Radioecology program prepares future scientists, Ecology lab provides research experience

People rarely contemplate the impact of nuclear activity unless power plants or nuclear production facilities reside near their communities. Those who live far from a nuclear facility, generally think about the environmental impacts of nuclear activities only after an accident like Fukushima or Chernobyl.

For the scientists at the University of Georgia's Savannah River Ecology Laboratory, the impacts of nuclear production are a primary focus. The lab has an ongoing mission to independently evaluate environmental impacts from operations on the U.S. Department of Energy's Savannah River Site. This mission extends to educating the next generation of professionals to address those impacts.

This focus is not a new one for the lab. In-depth, hands-on training of graduate students launched simultaneously with SREL's founding in 1951.

In the late 1960s, SREL expanded its reach to undergraduates, mentoring more than 700 students through the lab's experiential learning program. The program has twice received the UGA's coveted Excellence in Undergraduate Research Mentoring Program Award.

Not resting on past achievements, Dr. Olin E. Rhodes, Jr., director of SREL, saw a need to do more at the undergraduate level. "It is essential to prepare undergraduates for the specialized needs required to evaluate the impacts of radioactive elements in the environment The next generation of researchers must be astute in addressing the effects of radionuclides, or radioactive elements, in the ecosystem," said Rhodes.

This led to the lab establishing a Research Experience for Undergraduates in radioecology program in 2015. Funded by the National Science Foundation, the program recruits students from various colleges and universities around the country.

Ten to 12 undergraduates participate in experiential learning opportunities in the lab and in the field at SRS. They are responsible for all phases of research, from developing a hypothesis to articulating and presenting their results orally and at a research symposium.

Melissa Pilgrim, director of research at the University of South Carolina, Upstate, and co-coordinator of the program, said that the students are well prepared to investigate radioactive elements as well as other contaminants, like metals and mercury in the environment. "The 10-week research experience begins with intense training on protocols for safe handling of radioactive materials and contaminants, including skill in donning and removing protective wear," Pilgrim said.

Kyle Brown

Summer 2016 participant Kyle Brown, a student at the University of South Carolina, Upstate, had the opportunity to put this skill set to work as he examined Florida green water snakes.

He examined the species, found on the site, in three different contaminated wetlands to determine if their contaminant concentrations correlated to the contamination history of the wetlands. Brown also had the benefit of accessing SREL's 65-year database on these wetlands.

"The opportunity at SREL was priceless," said Brown. "Getting to be a part of the whole process of science — we built and set traps, captured snakes and used lab equipment to collect data."

Sarah Abercrombie, a student at Purdue University, another 2016 participant, said presenting results and getting lab experience was extremely beneficial. "The skills we learned at SREL were ones I would never have had exposure to in my undergraduate studies, and presenting scientific data is going to be a huge part of my future career."

J Vaun McArthur, a senior research ecologist at SREL, who coordinates the program with Pilgrim, said the seminars are a major teaching tool. "The seminars expose students to the lab's diverse radioecology studies at SRS and around the world," said McArthur.

He also said the members of the diverse cohorts of students have the benefit of learning from one another because they bring various perspectives and experiences from different undergraduate institutions to the program.

For Brown, the benefit of the SREL undergraduate experience has quickly expanded. He was recently selected to present his project at the Council on Undergraduate Research's Research Experiences for Undergraduates Symposium in Arlington, Virginia.

This is the second consecutive year an SREL undergraduate has been selected to present at the national level, a success that bodes well for the future of the program and the students that experience it.

Mixed Oxide Fuel Fabrication Facility: Swords to plowshares

The Savannah River Site has a storied past from its critical role in building our nation's nuclear deterrent. Today the site is taking center stage in international nuclear nonproliferation with the construction of the Mixed Oxide (MOX) Fuel Fabrication Facility.

Started in 2007, this huge plant (the main building is 600,000 square feet) is now more than 70 percent complete.

The area's congressional delegation has strongly supported MOX construction in the annual federal budget authorization and appropriation process. Senators Lindsey Graham and Tim Scott and Reps. Joe Wilson and James Clyburn have ensured continued funding for the project, as have other members of Congress in South Carolina and Georgia.

Once the building is completed, with its 23,000 instruments and 85 miles of piping, the facility will begin converting plutonium from retired nuclear warheads into fuel for nuclear power plants, sending one of the potentially most dangerous materials on earth on a path to providing electricity for American refrigerators and TV sets and, ultimately, to permanent disposition.

During the MOX process, the weapons-grade plutonium is converted into oxide powder, mixed with uranium powder (hence, the name mixed-oxide), and manufactured into pellets for fuel assemblies ready to be shipped to nuclear reactors. MOX fuel is not now used in American reactors, but it is prevalent in Europe and Japan. American nuclear plant operators showed interest in MOX in the early stages of the facility's development and are expected to become customers for the product once a firm production schedule is announced.

Since its inception, the MOX project has been a good neighbor for Aiken and surrounding communities. The construction project supports approximately 2,000 jobs, including highly skilled union labor and professional positions. Once operations begin, the facility will provide about 1,000 technical and professional jobs during the 20 years of its planned lifetime.

Construction has been a boon to the industry, creating a demand for trained nuclear engineers and technical support that had languished for years during a slump in nuclear building. Many professionals who cut their teeth on the MOX project have gone on to staff other nuclear construction projects as the industry revived.

The project has a strong safety and quality culture. The Nuclear Regulatory Commission, which monitors all civilian nuclear construction and operation, has awarded the MOX project its highest rating for six years in a row, stating there are no areas needing improvement. Overall, construction safety is also exemplary. In more than 25 million work hours, there has only been one job-related injury causing lost work time in more than six years, an exemplary safety record for any construction project, let alone complex nuclear construction.

Employees of CBI AREVA MOX Services also give to our community. For the sixth year in a row, they have been recognized for raising the most funds -- $37,000 in 2016 -- to support Children's Place, a child and family development program for at-risk children in Aiken. They also have generously given donations and volunteer hours to the Golden Harvest Food Bank, the American Heart Association and other nonprofits in our community.

The MOX project has a major presence in the community, but it has greater standing in the world of nonproliferation. The U.S.-Russia agreement that spawned the program, signed in 2000 and updated as recently as 2010, is a bilateral commitment to use MOX technology to eliminate a total of 68 metric tons of surplus weapons-grade plutonium, enough materials for 17,000 nuclear weapons. It is one of the most important advances in nonproliferation in the post-Cold War era, and the task of fulfilling the American side of the agreement rests in our community with the MOX Fuel Fabrication Facility.