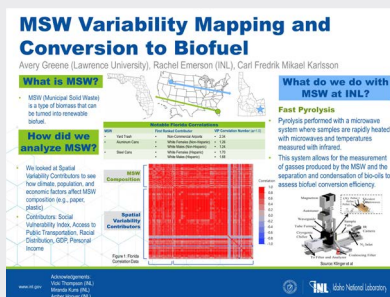
INL intern Kari Perry

INL intern **Kari Perry**, a mechanical engineering student at Montana State University, was part of a winning team during INL's Innovation Week 2022.

The team's proposal, "Bike Commuter Resource Center," addresses the lack of bike accessibility in Idaho Falls and offers an innovative solution that includes education, information availability and community development to encourage INL employees to reduce their carbon emissions by biking to work. Their proposal, which was mentioned during a Net-Zero presentation, has the potential to significantly reduce emissions related to employee commuting, which makes up 12% of INL's total carbon emissions, while improving biker safety and enhancing employee health and well-being.

Avery Greene, an INL intern studying chemistry at Lawrence University, worked on a project called Municipal Solid Waste (MSW) Variability Mapping and Conversion to Biofuel. MSW is a form of biomass that consists of components categorized as waste and trash. The general categories are paper, yard trash, construction and debris, appliances, tires, glass, metals, aluminum and steel cans, plastics, organics, inorganics, and household hazardous waste. This project focuses on the factors within a region or population that contribute to variability in the composition of MSW and its convertibility to biofuel.

After determining a list of contributors (social vulnerability index, access to public transportation, racial distribution, gross domestic product, personal income), the project team used JMP statistical software perform a multivariate analysis to determine correlations and a partial least squares regression to determine variable importance plots for each MSW category. In addition to data analysis, the team studied the convertibility of MSW to biofuel via microwave pyrolysis to separate and characterize the various gaseous and bio-oil products.



MSW Variability Mapping and Conversion to Biofuel, Avery Greene's team project





Fontes and her UMass-Lowell team were recognized by the Academic, Industrial and Research Radiation Safety Section with the Outstanding Radiation Safety Program Award.

Cassia Fontes will graduate in May 2023 with a master's in radiological sciences and protection from University of Massachusetts Lowell. She worked with a team of radiological engineers at the INL Advanced Test Reactor.

Fontes' expertise and knowledge of health physics, gamma spectroscopy and Excel spreadsheets helped her establish an outstanding technical basis for the new program.

Fontes attended this year's annual Health Physics Society meeting in Spokane, Washington. While there, Fontes and her UMass-Lowell team were recognized by the Academic, Industrial and Research Radiation Safety Section with the Outstanding Radiation Safety Program Award.

Ryan Lewis is a student at Utah State University and INL intern sponsored by the DOE's Science Undergraduate Laboratory Internships (SULI) program. Lewis worked on a project that studies how electric vehicles affect the grid. The transportation sector

continues to electrify at an increasing rate because of efforts to decrease greenhouse gas emissions. Medium and heavy-duty vehicles account for a large portion of transportation's energy demand; however, the effect of their electrification is not well understood. Electric vehicles will create a large load that the current grid cannot handle. To help prepare the grid for the energy load of electric vehicles, the Caldera tool is being expanded to model both light, medium and heavy-duty vehicles' load on the grid with a top-down approach.

This study established an approach to use available literature and data sets to create medium and heavy-duty vehicle charging behavior models in Caldera. Lewis is one of the four INL student STEM ambassadors. INL launched this new initiative in 2023 with funding from DOE Office of Science, in step with other DOE national labs. The program plays a significant role in inspiring the next generation of STEM professionals.



Lewis is one of the four INL student STEM ambassadors, inspiring the next generation of STEM professionals.

INL launched the new STEM ambassadors initiative in 2023 in step with other DOE national labs.

INL Intern Highlights



Krystiane Otis
Mentor: Kaleb Houck

Otis, a junior at Brigham Young University-Idaho, is majoring in computer science.

She has been an intern with the Digital Engineering department since June 2022 and has been working on mixed reality development for K-12 STEM outreach and large-scale energy systems. Otis helped the K-12 Education Programs team develop various virtual mini-lessons in the mixed reality headset, including an interactive periodic table that allows people to explore elements and create their own. When playing with the periodic table users can pick an element on

the table and then add neutrons, protons, and electrons to it. This allows them to see the stability difference and also change the element. These things can be added by dragging and dropping the balls that resemble the neutrons, protons, and electrons from their bins onto the atom itself. She also developed two interactive demonstrations highlighting INL's mission that have been showcased at DEF CON (a cybersecurity conference) and the Global Clean Energy Action Forum (a net-zero conference). Otis was a runner-up in the INL Intern Poster Session held in August.

INL Intern Ice Cream Social event, 2022.

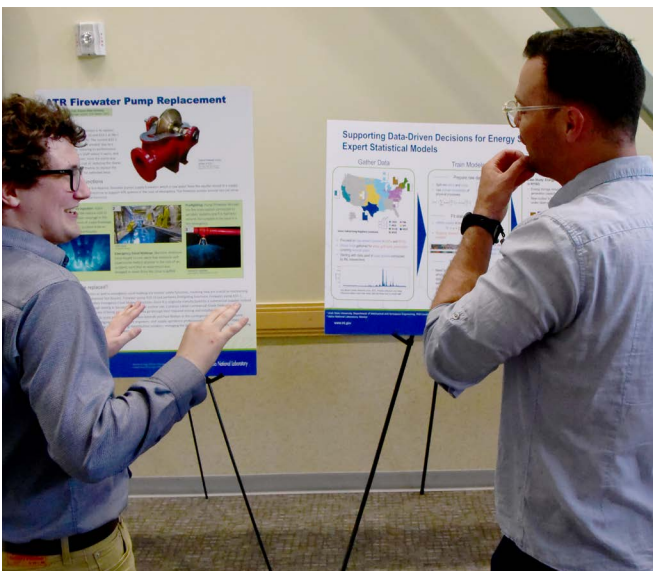




Patrick Merighe
Mentor: Zilong Hua

Merighe is a mechanical and aerospace engineering undergraduate student from Utah State University who came to INL under the Department of Energy Office of Science Undergraduate Laboratory Internships program. He helped his mentor collect and analyze experimental data using scanning electron microscopy and photothermal radiometry.

"His work has significantly contributed to my project and to a journal paper that we are working on and hopefully is going to be submitted soon," Hua said. "I have included his name in my recent conference presentation at Materials Science & Technology 2022."



Salvador Munoz
Mentor: Joshua Peterson-Droogh



Munoz is a student at Idaho State University majoring in nuclear engineering. He created a database of irradiation experiments, which he then coupled to Python – a general-purpose programming language – and a web-based interactive computing platform for advanced visualization. For another project, Munoz worked on a scoping tool to estimate important parameters for neutronic experiment analysis. He had to learn two new computer codes, MCNP and MC21, to get the scoping study and provide the needed data. Currently, Munoz is working on software quality assurance by testing a newly developed Python code called McAfee. He is comparing the results from McAfee to an older approach to sort out discrepancies.

"Salvador is one of the hardest working interns I have ever had the pleasure to work with," Peterson-Droogh said. "His desire to become a nuclear engineer is striking."

INL Intern Poster Session event, August 2022.

Mentorship

Mentors play an important role in the success of INL's internship, graduate fellowship and postdoctoral programs. Our exceptional mentors are dedicated and actively involved with their students. "The importance of my mentor during my assignment was huge as he not only made an impact in my career but strengthened my knowledge in the field," said INL intern Salvador Munoz. "He cared for my success and without a mentor like him, I wouldn't be where I am today."

Why is mentoring important?

Mentoring helps the lab develop and retain its most valuable resource, its people. Good mentoring helps:

- Enable career development.
- Foster an inclusive workplace.
- Develop business acumen and soft skills.
- Transfer both technical and "insider" knowledge.

Cultivating the next generation of talented individuals is key to continued success. INL researchers have a long tradition of mentoring young talent, providing ongoing support, advice and career direction.

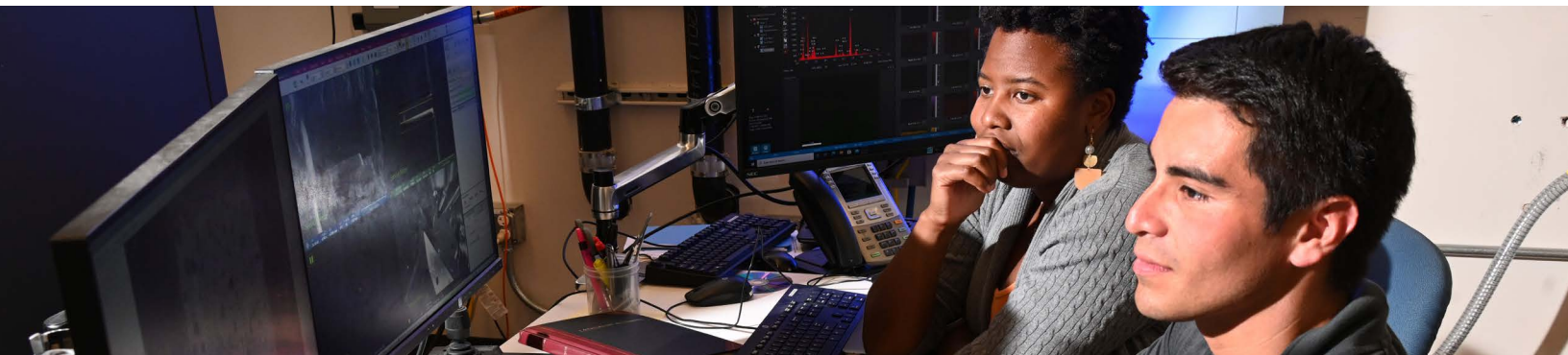
What are the outcomes of mentoring?

- Increased job satisfaction and retention of current and new employees.
- Improved morale and efficiency.
- Retention and transmission of institutional knowledge that would otherwise be lost when team members depart.

Resources for mentors

Learning how to be a better mentor is important. National University Programs and Human Resource and Diversity's Organizational Development have a suite of tools available to help participants fill this important role, from live workshops to guidebooks and video recordings.

Intern Xavier Quintana with mentor Trishelle Copeland-Johnson.



Mentor of the Year



Jana Richens, Mentor of the Year awardee

Eleanor Taylor and **Jana Richens** were the co-winners of the Mentor of the Year award. Both organized the intern cyber summer camp and made meaningful connections with their students. These INL mentors are hardworking, enthusiastic, encouraging, kind and always available for their students. They have been called out as the catalysts that made the internship experience the best the students ever had.

Eleanor Taylor, formerly Cybercore Program manager for Workforce Development, is now part of the newly formed National and Homeland Security Workforce Development Program Office. Taylor agrees that INL offers students incredible opportunities to be part of our mission and experience national laboratory research firsthand. "Mentoring is a critical component of any workforce development effort and is vital for our future," said Taylor. "It is a two-way partnership designed to bring out the best in each other, and you will find that you learn just as much in the process. Everyone benefits!"



Eleanor Taylor, Mentor of the Year awardee

Richens is National and Homeland Security's Workforce Development coordinator, and she is part of the Cybercore Integration Center. For Richens, it was an honor to participate in the mentor program at INL. "It means a lot knowing I can make a positive impact on someone's career and help build confidence in their skills and abilities," she said.

Cultivating the next generation of talented individuals is key to our continued success, and mentors play an extremely important role in this process. Mentors also help develop the bright minds that will lead our laboratory into the future. "As mentors, it is our responsibility to create a positive work environment with team-building opportunities, as well as establish clear goals, lines of communication, expectations and accountability," said Richens. "When a student has been given responsibility, they feel valued as a resource and more connected to the team."

Leadership across the Lab

The National Laboratory Directors' Workforce Workshop

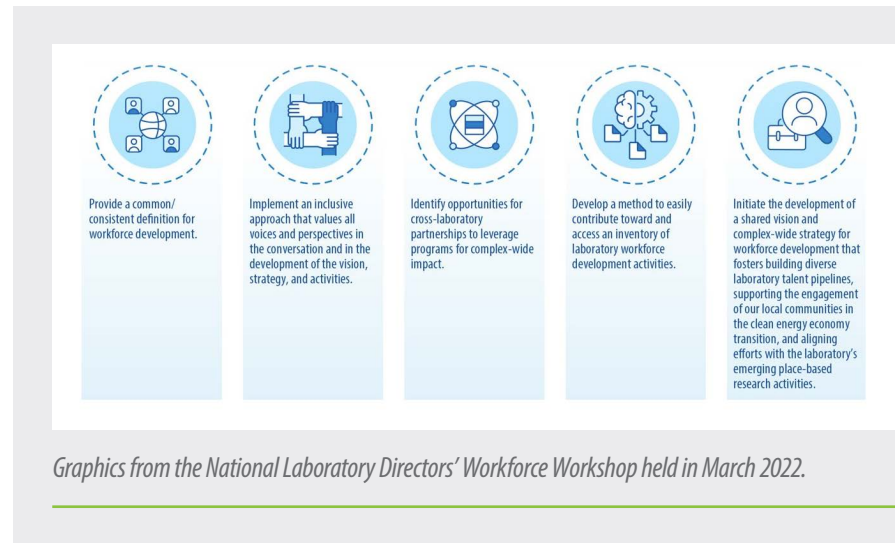
held in March 2022 and led by Michelle Thiel Bingham, National University Programs director, had over 200 participants from all 17 national laboratories and various DOE offices. It provided a forum to integrate workforce development activities that support all DOE missions, including local and regional bases, as well as those associated with the broader energy transformation.

The event offered opportunities to share best practices in diversity, equity and inclusion and evaluate the impact of these practices on DOE initiatives.

University Industry Demonstration Partnership Mission in Motion was held in March 2022. INL was represented in the keynote panel, "Collaborations to Build Historically Black Colleges and Universities (HBCU) Research and Program Capabilities." The main impact of this event was to increase awareness of INL to HBCUs. Many external organizations seek to partner with HBCUs and other emerging research organizations to support their goals of sustainably building research and program capabilities.

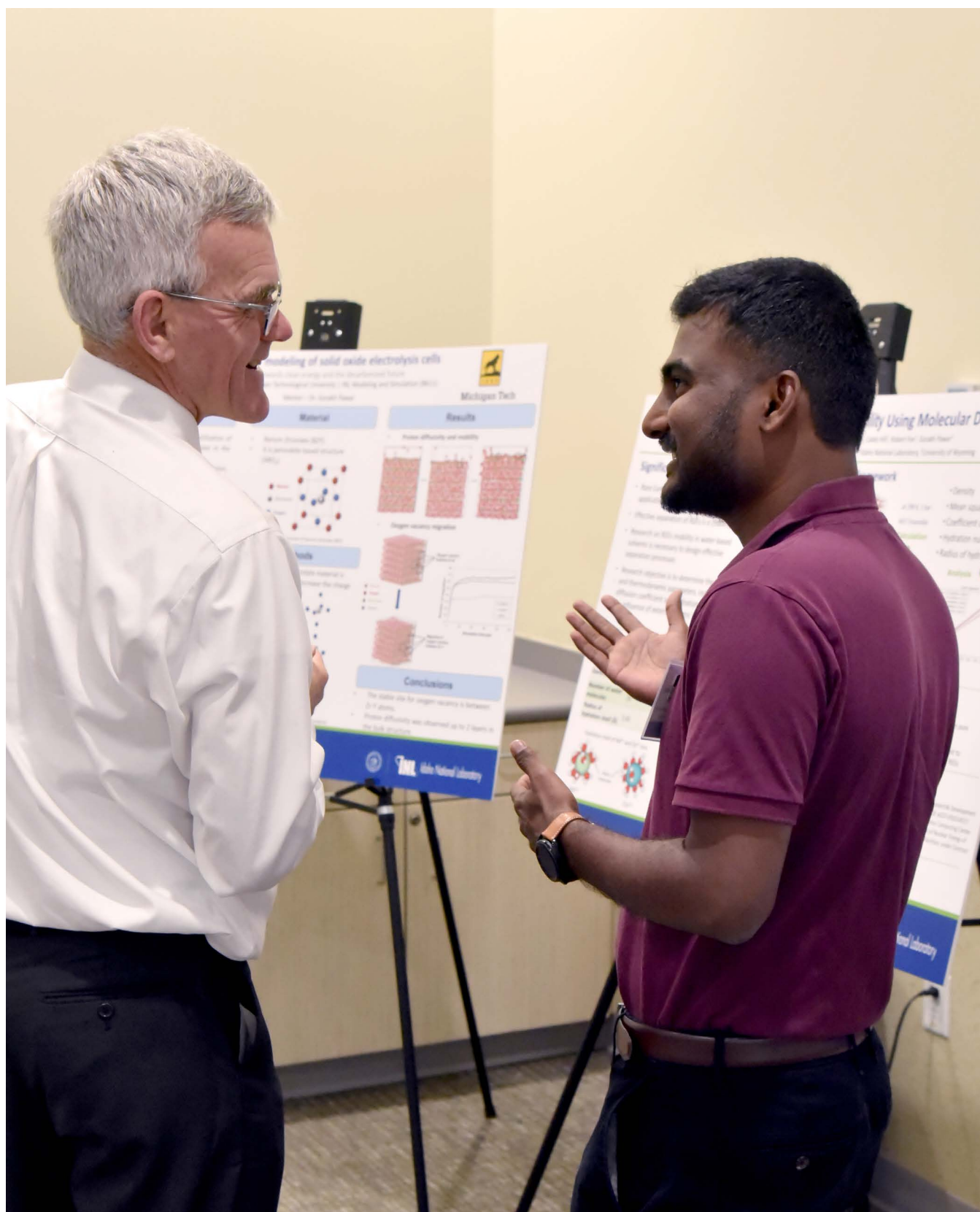
The session explored how external parties – companies, nonprofits, government agencies and others – can partner with these colleges and universities seeking to bolster their research and program assets. Over 200 attendees participated in this two-day event.

INL signed a Memorandum of Understanding with **University of Utah** to formalize the collaboration between the two institutions on research and development projects aimed at advancing the nation's energy and security technology. The newly signed Strategic Understanding for Premier Education and Research, or SUPER agreement, allows the organizations to explore deeper research collaborations and expand opportunities for students, faculty and researchers.



The five-year agreement solidifies what had been individual agreements between laboratory researchers and university faculty members.

Those will be replaced with a comprehensive institutional memorandum encouraging greater collaboration including shared academic materials, visiting research scholars, and cooperative symposia, seminars, workshops and conferences.



Postdoctoral Researchers

INL has built its cohort of postdoctoral researchers to 101, in fields including nuclear engineering, mechanical engineering, material science, chemical engineering and civil engineering. They represent 23 nationalities and 56 universities in the U.S. and five other countries. The diversity of degrees, institutions and ethnicities of our postdoc population provides a greater variety of perspectives and contributions to the important work we do at INL.



Postdocs Celebration

Idaho National Laboratory celebrated National Postdoc Appreciation Week with a dinner to honor our postdoctoral appointees. It was attended by approximately 120 people, including postdocs, mentors and members of lab management.

National Postdoc Appreciation Week, held Sept. 12-23, provided an opportunity to recognize the work of the lab's outstanding postdoctoral researchers along with their managers and mentors. The dinner was hosted by INL's National University Programs on Sept. 22 at the Hilton Garden Inn in Idaho Falls. This was the eighth annual event, but the first in-person celebration since the start of the COVID-19 pandemic.

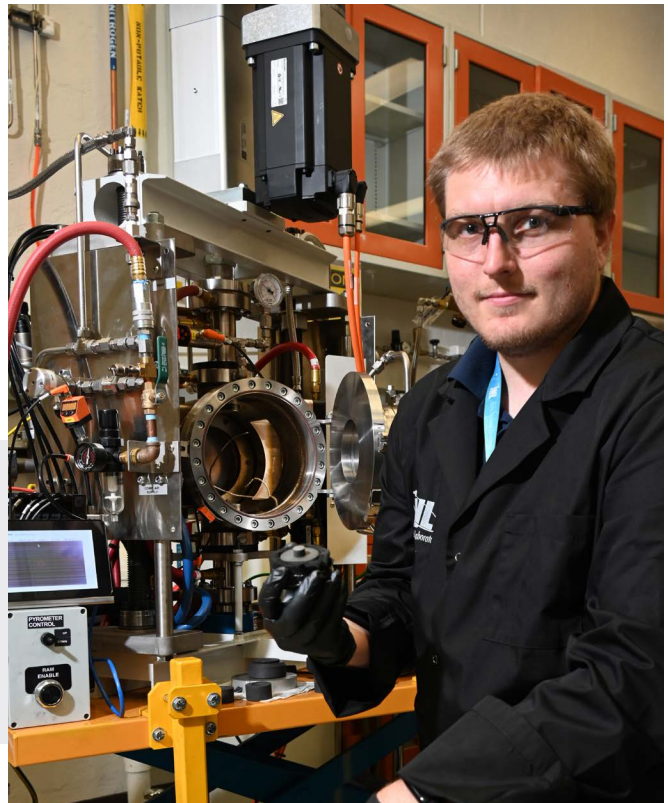


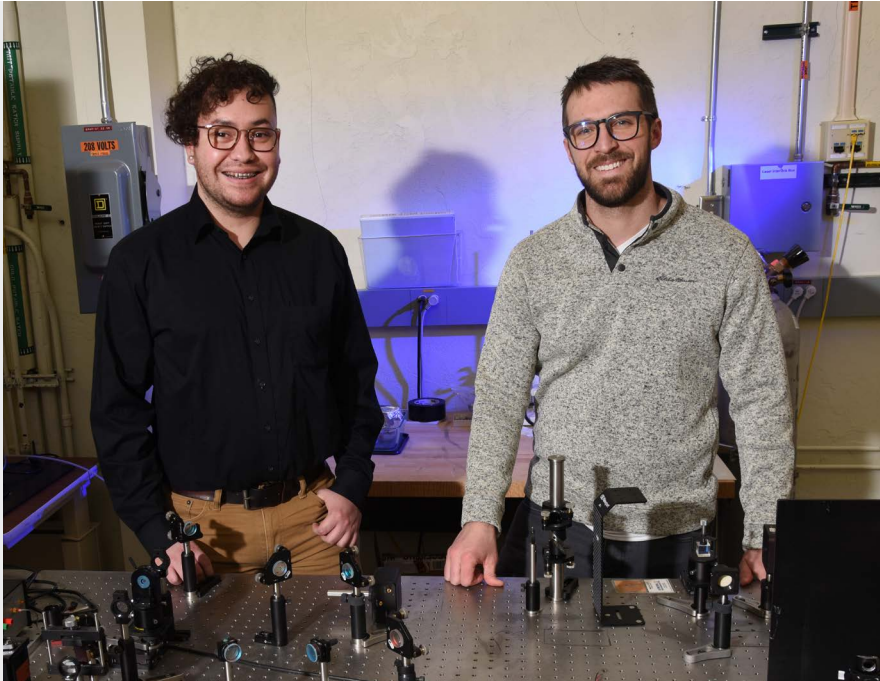
Russell L. Heath Distinguished Postdoctoral Associate

This appointment is awarded to outstanding early-career scientists and engineers

interested in advancing the fields of nuclear energy, critical infrastructure protection and clean energy deployment. We welcomed four recipients in FY-22.

Michael J. Moorehead – Doctorate in nuclear engineering and engineering physics at University of Wisconsin, and bachelor's in materials science and engineering at Arizona State University. Learn more about Moorehead's research [here](#).

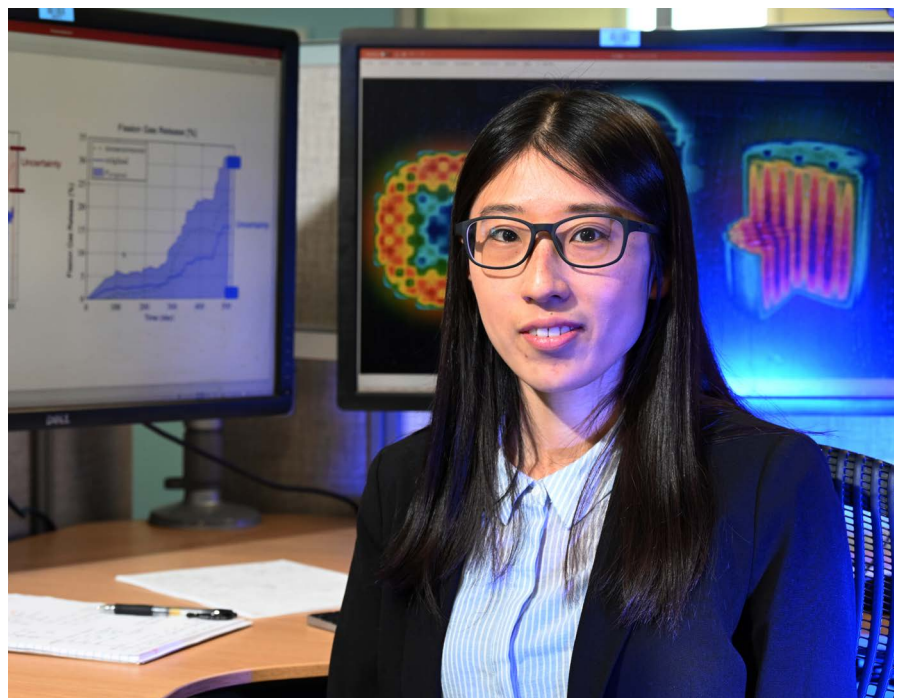




Kevin D. Vallejo – Doctorate in materials science and engineering at Boise State University and bachelor's in physics at University of Texas. Learn more about Vallejo's research [here](#).

Corey Efaw – Doctorate in materials science and engineering and bachelor's in mechanical engineering at Boise State University. Learn more about Efaw's research [here](#).

Yifeng Che – Doctorate in nuclear science and engineering at Massachusetts Institute of Technology and bachelor's in engineering, nuclear science and technology at University of Science and Technology of China, Hefei, Anhui, China. Learn more about Che's research [here](#).



Postdoctoral Researchers



Glenn T. Seaborg Distinguished Postdoctoral Associate

This program is designed to nurture early career Ph.D. scientists and engineers with the focus

being specifically on the actinide elements in support of nuclear energy, nuclear fuel cycle, waste treatment, and proliferation topics.



*Liyanage Ashini
Shamindra Jayashinge*

Originally from Colombo, Sri Lanka, **Liyanage Ashini Shamindra Jayashinge** received her bachelor's degree in chemistry from University of Colombo and her doctorate in inorganic chemistry from University of Iowa. She joined Idaho National Laboratory's Analytical Chemistry group in June 2022 as a Glenn T. Seaborg Distinguished Postdoctoral Associate. "As an

early-career researcher, the Seaborg distinguished postdoctoral position offered me an excellent opportunity to propose my research ideas in actinide chemistry while collaborating with others conducting high-impact research," said Jayashinge. Her next step is to explore the behavior of actinide salts in the presence of contaminants, which can impact the heat transfer properties of molten-salt reactors. She is also researching removing scalants from water using solvent driven aqueous separations technology under the supervision of Aaron Wilson in INL's Chemical Separations group, part of the Energy and Environment Science and Technology directorate.

"Working at INL allows me to interact and learn from experts in multidiscipline fields. I have a great satisfaction knowing that I am working toward achieving INL's mission, which will have a positive impact in the world," said Jayashinge.



Deslonde de Boisblanc Distinguished Postdoctoral Associate

This appointment is awarded to early career nuclear scientists and engineers to perform leading-edge research and development for advanced power reactor design and development as well as to support operations, safety, fuel management, experiment management and other pertinent activities associated with INL research reactor facilities.



Abdalla Abou Jaoude

Abdalla Abou Jaoude is INL's former Deslonde de Boisblanc Distinguished Postdoctoral Associate. Jaoude has his bachelor's and master's degrees from Imperial College London. He obtained his doctoral degree from Georgia Tech in nuclear and radiological engineering.

Jaoude's research evaluated and assessed the feasibility of a molten salt loop irradiation experiment in INL's Advanced Test Reactor. "It's a great opportunity and the position is very prestigious; you have exceptional mentoring support from INL leadership. I made a lot of incredible connections through this appointment," said Jaoude.

Jaoude became a full-time staff member less than a year later, halfway to completing the postdoc appointment. "I appreciate that INL allowed me to transition earlier to be part of the full-time staff benefits while still letting me work on my proposed project," said Jaoude. He has been a staff scientist in the Advanced Reactor Technology department since 2018.



Strong mentorship
is how we become
successful

Postdoc of the Year

Nepu Saha joined INL in May 2021 after receiving his doctorate in chemical engineering from Florida Institute of Technology. He has authored and co-authored 29 publications, nine since joining INL, along with working on various projects.

"In his work at the lab, he has been part of a large team of diverse people to accomplish research objectives," INL's Jordan Klinger wrote in his letter of recommendation. "Nepu has done a remarkable job navigating the difference in these professional backgrounds, as well as their personal backgrounds and varying behaviors to stimulate positive discussion and energy."

Saha said INL is an organization full of opportunities. "Strong mentorship is how we become successful, and I am very grateful for having the support of Jordan Klinger and the bioenergy team."



INL Deputy Laboratory Director Marianne Walck presented Saha with his award during the dinner and announced he had accepted a full-time position at the lab.

Graduate Fellowship Researchers

Idaho National Laboratory's Graduate Fellowship Program offers young researchers the opportunity to engage with experts in nuclear science, cybersecurity, energy systems and more. Graduate fellows are selected in degree fields aligned with INL's mission areas of innovative nuclear energy solutions, clean energy options and critical infrastructure. INL awarded graduate fellowships to 25 students from 12 universities across the United States in FY-2022. A graduate fellowship typically runs for three to five years. INL graduate fellows must be accepted into an accredited doctorate program in a research area related to one of INL's core capabilities where the student will provide two years of their doctorate program research to INL. In return, the program offers fellows access to world-class research facilities and expert researchers. In the first year of the program, the student takes classes through their university. During this period, their university pays their tuition and fees.

Once the student begins the hands-on research portion of their program, INL pays for their tuition and fees along with providing a \$80,000 annual salary.

Spotlights



Casey T. Icenhour's core thesis research is broadly in the areas of low-temperature plasma physics and advanced manufacturing.

Casey T. Icenhour earned a bachelor's degree in electrical engineering from Western Carolina University, and soon will complete his postdoctoral degree in nuclear engineering from North Carolina State University. His core thesis research is broadly in the areas of low-temperature plasma physics and advanced manufacturing, where he developed the electromagnetics module for INL's Multiphysics Object Oriented Simulation Environment, or MOOSE, to explore the impacts of high-frequency electromagnetic fields on energy deposition and plasma uniformity for industrial plasma applications (i.e., microchip manufacturing, advanced coatings, etc.).

"The INL Graduate Fellowship program has greatly enhanced my research by enabling direct collaboration with world-class researchers in computational science and engineering," said Icenhour. This opportunity to work on laboratory projects and his own research in advanced manufacturing and computational electromagnetics as part of the MOOSE framework development team has broadened his research experience. "I grew a great respect for the work INL does - we aren't only a nuclear energy lab!" said Icenhour.



Musa A. Moussaoui's current research is on blowdown transient critical heat flux, which is triggered by a hypothetical loss of coolant accident.

Musa A. Moussaoui is an INL graduate fellow who is completing his doctorate at Oregon State University, where he earned his undergraduate and graduate degrees. His current research is on blowdown transient critical heat flux, which is triggered by a hypothetical loss of coolant accident. It is a phenomenon that may lead to fuel failure, making it an important area of research. "My INL fellowship has been essential in my research during these recent times of global uncertainty. My INL colleagues continue to be valuable sources for providing me with tools from high computing resources to experiment design. I have also gotten to know other INL fellows through this program. Overall, I am grateful for this opportunity to pursue the highest degree in my field," said Moussaoui.



Logan Harbor's research focuses on improving high-fidelity reactor transport simulations.

Logan Harbor is another INL graduate fellow from Texas A&M University working on his postdoctoral degree in nuclear engineering. His research focuses on improving high-fidelity reactor transport simulations by applying a novel solution technique (the method of separated representations) to solutions obtained by the MOCKingbird and Rattlesnake codes developed at INL.

Joint Appointments

The Joint Appointment Program at Idaho National Laboratory enhances research collaborations between INL and university staff members.

Joint appointees develop or conduct research and development at INL and their host institutions. Joint appointment agreements are negotiated between INL and the partner university.

We have two types of joint appointments:

Incoming: A university employee is requested to collaborate with INL with opportunity for on-site access.

Outgoing: An INL employee is requested to collaborate with a university on research opportunities and may teach at partner universities.

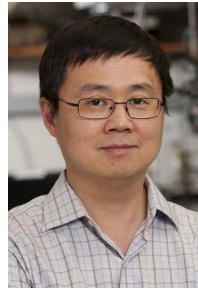
The new joint appointees for FY-2022



Greg Shannon,
Ohio State University

Shannon is a leader in INL's efforts to improve the security and resilience of U.S. critical infrastructure. He is improving methods for efficient security and resilience in manufacturing

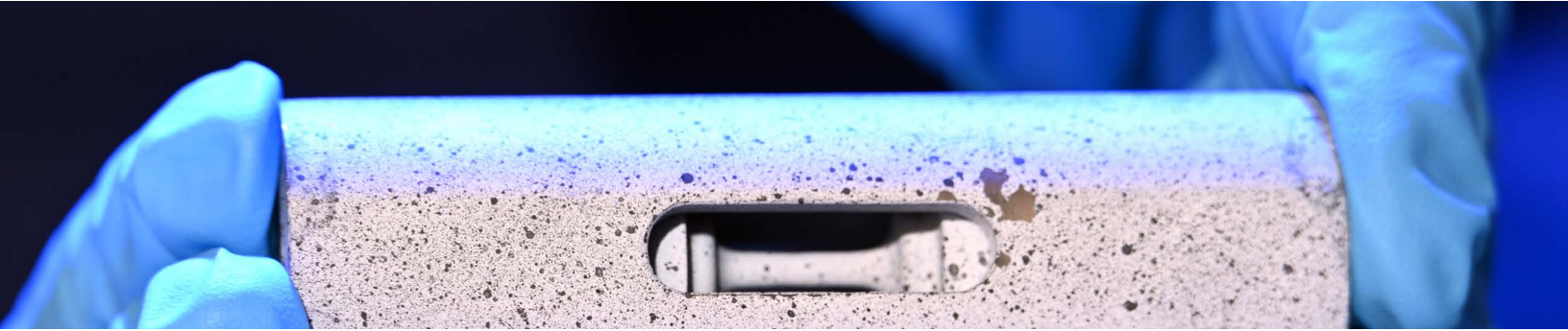
and other cyber-physical domains. With a joint appointment at The Ohio State University, Shannon will expand INL's university relationship with a goal to advance research in security and resilience methods. These methods include advancing tools for manufacturing, nuclear energy infrastructure, and other cyber-physical domains. Such methods, tools and applications are central to expanding INL's capabilities to meet the national and homeland security challenges within the Department of Energy and other agencies such as the departments of Defense and Homeland Security. Efforts to improve the security and resilience of cyber-physical systems will focus on formal methods, advanced manufacturing, energy stability, trusted architectures and agile engineering methods.



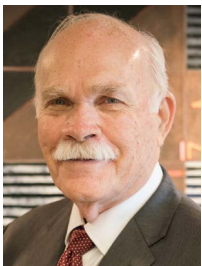
Kevin Chen,
University of Pittsburgh

Developing advanced sensors and instrumentation is a strategically important capability for Nuclear Science and Technology. INL's Measurement Science department develops optical fiber technology

for measurement solutions in irradiation experiments and applications to advanced reactors. Kevin Chen is an international leader in developing innovative solutions for the application of optical fiber sensing. His laboratory at the University of Pittsburgh fabricates and characterizes novel fiber sensors topologies and related interrogation methods. This joint appointment complements NS&T capabilities in deploying optical fiber sensors with basic optics research work and provides a pipeline for future research with specialized expertise.



Joint appointees develop or conduct research and development at INL and their host institutions, enhancing research collaborations between INL and university staff members.



Glenn Dietrich,
University of Texas San Antonio

Glenn Dietrich of the University of Texas at San Antonio (UTSA) becomes a joint appointee of INL and UTSA, facilitating cooperative research and development work.

UTSA is a member of the INL Strategic Understanding for Premier Education and Research Agreement and is engaged in education and research aligned with the INL mission. His research focus is on information assurance, cyber physical systems security and privacy, and technology management and innovation.



Lane Carasik,
Virginia Commonwealth

Idaho National Laboratory's Reactor System and Design Analysis Division identified the need for an active engagement

with Virginia Commonwealth University's Nuclear Engineering program. Lane Carasik is an assistant professor in VCU's Department of Mechanical and Nuclear Engineering, focusing on computational and thermal hydraulics. He is also director of the Fluids in Advanced Systems Technology (FAST) Research Group at VCU. The FAST Research Group utilizes and develops high fidelity computational fluid dynamics and reduced-order design tools for nuclear, solar and geothermal power plants. This engagement effort will support growing research initiatives and talent pipeline development needed for INL's Irradiation Experimental Thermal Hydraulics Analysis Department.

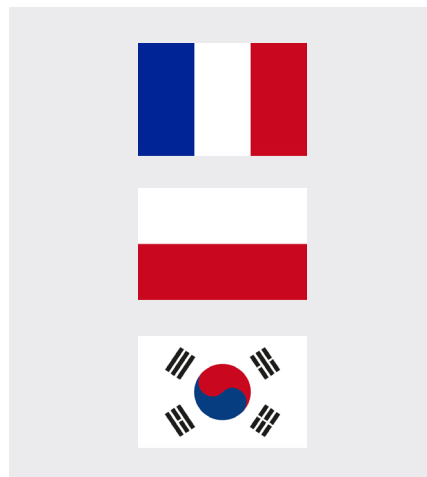
The purpose of this joint appointment is to establish a working relationship between INL and VCU to expand a mutual thermal hydraulics research portfolio. This joint appointment will also identify research opportunities, recognize and implement research experiences at INL for VCU students, and work toward establishing long-standing funding opportunities to support the talent pipeline of highly trained professionals.

International Researchers

INL participates in the U.S. Department of Energy's Exchange Visitor Program, which provides international researchers opportunities to use the lab's resources. The program sponsors exchange visitors on J-1 visas. INL researchers have a chance to share diverse perspectives, and the possibility to have a higher profile within the international community.

During FY-2022 we hosted eight international researchers from three different institutions.

The leadership council encourages all employees to use the INL Culture Wizard, an interactive tool designed to enhance cross-cultural communication, collaboration and interaction.

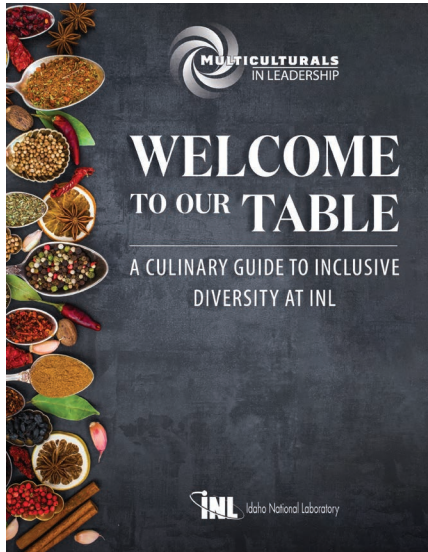


Academic Visitors

The Academic Visitors program brings university researchers who regularly collaborate with INL to the lab to discuss research topics of mutual interest. Academic and international visitors do not receive laboratory funding for their work. To expand these collaborations, visiting researchers are invited to attend guest lectures and community activities, and have an INL mentor. Despite travel challenges due to uncertainties about the COVID-19 pandemic that limited some opportunities, INL still hosted 26 academic visitors from seven different institutions.



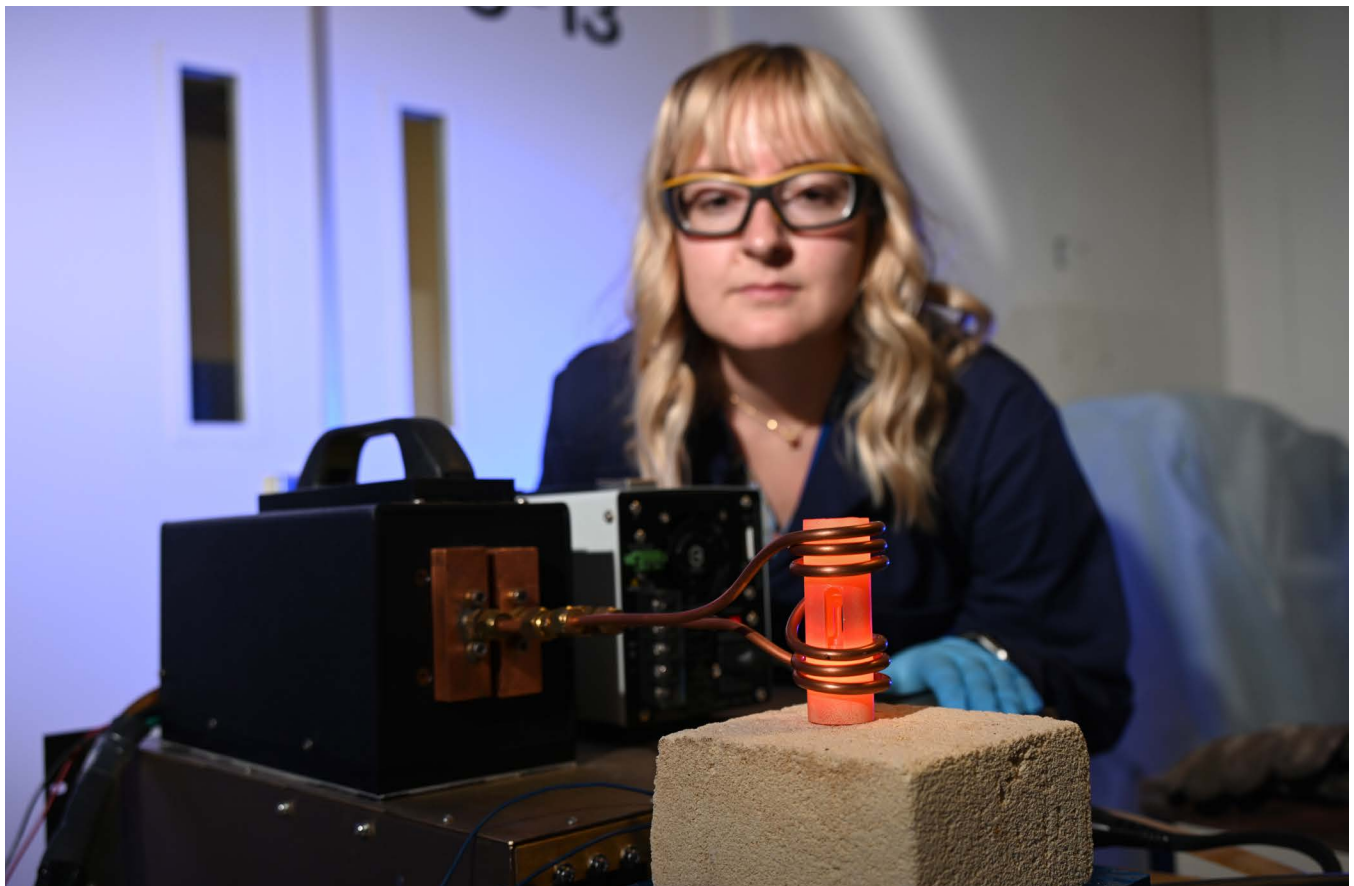
Multiculturals in Leadership



INL's Multiculturals in Leadership

Council advocates for international researchers by addressing practices and factors that impede inclusion.

Click [here](#) for the second edition of our multicultural cookbook.



Military Fellowships & Veteran Outreach

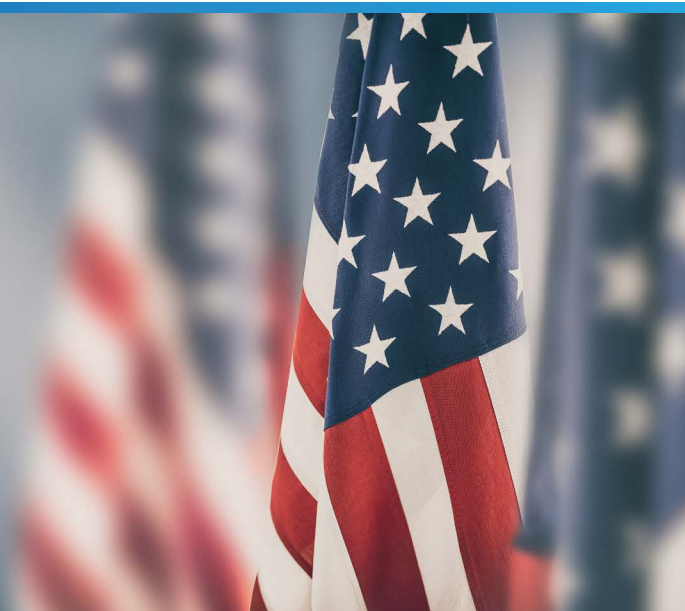
INL is increasing its recruiting and outreach efforts with active military service members and veterans. We work closely with leaders from the Veterans and People with Disabilities Inclusion Council, Human Resources and Diversity, veterans across the laboratory, and transition programs including Hiring our Heroes (military transition and spousal support), DOD SkillBridge, and more. INL is working to establish a coalition to enhance these collaborations and provide support and guidance when needed. The lab is developing a focused approach that not only provides substantial fellowship experience, but also a network of resources for a seamless transition from military to civilian life.

Vets2STEM events



INL and other national laboratories helped establish Vets2STEM for various military/veteran recruiting events. The first Vets2STEM event was held at Colorado School of Mines in 2019. The second event was held virtually and hosted by the University of Texas at San Antonio in November 2020. These events centered on active-duty military and veterans across academia who wanted to work for a national laboratory. These events help us highlight the advantages and ease of transitioning from a military career under the Department of Defense to a civilian career with a Department of Energy national laboratory. We look forward to more events in the future.

**These events
highlight the
advantages and ease
of transitioning from
a military career**



Landon Hillyard is a full-time employee at INL's Materials and Fuels Complex. He came to INL through the DoD SkillBridge program, which connects service members with private and public sector organizations that offer internship opportunities for transitioning service members to build their resumes, explore employment interests, develop job skills, and gain valuable federal government work experience. Hillyard was a Navy veteran, and he started his SkillBridge program at INL in October 2021. He learned about this program through his command at F.E. Warren Air Force Base. "I reached out to a recruiter at INL for possible participation in the program with INL," said Hillyard. Each year over 200,000 service members transition out of the military.

INL's Military Fellowships & Veteran Outreach program promotes this valuable relationship between the military and our lab community.

The DoD SkillBridge Program provides opportunities for active-duty service members to gain valuable civilian work experience during their last 180 days of service.

"I am beyond grateful for the opportunity SkillBridge provided for my transition, and for MFC leadership taking a chance on me. MFC was very supportive in allowing me the time to explore the different organizations at INL to ensure I would apply for the position that best utilizes the skills I bring from the Navy," said Hillyard.



Landon Hillyard

DoD SkillBridge service member who joined INL workforce

“I am beyond grateful for the opportunity SkillBridge gave me in my transition, and for MFC leadership taking a chance on me.”



National University Consortium

INL established the NUC in 2005 with partner universities Massachusetts Institute of Technology, North Carolina State University, Ohio State University, Oregon State University and University of New Mexico. NUC's collaborative research strengthens the portfolios of INL and the universities to advance the nation's strategic nuclear energy objectives, clean energy initiatives and critical infrastructure security goals.

Summary of NUC collaborations:

- Complement capabilities to accomplish INL's mission
- Establish long-term relationships
- Educate the next generation
- Support INL initiatives, including workshops and collaboration sessions, proposal writing for funding, joint publications, and summer faculty engagements

NUC highlights

- **Fission Battery Initiative:** The Nuclear Science and Technology directorate initiated a fission battery strategic grand challenge initiative that envisions developing technologies that enable nuclear reactor systems to function as batteries, referred to as fission batteries. Idaho National Laboratory and the NUC executed a workshop series between January and April 2021 related to this important initiative. In FY-22, the NUC team and NS&T prepared for the Lightweight Material Workshop that happened in Nov. 2022.
- **A Special Issue in Progress in Nuclear Technology:** "Innovations Addressing Technical Issues Posed by Fission Battery Attributes" was published as a result of the Fission Battery workshop series.
- **SEED awards:** FY-22 SEED deed proposals were awarded with Oregon State and Ohio State supporting the Nuclear Reactor Sustainment and Expanded Deployment and Advanced Materials and Manufacturing for Extreme Environments initiatives.
 - The FY-22 second quarter seed award, "An accelerated assessment of the creep mechanisms in uranium zirconium model alloys," was led by INL primary investigator David Frazer (MFC), with Dewen Yushu (NS&T) and Tianyi Chen (Oregon State).
 - The FY-22 third quarter seed award, "Effect of oxide inclusions on the mechanical properties of additively manufactured stainless steel," was led by INL primary investigator Yachun Wang (NS&T) with Gerald Frankel (Ohio State).
- **Joint Peer Reviewed Publications:** During FY-22, NUC had 70 publications. According to the Nature journal metrics it had an impact factor of 69.5.



*Vivek Agarwal,
technical lead, Fission
Battery Initiative*

Visit the NUC website [here](#).

NUC's collaborative research strengthens the portfolios of INL and the universities to advance the nation's strategic nuclear energy objectives, clean energy initiatives and critical infrastructure security goals.



Marianne Walck, Deputy Laboratory Director of Science and Technology, Chief Research Officer



Dayna Daubaras, NUC Deputy Director

NUC university members



Workforce Development

Workforce Development's objective is to train, develop and positively influence the next generation of the energy workforce.

Target audience

- INL employees (skills enhancement or new skill development)
- Community/future employees

Existing relationships

- Collaborations (Center for Advanced Energy Studies, National University Consortium, Strategic Understanding for Premier Education and Research)
- Employee education
- Sample of workforce development support
- Fire protection (University of Idaho)
- Welding (College of Eastern Idaho)
- Certifications and associates degrees
- ISU's Energy Systems Technology & Education Center (ESTEC)
- Cyber-physical security
- Electrical engineering technology
- Instrumentation engineering technology
- Mechanical engineering technology
- Nuclear operations technology

Highlights

National Laboratory Directors' Council (NLDC) – Workforce Workshop, March 2022

The event was led by INL and shared DOE laboratory workforce efforts and best practices with a focus on strategic partners collaboration and support.

NLDC Working Groups Partnering Together graphic: Workforce is a challenge for all of us





