CLEMSON UNIVERSITY

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E³S Year in Review

Department of Environmental Engineering and Earth Sciences

Chair's Corner

Dear Colleagues and Friends:

I am pleased to present you a brief summary of the activities and accomplishments of our Department during the past academic year. More detailed information can be found on our web page. As documented in this summary, our department is a vibrant academic community with focus areas in environmental process engineering, hydrogeology, environmental health physics and radiochemistry, environmental chemistry, and sustainable systems. Despite challenges around the country and in our state, the department had a very successful year. Our faculty have received several significant competitive fundings, a few are documented here. Drs. Freedman and Grady were both recognized with impressive publication awards. The number of CAREER Awardees in the department increased to five by Dr. Miller joining the group with her new award on environmental sustainability. Several of our faculty have continued to serve on editorial boards of journals and national assignments. We are also proud of the accomplishments of our students; several of them have received national and state wide recognitions. We organized another very successful Hydrogeology Symposium with over 350 attendees and 25 exhibitors. We had an interesting discussion on Climate Change by participation of two prominent speakers presenting opposing views on this important topic. The kick off seminar of Dr. Alan W. Elzerman Series was also held on our Campus. Special thanks to our dedicated staff for continuing to support the mission of the department. Overall, this was a very busy and productive year!

Tanju Karanfil

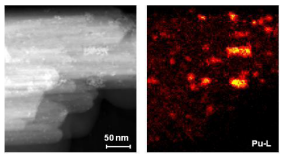
Tanju Karanfil, Ph.D., P.E., BCEE

Faculty Research

Several faculty have received impressive research grants. A few examples are represented below:

Drs. Ron Falta and **Larry Murdoch** were recently awarded an EPA Science to Achieve Results (STAR) grant to pursue research related to geologic sequestration of carbon dioxide (CO_2). Geologic storage of CO_2 is considered to be one of the most promising alternatives for reducing global CO_2 emissions to the atmosphere. The three-year, $891k project, titled "Understanding and Managing Risks Posed by Brines Containing Dissolved Carbon Dioxide" involves laboratory experiments and numerical modeling to better understand the injected CO_2 behavior. This project focuses on the unique properties of CO_2 dissolved in brines at high pressures (>1000 psi). Under these conditions, the aqueous solubility of CO_2 can be 50 g/l or more. The project is a collaborative effort between Clemson University and Stanford University. The work at Stanford will be directed by Dr. Sally Benson, an adjunct faculty member in the EEES department. Benson is currently director of Stanford's Global Climate & Energy Project.

Drs. Jim Castle and **John Rodgers** were recently awarded more than $800k to find economical and environmentally sensible ways to treat waters that come out of the ground during oil and natural gas production. Funding is from the U.S. Department of Energy and Chevron of Houston, Texas. Department of Energy experts say that "co-produced water comprises 98 percent of all waste generated by U.S. oil and natural gas operations. Handling and disposal of this water is the single greatest environmental impediment to natural gas and oil exploration and production." Castle and Rodgers are developing constructed wetland systems to treat the contaminated water for reuse. They have developed similar constructed wetlands for the energy industry, such as treating water used in coal-burning power plants. In addition to decreasing environmental risks, constructed wetland treatment systems generate treated water reusable for many purposes, including irrigation, livestock watering, cooling-tower water, and municipal water use.



Dr. Brian Powell will collaborate on a proposal ($6 million over five-years) funded by the Department of Energy's Office of Science, Biological and Environmental Research (BER). The project will be lead by Dr. Annie Kersting and Dr. Mavrik Zavarin at the Lawrence Livermore National Laboratory and focus on understanding the dominant geochemical processes that control plutonium transport in the environment. Plutonium geochemical behavior is influenced by complex chemical, physical, and biological processes. For example, plutonium associated with groundwater colloids (such as nanoscale mineral particles) has been shown to facilitate accelerated transport of plutonium in groundwater. However, very little is known about the association of plutonium with these colloids. The figure demonstrates strong association of plutonium colloids associated with the iron oxyhydroxide mineral goethite. This project will provide the DOE with models which provide a scientific basis to support decisions for the remediation and long-term stewardship of contaminated legacy sites.

Student Awards

Jesse Addison received the American Water Works Association's (AWWA) Second Place 2009 Academic Achievement Award for the best Master's Thesis.

Darryl Jones, an EE&S MS student received the 2009 AWWA LARS PhD Fellowship.

Chaquetta Greene, one of our undergraduate students in Geology received the American Geological Institute's Minority Scholarship for the 2008-09.

Dave Hisz, a Hydrogeology MS student**,** won the Outstanding Student Paper Award at the 2008 Fall Meeting of the American Geophysical Union in San Francisco.

Hari Shankar Peethambaram, a current EE&S graduate student, was selected as a recipient of The Ivanhoe Foundation Fellowship.

2009 EEES Student Awards

A. Ray Abernathy Fellowship
Jennifer Horner

Linvil G. Rich Fellowship
Darryl Jones

2009 Graduate Teaching Assistant Award in Geological Sciences
Curtis Gebhard

Environmental Scholars
Hailian Liang
Dan Matz
Sam Sarkar

Thomas F. Logan, Jr. Geology Merit Award
Kirk Ellison
Ben Robinson

Jean G. Stillwell Award
Jamie Ryan

Student News and Accomplishments

Students from **Dr. Shelie Miller's** EES 486/686 Pollution Prevention and Industrial Ecology class wrote a successful proposal for $10,000 to the EPA's People, Planet and Prosperity program, addressing the solid waste management problem of waste tires on the island of Dominica.

Jennifer Oblinger, an MS candidate in Hydrogeology, under the direction of **Dr. Stephen Moysey**, received a $500 NGWREF Farvolden scholarship for her talk entitled "Assessing the Impact of Water Harvesting on Water Resources in Rural India" at the 2008 National Ground Water Association Ground Water Summit in Memphis, Tennessee.

Dr. Freedman's research group (doctoral students **Huifeng Shan** and **Vijai Elango** and undergraduate researcher **Audrey Bone)** presented four papers at the Tenth International Battelle Symposium on In Situ and On-Site Bioremediation in Baltimore, Maryland in May.

Arika Bridhikitti presented the following platform papers coauthored with **Dr. Tom Overcamp:** "Comparison of MODIS Aerosol Products and AERONET and Their Dependences On Land Surface Brightness and Aerosol Type: The Study in Southeast Asia," and "Understanding Optical Characteristics of the Southeast Asia's Regional Aerosol," at the Annual Meeting of the Air & Waste Management Association, Detroit, MI, June 16-19, 2009.

Jim Chamberlain presented a paper at the American Society of Engineering Education (ASEE) conference in Austin, Texas, on June 15. The title was "Forming a Culture of Engineering: Undergraduate Research Projects in a Developing Country".

Dr. Karanfil's research group **Jia Hu, Ting Shao, Darryl Jones, Sule Kaplan, Amer Kanan and Meric Selbes** attended the 19th Annual South Carolina Environmental Conference in March. They presented six posters and five of them won awards**.**

Todd Miller gave a presentation at the 238th American Chemical Society Meeting in Washington DC titled "Determination of Subsurface Transport Parameters of Neptunium in Southeastern U.S. Soils" which was coauthored with **Amy Hixon** and **Dr. Brian Powell.**

Kathryn M. Hajdu, senior Geology major with a concentration in Hydrogeology, won a university award for her Creative Inquiry e-portfolio. She was a member of the Creative Inquiry project, "Analysis of Water Sustainability Issues in Jagatpura, India."

Faculty Accomplishments

Dr. David Freedman was awarded the 2008 Association of Environmental Engineering and Science Professors (AEESP) Outstanding Publication Award. This very prestigious recognition by the AEESP is given annually to recognize the author(s) of a "landmark environmental engineering and science paper that has withstood the test of time and significantly influenced the practice of environmental engineering and science."

> **Freedman, D. L., and J. M. Gossett.** 1989. Biological reductive dechlorination of tetrachloroethylene and trichloroethylene to ethylene under methanogenic conditions. Appl. Environ. Microbiol. 55(9):2144-2151.

Dr. Tom Overcamp was presented with the Outstanding Associate Editor Award, Journal of the Air & Waste Management Association.

NSF Career Awards

Dr. Shelie Miller received the National Science Foundation (NSF) CAREER Award of $400,000 for a project entitled "Creating a Predictive and Dynamic Life Cycle Assessment". This prestigious award is granted to junior faculty members demonstrating potential for excellence in both research and education. **Dr. Miller** is currently analyzing switch grass, a hardy perennial grass that shows promise as a biofuel. This brings the number of our CAREER award recipients to five.

Other recipients of this award include:


Carraway


Karanfil


Murdoch


Schlautman

Other Faculty News

The 17th annual **Clemson/Dave Snipes Hydrogeology Symposium** was held on April 2nd on the Clemson campus. This year's event attracted over 370 attendees and 26 exhibitors. The keynote presentation was made by Dr. Peter Cook of Australia.

Dr. Richard Warner established the Dr. David S. Snipes Memorial Student Assistance Endowment. Dr. Snipes was a professor of geology at Clemson University from 1968 until his retirement in 1998 and was the driving force in the formation of annual hydrogeology symposium.

Scientists Michael MacCracken and John Christy presented contradictory viewpoints on global warming in April as the final seminar organized by retiring Dempsey Professor **Bob Fjeld**, underwritten by the Jerry E. and Harriet Calvert Dempsey Endowment. The event was cosponsored by the Strom Thurmond Institute, the Clemson Environmental Institute, and the Department of Environmental Engineering and Earth Sciences.

Dr. Robert G. Ford of the US EPA gave the inaugural seminar for the Alan W. Elzerman Seminar Series. The Series was established to honor the contributions of Dr. Elzerman to the department, university and environmental chemistry by **Dr. Cindy Lee** and **Riley Stevens**.

Faculty National Activities

Editorial Board or Editorial Advisory Board

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. 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. Cindy Lee, Member, Environmental Engineering committee of the Science Advisory Board of the US EPA

Dr. Larry Murdoch, Member, Board of Directors of CUAHSI, the Consortium of Universities for the Advancement of Hydrologic Sciences. The geoscientist on the Experimental Design Committee for DUSEL, The Deep Underground Science and Engineering Laboratory.

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, Second Edition Revised and Expanded" (1999) with Glen Daigger and Henry Lim.

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

Dr. Leslie Grady and **Dr. Bill Hiatt (EE&S PhD 2006)** were selected to receive 2009 Rudolf Industrial Waste Management Medal from Water Environment Federation for their publications in the Water Environment Research journal:

Hiatt, W. C. and Grady, C. P. L. Jr., "An updated process model for carbon oxidation, nitrification, and denitrification", Water Environment Research, 80, 2145-2156, 2008.

Hiatt, W. C. and Grady, C. P. L. Jr., "Application of the activated sludge model for nitrogen to elevated nitrogen conditions", Water Environment Research, 80, 2134-2144, 2008.

Dr. Larry Murdoch was invited to give a talk entitled "Building a community modeling platform for hydrology" at the MODFLOW 2008 Conference. **Dr. Murdoch** also presented a paper at the 2008 computational Methods in Water Resources Conference, and convened a special session on hydrologic modeling at this conference as well as at the 1st CUAHSI National Colloquiem.

Dr. Tanju Karanfil gave an invited lecture entitled "Formation and Control of Disinfection By-Products" at the SC AWWA Partnership for Safe Water Committee Workshop in Columbia, South Carolina, on May 20, 2009.

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Alumni News

Dr. Nancy Love (EE&S PhD 1994) has recently been appointed as Chair of the Department of Civil and Environmental Engineering's (CEE) at the University of Michigan. **Dr. Leslie Grady** served as **Nancy's** advisor.

Dr. Susan Morgan (EE&S PhD 1995) has been promoted to full professor and Chair of the Civil Engineering Department at Southern Illinois University, Edwardsville. Dr. Morgan joined the Civil Engineering Department at SIU-E after completing her dissertation research with **Dr. Cindy Lee.**

Dr. Claudia Gunsch (EE&S MS 2000) received the National Science Foundation (NSF) CAREER Award. She is currently an assistant professor at Duke University. **Dr. David Freedman** served as Claudia's advisor.

Dr. Stephen Graef (EE&S PhD 1976) was selected for the 2009 Stanley E. Kappe Award which is presented by the American Academy of Environmental Engineers. **Dr. Graef** retires after 17 years with Renewable Water Resources, ReWa, (formerly Western Carolina Regional Sewer Authority) on January 17, 2009. During retirement, he will serve as a part time special consultant to the Executive Director of ReWa, as well as providing some private consulting affiliations that do not conflict with ReWa.

John Sivey (EE&S MS 2005) was awarded an EPA STAR Fellowship for the 2008-09 academic year. John is pursuing his PhD in Environmental Engineering at Johns Hopkins in Baltimore. John received his MS degree under the direction of **Dr. Cindy Lee.**

Richard Edwards (EE&S MS 1974) Director of Pfizer's Waste and Wastewater Networks and recently celebrated his 30th anniversary working with the company in the environment field, will be traveling to Kampala, Uganda later this month to work with Water Aid as a Global Health Fellow. Water Aid's extensive network and resources span 17 countries in Africa and Asia and play a key role in the wider international WASH campaign, advocates for water, sanitation, and hygiene for all. In Uganda, Richard will support local efforts in urban waste and wastewater planning/project execution, and help establish viable sanitation programs.