CLEMSON UNIVERSITY

2010-2011 Academic Year in Review

Environmental Engineering and Earth Sciences

Chair's Corner

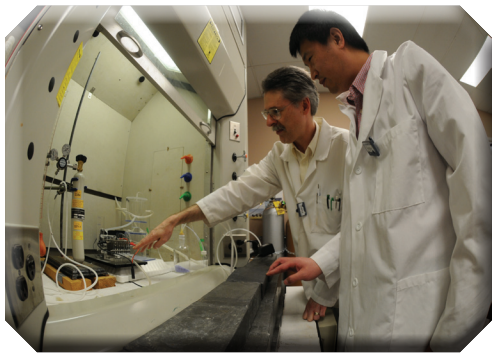
Dear Colleagues and Friends:

I am pleased to present to you a summary of the accomplishments and activities of our Department during the past academic year. The state of the department is strong. We had an exceptional year, despite the significant economical challenges across the nation. We currently have 152 undergraduate and 134 graduate students. New research awards, several of which are from keen national competitions, reached $3.3M in the past year, while research expenditures totaled $2.7M. This is a testament to the hard work and impressive productivity of our talented faculty, students and staff. Three new faculty, Drs. Shuller-Nickles, Coulson and Nammouz joined us. In addition, Biosystems engineering undergraduate and graduate programs joined EEES after the reorganization in the College of Agriculture, Forestry, and Life Sciences. Four Biosystems faculty with their research and teaching on biofuels, bioprocessing, storm-water runoff, erosion control, irrigation and water quality will compliment and further strengthen the Department. We are also very proud of the accomplishments of our students; several of them have received impressive national awards and recognitions, as listed to the right. Several of our faculty have continued to serve on editorial boards of journals and national assignments. Our new environmental engineering undergraduate degree continues to grow. We have about 50 majors after the first two years. We organized another very successful Hydrogeology Symposium with over 300 attendees and 20 exhibitors. On a sad note, Dr. Linvil Gene Rich, the founder of EEES and one of the pioneers and icons in the Environmental Engineering profession passed away on Sept. 29, 2011. Dr. Rich will be greatly missed at EEES and will always be remembered with fondness and pride in the Department and Clemson University. Overall, I am very proud of the exemplary work ethics and productivity of our immensely talented faculty, students and staff.

Tanju Karanfil, Ph.D., P.E., BCEE

Student Accomplishments and Activities

We are proud of our students and their accomplishments. Here are a highlighted few:



Peng Luo (PhD, EE&S) received a 2010-11 Roy G. Post Foundation Graduate Student Scholarship in the amount of $5,000.

Jia Hu's (PhD, EE&S) doctoral dissertation "Exploring Formation and Distribution of Halonitromethanes in Drinking Waters" was selected as one of the best doctoral dissertations completed in 2010 by American Water Works Association.

Viet Duc Dang and **Ting Shao** (PhD, EE&S), were selected as the recipients of Graduate Student Awards from the Division of Environmental Chemistry of American Chemical Society.

Salmatta Ibrahim (MS, Hydrogeology) recently received an award from the Margaret McNamara Memorial Fund (MMMF) administered by the United Nations World Bank.

Glenn Skawski (MS, Hydrogeology) studied in Japan this summer as part of a prestigious 2011 National Science Foundation (NSF) Summer Travel Fellowship.

Hem Joshi (PhD, BE) was selected by the Graduate Fellowship Committee as a Clemson University Outstanding Graduate Researcher.

Kay Millerick and **Francisco Barajas** (PhD, EE&S) attended the US-EC Course in Environmental Biotechnology, Lausanne, Switzerland.

Jim Chamberlain (PhD, EE&S), was awarded a Paul Harris Fellow by Rotary Club International for his work in El Salvador.

Sarah Rudy (MS, EE&S), was selected by the Savannah River Branch of the Health Physics Society to be the 2011 recipient of the Roscoe Hall Memorial Scholarship from Clemson University.

David Hisz (PhD, EE&S) won an Outstanding Student Paper Award for his presentation at the 2010 Fall AGU Meeting in San Francisco, California.

April Gillens (PhD, EE&S) was awarded the 2011 Department of Homeland Security Nuclear Forensics Fellow.

Faculty Research Interests

Our department is a vibrant academic community with focus areas in environmental process engineering, hydrogeology, biosystems engineering, environmental health physics and radiochemistry, environmental chemistry, and sustainable systems:

Dr. Carraway's recent work includes the environmental behavior of metal oxide nanoparticles, measuring metals in SC streams, abiotic reduction of uranium, and photochemical transformations of mercury.

Dr. Castle's research group investigates treatment of energy-produced waters for the purpose of increasing opportunities for beneficial use of these waters.

Dr. DeVol's research centers on in-situ and field-portable instruments and methods for environmental radiation measurements, environmental health physics, radiation monitoring statistics, and nuclear forensics/homeland security.

Dr. Drapcho's research focuses on the development of sustainable bioprocesses for the production of hydrogen gas and valuable co-products from waste agricultural feedstocks.

Dr. Elzerman has been working on sustainability education for diverse groups as well as his traditional environmental chemistry research on contaminants in surface and groundwater systems.

Dr. Falta is investigating CO_2 sequestration, subsurface thermal energy storage, thermal remediation of fractured rocks, probabilistic simulation of groundwater remediation, and aerobic biodegradation of CVOCs.

Dr. Finneran's research focuses on biodegradation/bioremediation and biofuel production; the projects emphasize basic microbial physiology and anaerobic microbial ecology, and how these can be adapted for specific applications.

Dr. Freedman's current research includes development of enrichment cultures for halorespiration of chlorinated ethenes in low pH groundwater, γ-hexachlorocyclohexane, 1,2-dichloroethane, and ethylene dibromide.

Dr. Karanfil's research group investigates the formation and control of disinfection by-products in drinking water, wastewater effluents, and swimming pools, and the behavior of nanomaterials in engineered and natural systems.

Dr. Ladner is finding ways to make membrane separations sustainable for water treatment and biofuels using novel membrane materials, advanced module design, and renewable-energy-driven techniques.

Dr. Lee's research uses enantioselective analytical techniques to understand behavior of chiral pollutants such as PCBs, pesticides, and pharmaceuticals in natural and engineered systems.

Dr. Molz, Research Professor and Distinguished Scientist Emeritus, is working with 2 teams of colleagues: one studying plutonium in soils; the other developing geothermal heat pumps.

Dr. Moysey applies geophysical imaging and geostatistics to study earth processes with current applications in biogeochemistry, carbon sequestration, land mine detection, and water resource sustainability.

Dr. Murdoch's current research involves field investigations and theoretical analyses to improve understanding of aquifer geomechanics, environmental remediation, transport through fractured media, and CO_2 sequestration.

Dr. Overcamp's research is primarily in air pollution. Currently, he has a project assessing air quality in Southeast Asia using satellite data.

Dr. Owino's research interests are in the areas of water quality, irrigation and drainage, horticultural engineering.

Dr. Powell's current research focuses on understanding radionuclide and nanoparticle environmental behavior, radioactive waste disposal performance assessment, characterization of solid-water interfacial reactions, and nuclear forensics.

Dr. Privette's current research interests are in the areas of hydrology, stormwater, run-off and erosion control best management practices, low impact development.

Dr. Schlautman investigates the reactivity, fate and transport of metal and organic contaminants; carbon cycling in soils and streams; and impacts of land use on water quality.

Dr. Shuller-Nickles' research combines computational and experimental methods to understand the thermodynamic stability of actinide-containing materials and the kinetics governing oxidation-reduction reactions at solid-liquid interfaces.

Dr. Walker's research group focuses on conversion of lignocellulosics, vegetable-based oils and glycerine by-products to algal and fungal oils, enzymes and alcohols used primarily in biofuels production.

Environmental Engineering Undergraduate Degree Growing

EEES now offers an Environmental Engineering undergraduate degree. This is the only program of its type in South Carolina. The degree began in the Fall of 2010 with 15 students and followed this Fall with another 35 students. It has been generating a lot of interest with the students. Watch our video on our website about the new degree.

Dr. Lindsay Shuller-Nickles joined EEES as an Assistant Professor this Fall. She received her PhD in Materials Science and Engineering at the University of Michigan in 2010. Lindsay's research integrates computational and experimental techniques to better understand the thermodynamic stability and kinetics that control the behavior of radionuclides in the environment.

Dr. Minory Nammouz also joined EEES this Fall as a Lecturer. She received her PhD in curriculum and instruction at Clemson University in 2005. Minory is designing and teaching physical science courses for elementary education majors that emphasizes the interconnections among the various science disciplines. Her primary research interest is in understanding how students learn.

Dr. Alan Coulson joined the EEES faculty last Fall as a Lecturer. He received his PhD in GeoSciences from the University of South Carolina in 2009. His primary teaching and research interests are vertebrate paleontology and stable isotope geochemistry relating to paleoenvironmental reconstruction.

Dr. Stephen Moysey, alumnus **Dan Matz** (MS, EE&S, 2010) and collaborators from India were honored with a "Best of SAGEEP" award for their paper "Integrating hydrology and geophysics to evaluate the impact of artificial recharge on groundwater in rural India" presented at the 2011 Symposium on Applications of Geophysics to Engineering and Environmental Problems held in Charleston last spring. As part of the award **Dr. Moysey** gave the presentation at the European Association of Geoscientists & Engineers meeting in Leicester, England this September.

Dr. Tanju Karanfil visited Beijing, China May 24-30 to give an invited talk at the International Workshops on Endocrine Disrupting Compounds, Pharmaceuticals, Personal Care Products and Disinfection By-Products organized by VEOLIA and Tsinghua University. He also gave a talk at the School of Environmental in Tsinghua University.

Faculty National Activities

Editorial Boards or Editorial Advisory Boards

Dr. Jim Castle, Editor in chief, Environmental Geosciences

Dr. Alan Elzerman, Editorial Advisory Board, Environmental Science and Technology

Dr. Ron Falta, Associate Editor, Vadose Zone Journal

Dr. Tanju Karanfil, Editorial Advisory Board, Journal of American Water Works Association

Dr. Kevin Finneran, co-Editor-in-Chief, International Journal of Soil, Sediment, and Water.

Dr. Cindy Lee, Associate Editor, Environmental Toxicology and Chemistry

Dr. Tom Overcamp, Associate Editor, Journal of Air and Waste Management Association

Committee or Board Appointments and Assignments

Dr. Alan Elzerman, Member, Executive Committee, Council of Environmental Deans and Directors

Dr. Brian Powell was selected to augment the USEPA Scientific Advisory Board, Radiation Safety Committee for a technical review of post-closure operations of uranium in-situ leach/in-situ mining operations.

Dr. Cindy Lee, Member, Environmental Engineering committee of the Science Advisory Board of the USEPA.

Dr. Larry Murdoch, Chair, Board of Directors of CUAHSI, the Consortium of Universities for the Advancement of Hydrologic Sciences. Geoscientist on the Experimental Design Committee for the Deep Underground Science and Engineering Laboratory (DUSEL).

Books Published by EEES Faculty

Lois Breur Krause, "How We Learn and Why We Don't: Student Survival Guide Using the Cognitive Profile Inventory" 4th Edition (2003).

Ron Falta "Vadose Zone: Science and Technology Solutions, Volumes I and II" (2000) with Brian Looney.

Bob Fjeld "Quantitative Environmental Risk Analysis for Human Health" (2007) with N. A. Eisenberg and K. L. Compton.

Leslie Grady "Biological Wastewater Treatment, Third Edition Revised and Expanded" (2011) with Glen Daigger, Nancy Love and Carlos Filipe.

Tanju Karanfil "Disinfection By-Products in Drinking Water: Occurrence, Formation, Health Effects and Control" (2008) with Stuart Krasner, Paul Westerhoff and Yuefeng Xie.

Drapcho, C. and **Walker, T.** Biofuels Engineering Process Technology (2008) with N. Nghiem.

Emeritus Professor **John R. Wagner,** Geology, received the South Carolina Science Council's highest award for a science educator at the Council's annual convention held at the Myrtle Beach Convention Center. The 'Catalyst Award for Educational Excellence' is presented each year to a science educator who has made a significant difference in the way science is taught in the state of South Carolina.

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Biosystems Engineering Graduate and Undergraduate Programs join EEES. We welcome the following faculty:

Dr. Caye Drapcho, Associate Professor
Research focuses on the sustainable production of biofuels, primarily hydrogen gas, from waste agricultural feedstocks; and on carbon capture/high-value product formation by freshwater algal cultures.

Dr. Charles V. Privette III, Assistant Professor
Professional engineering licensure in South Carolina. He provides instruction on innovative engineering design for water quality/quantity issues as related to storm-water runoff and erosion control.

Dr. Terry Walker, Professor
Bioprocess engineering research and design. His research emphasizes sustainable engineering for integrated bioprocessing of feedstock materials to bioenergy and high-value components.

Dr. Tom Owino, Associate Professor
Research interests are water quality, irrigation and drainage, and horticultural engineering.

The 19th Annual Clemson David S. Snipes Hydrogeology Symposium

The Hydrogeology Symposium was held this year on April 7th at the Madren Center along with field trips on the Chattooga River on April 8th and April 9th. This year's event attracted over 300 attendees with most from SC but others coming from NC, GA, TN, VA, MS, and FL. There were fifty oral and poster presentations given over three consecutive sessions. The theme sessions covered innovative techniques for groundwater and soil remediation using oxidation technologies, CO_2 sequestration, Constructed Wetland Treatment Systems, well and stream monitoring networks, bioremediation, stream and watershed hydrology, and the Geology undergrad Creative Inquiry projects.

Dr. Ron Falta presented research on dissolved CO_2 exsolution from brines, **Dr. Larry Murdoch** gave a talk on using casing deformation to monitor CO_2 injection, and **Dr. Stephen Moysey** discussed detection of preferential multiphase flows in the subsurface. Graduate students giving oral presentations included **Dave Hisz, Kirk Ellison, Catherine Ruprecht, Chris Patterson, Kristen Jurinko, Tina Ritter, Michael Pardue, Alex Beebe, Clay Freeman, Rich Hall, Dan Matz, Fei Chen, Adam Mangel,** and **Johnathon Ebenhack.** Recent graduates **Jim Henderson** and **Dan Matz** returned to give talks as well. A complete list of presenters and the titles of their talks can be found at: http://www.ces.clemson.edu/hydro/symposium/speaksched.htm

The field trips were led by **Scott Brame**. They consisted of a river level examination of the rocks and processes that have shaped the morphology of the Chattooga River.