THE NEUPdate

January 2014 Edition
U.S. Department of Energy's
Nuclear Energy University Programs

IUP Fellows and Dr. Pete Lyons meet to discuss research at Winter ANS

It's not every day graduate students get to meet one of nuclear energy's most important decision makers.

Integrated University Program (IUP) Fellows had this opportunity at the 2013 Winter American Nuclear Society (ANS) Meeting this past November in Washington, D.C. Department of Energy Assistant Secretary for Nuclear Energy, Dr. Pete Lyons, greeted IUP Fellows in a special meeting to discuss research experiences, future plans, and perspectives on nuclear energy R&D. The meeting gave Fellows the opportunity to interact with Dr. Lyons and other Office of Nuclear Energy (NE) leadership and provide feedback on their fellowship experiences.

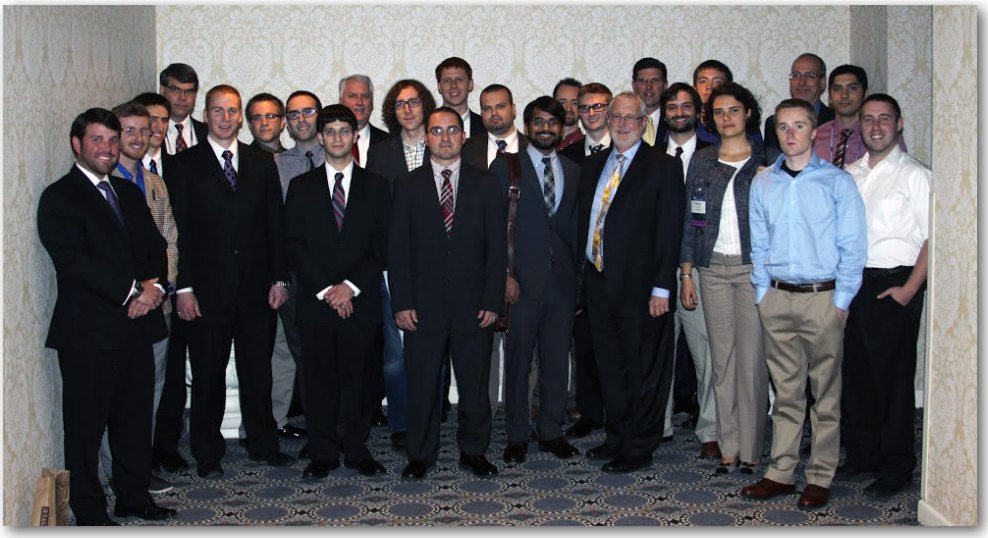


Photo features DOE leadership and IUP Fellows. Front: Bradley Williams, Joel Hughes, David Woodley, Brycen Wendt, Lane Carasik, Gabriel Brown, Vishal Patel, Dr. Pete Lyons, Raluca Scarlat, Jon Walsh, Kurt Harris. Back: Gregory Bala, Chris Morrison, Ethan Chaleff, Dr. John Gilligan, Sean Carney, Eric Collins, Matt Mille, Joshua Hodson, Geoffrey Gunow Edward McGinnis, Nathan Almirall, Simon Bolding, Andy Griffith, and Mehrad Mehr.

"Meetings like this are a unique opportunity," said Bradley Williams, NEUP Team Lead. "This was our second opportunity to host this event, and we are extremely happy to have students interact with Dr. Lyons and other senior leadership in such a personal setting. These meetings help keep senior leadership informed of progress, interests, and concerns of current students while affording students the opportunity to gain insight into the status of the nation's nuclear energy R&D program."

Each Fellow presented a synopsis of their research and engaged in dialogue about current trends in nuclear energy R&D.

"Dr. Lyons' presence at this meeting is a true testament to how important students are to the future of the field," said Jenna Payne, NEUP Student Educational Support Lead. "I have no doubt we're going to see great things from these students as they embark on their professional careers in nuclear energy fields."

FY 2013 Awards Recap

In FY 2013, the Department of Energy, NE awarded more than $52 million in competitive funding through NEUP. Awards included 61 university-led research and development projects, 16 Infrastructure projects and 1 Integrated Research Project. NEUP R&D awards were spread across 38 different U.S. universities and colleges in 28 states and the District of Columbia.

Additionally, 31 graduate fellowships and 37 undergraduate scholarships totaling approximately $5 million were awarded through the Integrated University Program.

Meet...*Rita Patel*

FY 2012 IUP Fellowship Recipient
University of Pittsburgh

How did you become interested in nuclear engineering?

I was required to take a heat and mass transfer class as part of my engineering degree from Dr. John Metzger. I loved Dr. Metzger's teaching style and found out that he was teaching a nuclear engineering class in the spring. I immediately enrolled in the class.

At the time, Dr. Metzger was trying to jumpstart a nuclear engineering program at University of Pittsburgh. After that second class I was hooked, and I helped him build up an ANS chapter at University of Pittsburgh. I like to think of Dr. Metzger as a mentor. He was the one who notified me of the IUP fellowship opportunity.

Why did you decide on nuclear energy research?

My father is a doctor and instilled in me an interest in math and science at an early age. As I began studying in college I realized that, in nuclear engineering, you can do anything you want. Unlike many other scientific fields, there is a wide range of research areas available. I believe this flexibility will be advantageous as I enter the job market.

What research are you performing?

I am currently doing materials research, under Dr. Gerald Meier, studying the effect of oxidation on stainless steel alloys. My bachelor's was in Materials Science and I have continued along that path. I am taking advantage of opportunities to present and publish my results. My most recent presentation was at the Student ANS Meeting in April 2013.

What goals do you have for the future?

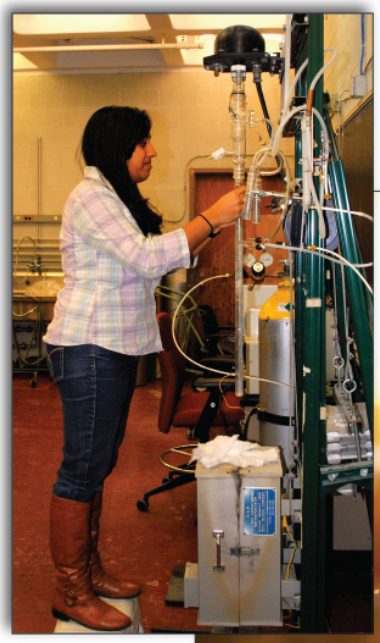
I feel like there is a big gap between research and the public perception of nuclear. I am currently part of the Science Ambassador Program and the Carnegie Science Center Museum in Pittsburgh promoting K-12 alternative energy education. In the future, I want to fill this gap between research and public policy, hopefully increasing public support of nuclear energy through both public policy and K-12 involvement.

How has the IUP fellowship helped you achieve your goals?

The IUP fellowship highlights the importance of nuclear energy research, especially at University of Pittsburgh. University of Pittsburgh needs a nuclear engineering program and this fellowship shows that the program adds value by bringing in money and distinction. I hope to be a spokesperson for nuclear engineering as a whole. Dr. Metzger gave me the support and inspiration to carry the torch for nuclear engineering education at University of Pittsburgh and I will continue to carry it with his passing.

What do you do in your free time?

I established a club Quidditch team in Pittsburgh. Inspired by Harry Potter from J.K. Rowling's hit children's series, every Saturday we travel to play other teams along the Eastern Coast, sporting our Quidditch outfits and broomsticks. Our club is ranked in the Top 15 teams internationally! I also love baking; my specialty is peanut butter dark chocolate truffles.



Left: Patel adjusts the sample setting on a vertical furnace, used to study corrosion and oxidation effects. Below: Freezing temperatures do not stop Patel from a good game of Quidditch.

Photos courtesy of Rita Patel and Deanna Edmunds

Clemson PI expands knowledge of high temperature sorption behaviors for used nuclear fuel storage

By Drew Thomas
NEUP Communications

With continued uncertainty about used nuclear fuel storage, more research is needed to make informed decisions. Brian Powell, a Clemson University PI, and his research team hope to add real scientific data to the discussion.

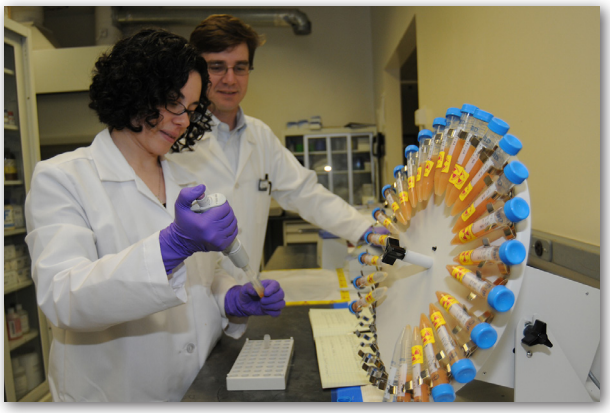
One of the major used fuel storage challenges is understanding how radioactive contaminants move and change over time. Some minerals and materials absorb radioactive materials, preventing contaminants from leaching into the environment outside of the storage facility.

Chemical reactions caused by different environmental factors, such as exposure to oxygen or carbon dioxide, can change the actinide or radioisotopes' state, or species, making it behave differently than it originally would. Different species will exhibit different sorption behavior and thus different mobility in the environment. Traditionally, empirical constants have been used to predict movement of radionuclides in the environment. This technique only provides results for the conditions under which the empirical constants were measured meaning it cannot account for the changing conditions inside of a changing geologic environment.

That's where Powell and his team take over.

"We are trying to gain a better understanding of transuranic elements and how they are going to behave," said Powell. "We want to get away from the empirical models and incorporate specific chemical reactions into fate and transport models."

The team's novel approach focuses on creating an accurate dataset for use in predicting the specific chemical species present in aqueous and solid phases within the environment. A unique collaboration combines Clemson's expertise in actinide envrionmental chemistry with Lawrence Berkeley National Laboratory's expertise in isothermal titration calorimetry and chemical thremo-dynamics and University of California, Berkeley's expertise in x-ray absorption spectroscopy to identify the different chemical species involved.



Powell supervises PhD student, Amy Hixon, as she withdraws a mineral suspension containing trace level plutonium. The sample will be analyzed to determine the amount of plutonium sorbing to the mineral.

"This was a natural marriage between calorimetry measurements, x-ray absorption spectroscopy and sorption experiments," said Powell. "Coupling the three technical approaches creates accurate data to prove the principle."

These techniques, when combined, create a fundamental understanding of the reactions occurring during sorption of an actinide to a mineral surface which are quantified with thermochemical constants rather than empirical constants. By using these thermo-chemical constants, models can consider all possible chemical species, resulting in a more robust, versatile, and technically consistent model.

The idea for the research was hatched seven years ago, while Powell was working for now collaborator, Dr. Linfeng Rao at Lawrence Berkeley National Laboratory, who is an expert in actinide thermodynamic studies and calorimetry measurements.

"These early discussions really laid the foundation for the theoretical background for these sorption entropy and enthalpy measurements, which is the key component of the research," said Powell.

The compilation of project data will provide a vast dataset to understanding thermochemical reactions which are able to predict actinide speciation under different conditions.

Databases listing energies involved in chemical reactions are not a new concept. The International Nuclear Energy Agency has been compiling data for aqueous actinides species for several years. Powell and his team hope to create a similar database for speciation on mineral surfaces, improving modeling and simulation accuracy in the area.

Powell emphasizes that the database can be useful for any disposal site, not just a repository. He hopes that his research will inform decision makers and open up candid discussion about viable fuel cycle options.

This work supports the Office of Nuclear Energy's Fuel Cycle Research and Development Program.

Meet the NEUP Staff

Stefanie Johnston
NEUP Contracts Lead

Stefanie Johnston has worked at the NEUP Integration Office at the Idaho National Laboratory since February 2010 and has served in several different roles including office administration. Prior to joining NEUP, Stefanie worked in private industry in various financial positions. Stefanie is currently completing her degree in General Studies, with an emphasis in business from the University of Idaho.

In her current position, Stefanie leads the reporting and close-out processes for the 286 contracts and cooperative agreements as the primary interface between Principal Investigators, PICS:NE staff and the DOE-ID team. She is establishing and maintaining a process for compliance of reports submitted through the PICS:NE system. In addition, Stefanie is undertaking the financial operations and planning of the Integration Office.

Outside of work, Stefanie enjoys a wide array of outdoor activities with her family, including snowmobiling and skiing in the winter and dirt biking in the summer.

To submit suggestions for future newsletters, contact Drew Thomas at **Andrew.Thomas@inl.gov**.

U.S. DEPARTMENT OF ENERGY

From the IO Director...PICS:NE quarterly reporting system improves NEUP reporting process

NEUP is continually working to better integrate university research within the overall NE R&D portfolio to effectively support NE's mission.

Since 2009, NEUP project reporting has been conducted by the neup.gov submittal system. NEUP has now been incorporated into the PICS:NE system used by the majority of NE's programs for their direct funded work; allowing for increased integration and visibility of university projects.

Beginning with the FY 2013 second quarter reports, PIs on FY 2012 projects were required to use the PICS:NE system to submit their reports. Recently, FY 2011 reports have transitioned to the PICS:NE system as well.

FY 2011 and FY 2012 PIs have now been trained on the new system. Training for FY 2013 awardees will begin soon and PIs will be contacted with additional information.

The PICS:NE administrators will provide resources to resolve any questions PIs may have. For questions, contact Wendy Jue, at 301-658-2396 or via e-mail at wjue@alleghenyst.com.

PIs working on FY 2009 and FY 2010 projects will continue to use the neup.gov submittal system through project completion.

For questions related to FY 2009-2010 projects please contact Stefanie Johnston at 208-526-1197.

Sincerely,

Dr. John Gilligan, Director
NEUP Integration Office

FY 2014 Funding Opportunity (FOA) Update

The Department of Energy, Office of Nuclear Energy released two Funding Opportunity Announcements in October: the Consolidated Innovative Nuclear Research FOA (DE-FOA-0000998) and the Consolidated Scientific Infrastructure Support FOA (DE-FOA-0000999).

Pre-applications for R&D projects were due on December 2, 2013. NEUP received 529 pre-applications and NEET received 139 pre-applications in 22 different workscope areas.

Results of the pre-application reviews are expected by the end of February. All applications are due April 3, 2014.