

Nuclear Environmental Engineering and Science Program



The Nuclear Environmental Engineering and Science (NEES) program is a graduate only academic program that focuses on the environmental aspects of nuclear technologies, including environmental health physics, radioactive waste processing, environmental risk assessment, the nuclear fuel cycle, radiation detection and measurement, environmental radiochemistry, and environmental remediation. The NEES educational program is a combination of classroom instruction, laboratory instruction, and research. The NEES program is unique relative to other nuclear programs in the country because it is housed within the multidisciplinary Environmental Engineering and Earth Sciences department. The average number of

M.S. and Ph.D. students pursuing the NEES concentration has been ~17 per year over the past 5 years. The average number of graduates from the program (over the last 5 years) is ~3/year for the M.S. degree and ~1/year for the Ph.D. degree. With the increased interest in nuclear power and global climate change, we are anticipating an increase in the numbers of students seeking to enter the NEES program.

Dr. Timothy DeVol oversees the Accreditation Board for Engineering and Technology (ABET) and Applied Science Accreditation Commission (ASAC) accredited Environmental Health Physics track within the NEES focus area. This educational and research track involves such areas as: radiological environmental measurements, radioactive waste disposal and treatment, dose assessment, and quantitative risk assessment. Ongoing research projects include: on-line quantification of alpha and beta radioactivity in an aqueous medium, statistical analyses of time-series data, low-level radiation quantification and development of in-situ and field portable analytical instrumentation for radioactivity monitoring. Collaborations on these projects include scientists at the Savannah River National Laboratory and the Pacific Northwest National Laboratory.

Dr. Brian Powell oversees the Environmental Radiochemistry track within NEES. This educational and research track combines the fields of environmental radiochemistry, actinide chemistry, environmental chemistry, radioanalytical chemistry, and contaminant fate and transport in an effort to develop quantitative models describing radionuclide geochemical behavior. Ongoing projects include examination of metal and radionuclide interactions at solid-water interfaces, actinide subsurface transport, and characterization of the geochemical behavior of redox active radionuclides such as plutonium, iodine, technetium, and neptunium. Collaborators on these projects include scientists from Lawrence Livermore National Laboratory, Savannah River National Laboratory, The Desert Research Institute, and University of Michigan.

Faculty Profile



Dr. Jim Castle, Professor, has been with Clemson University since 1995. Prior to joining Clemson, he worked for Cabot Oil & Gas and Chevron in California, Houston, Denver, and Pittsburgh on exploration and development projects, including CO₂ enhanced recovery at Rangely oil field, Colorado. Dr. Castle's research interests are in geological and environmental aspects of energy resources. His current research focuses on physical, chemical, and biological processes in sediments for application to remediating waters produced by energy extraction and utilization. His research includes applying results from studies of modern natural and experimental systems to understanding processes operating on the scale of geologic time, especially those related to climate change. Dr. Castle, along with Dr. John Rodgers in the Department of Forestry and Natural Resources, recently proposed a new hypothesis that toxin-producing algae contributed to Phanerozoic mass extinctions, which may have been related to global warming. He teaches courses in sediments, aquifer characterization, and structural geology. He is Editor-in-Chief of the peer-reviewed journal, *Environmental Geosciences*, and serves on the Executive Committee of the Division of Environmental Geosciences, American Association of Petroleum Geologists. Dr. Castle received a PhD in geology from the University of Illinois in 1978. He is married, has three children, and enjoys traveling.

Chair's Corner

Dear EEES alumni and friends:

We just completed another busy but successful semester. I am pleased to present you a new issue of our newsletter highlighting some examples of our activities and accomplishments during that time. Please remember that we also publish an e-newsletter at the "Newsletter Archives" section of our web page. Visit us to learn more about the events and activities in the Department.

We will start offering our new undergraduate degree in environmental engineering beginning this Fall semester. We are partnering with Biosystems Engineering Department and will offer a degree that allows students to pursue a process engineering path or a natural systems concentration. This will be the first and only degree of its type in South Carolina and we have about 20+ students for the first cohort. If you have not seen it yet, we prepared a short video for the new degree that you can find on our web page along with the curriculum information.

We had another (18th!!) very successful David Snipes Hydrogeology Symposium with over 300 attendees and 28 exhibitors. I am pleased to report that this is now a well established must go to event for geologists and hydrogeologists. Its influence and attraction pass beyond the boundaries of Southeastern United States.

On the cover, you will see our feature article about Nuclear Environmental Engineering and Science program. This has been a unique and an important expertise of our department for many years. With energy and climate challenges, there has been a nuclear renaissance worldwide. The Department is well positioned to address some of the environmental challenges with the increased use of nuclear energy.

As always, we are proud of the accomplishments of our students. Their hard work has been recognized in different forms, at both national and departmental levels, as listed in this newsletter. I thank our faculty, students and staff for creating such high quality professional and collaborative atmosphere in the department, making EEES a special place to study and work.

Finally, in this issue, we also acknowledge our donors since the beginning of the current fiscal year. We greatly appreciate these donations during these tough economic times, and we are thankful for your continued and most generous support. THANK YOU!



Tanju Karanfil, Ph.D., P.E., BCEE
Professor and Chair

Departmental Graduate Student Awards



Congratulations to the Graduate Students shown in the picture from left to right that received this year's awards:

Jose Alfaro, South Carolina Environmental Scholars Award; Anthony Reid, A. Ray Abernathy Fellowship; (Dr. Tanju Karanfil); Amer Kanan, South Carolina Environmental Scholars Award; Meric Selbes, L. G. Rich Fellowship; and Richard Hall, South Carolina Environmental Scholars Award.

Department/Faculty News

Environmental Engineering Undergraduate Degree



EEES, in conjunction with BioSystems Engineering, now offers an Environmental Engineering Undergraduate Degree. We will offer a BS degree in Environmental Engineering and a BS degree in Environmental Engineering with a Natural Systems Concentration. It is the only degree program of its type in South Carolina. The degree is generating a lot of interest with students already signing up. Our thanks to everyone who helped pull this new degree program together

and get the information out to the public. A short video about the new degree and curriculum information can be found on our web page.

US News and World Report Graduate Program Rankings for 2010

were announced. The EEES Environmental Engineering graduate program was ranked 17th among public universities. Ninety-five environmental engineering graduate programs around the country were ranked. Environmental Engineering is the highest ranked graduate engineering program in Clemson.

The Department has received a gift of \$10,000 from the Brown Foundation for the express purpose of supporting (1) geology undergraduate creative inquiry and (2) geoscience field courses (GEOL 370 and GEOL 375). This is the culmination of **Dr. Richard Warner's** efforts working through the Clemson Development Office (with Ann Marie Alexander).

Dr. Brian Powell and Yuji Arai will lead a \$1.18 M three year project entitled "Development of a Self-Consistent Model of Plutonium Sorption: Quantification of Sorption Enthalpy and Ligand-Promoted Dissolution" that was selected for funding by the DOE Office of Science, Biological and Environmental Research Program. The external collaborators are Dan Kaplan from SRNL and Udo Becker and Rod Ewing from the University of Michigan. The project will focus on development of a mechanistic model of plutonium reactions at solid-water interfaces.

18th Annual Clemson University/David S. Snipes Hydrogeology Symposium

The 18th Annual Clemson/David S. Snipes Hydrogeology Symposium was held on April 1st at the Clemson Madren Center along with Field trips to the Glassy Mountain area north of Greenville, South Carolina on March 31st and April 2nd. This year's event attracted over 300 attendees with most from South Carolina, but others coming from North Carolina, Georgia, Tennessee, Virginia, Mississippi and Florida.



There were 50 oral and poster presentations given over three consecutive sessions. The theme sessions covered groundwater and soil remediation using oxidation technologies, CO₂ sequestration, well and stream monitoring networks, bioremediation, stream and watershed hydrology, sustainable practices, and the Geology undergraduate Creative Inquiry projects.

In recognition of Clemson's achievements and increasing expertise, **Dr. Fred Molz** has been appointed to a DOE National Panel charged with providing a mid-term review of the DOE Integrated Field Research Challenge (IFRC). The IFRC is comprised of three large 5-year awards for multidisciplinary field-scale research at the 300 Area of the Hanford Site in Washington state, the Y-12 National Security Complex in Oak Ridge, Tennessee and at a former uranium mill tailings site in Rifle, Colorado.

Dr. Cindy Lee in her role as a member of the Environmental Engineering Committee of the Science Advisory Board of the US EPA participated in a public meeting concerning the effects of hydraulic fracturing on drinking water on April 7-8, 2010, in Washington, DC. The goal of the meeting was to provide advice on the EPA's Office of Research and Development (ORD) proposed approach to be used to frame the hydraulic fracturing study design and the areas that will be addressed by research relevant to hydraulic fracturing. The meeting was heavily attended by industry, advocacy groups, and the media.

National Graduate Student Awards

Jose Alfaro, working with **Dr. Shelie Miller**, was selected as one of the recipients of the National Science Foundation 3-year graduate research fellowships (NSF GRF) for students in science, engineering, mathematics, technology, and some social sciences. These are very prestigious awards with a generous support package (\$45k/year).

Darryl B. Jones masters' thesis, "Formation and Control of Iodinated Trihalomethanes in Drinking Water Treatment" was selected to receive the American Water Works Association (AWWA)'s First Place 2010 Academic Achievement Award for the best Master's Thesis. As the winner, **Darryl** will receive a \$3,000 check and plaque and **Dr. Tanju Karanfil** will receive a plaque as the research advisor during the A. P. Black Research Plenary Session on June 22, 2010 at the AWWA Annual Conference in Chicago.

Kelly Grogan was selected as the recipient of the 2010-2011 Robert S. Landauer Fellowship for graduate studies in health physics. This fellowship is sponsored by Landauer, Incorporated. The award will be in the amount of \$6,000 for the purpose of supporting his graduate work at Clemson University this coming academic year.

John Kroon has been selected as the 2010 recipient of the Donald A. and Mary O'Nesky Named Grant of the American Association of Petroleum Geologists. This AAPG Grants-in-Aid award is made in support of John's thesis research, "Molecular Biogeochemistry of Lower Huron and Cleveland Shales in Eastern Kentucky and Southern West Virginia."



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ALUMNI PROFILE

David D. Brown, CHP



David graduated from Clemson in 1993 with an M.S. in Environmental Systems Engineering, focusing in Environmental Health Physics. He began his career with Dames & Moore (now URS Corporation) in Orchard Park, NY. In 1999, David was certified in the comprehensive practice of health physics by the American Board of Health Physics. Answering a call to public service, in 2000, he joined the U.S. Nuclear Regulatory Commission (NRC) in Rockville, MD, and advanced to senior staff by the fall of 2004. His successful projects at the NRC include issuance of a construction authorization for the Mixed Oxide Fuel Fabrication Facility, a major Department of Energy nonproliferation initiative to reduce U.S. surplus stocks of weapon usable plutonium. In 2005, NRC Commissioner Edward McGaffigan, Jr., then starting his third term, selected David as one of a handful of his senior staff.

Following the passing of Mr. McGaffigan in 2007, David returned to a senior staff position to manage several complex waste management and decommissioning projects for the NRC. Today, David is a Senior Health Physicist in the NRC's Office of New Reactors, where he is currently reviewing applications for new nuclear power plants. David enjoys spending time outdoors with his wife, Cathy, and children, Erin and Matthew.

