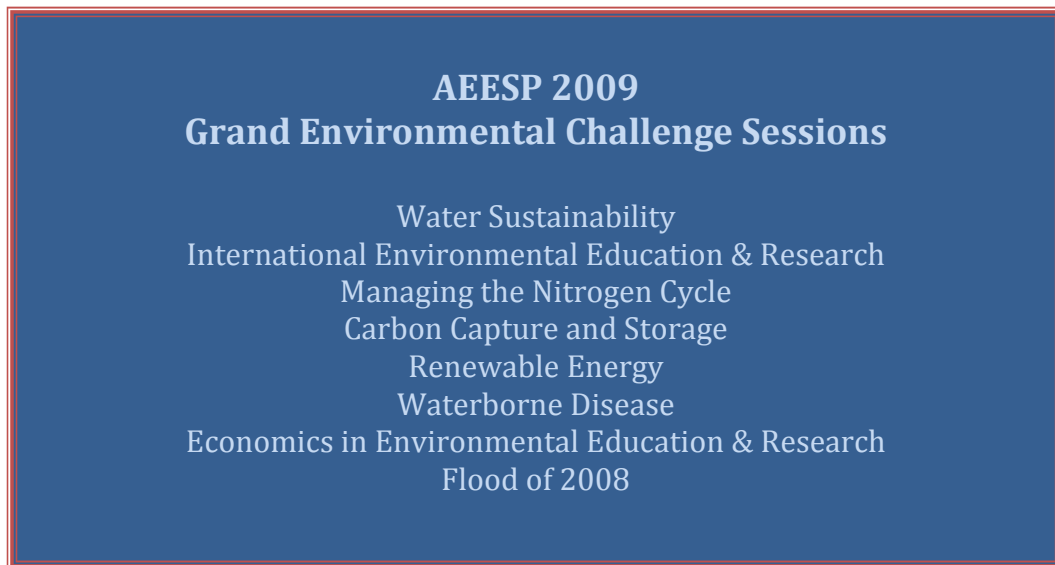


Call for Abstracts
Due: April 3, 2009
www.aeespiowa.org

We would like to invite abstract submissions for the AEESP 2009 conference on Grand Challenges in Environmental Engineering and Science. The conference will be held at The University of Iowa on July 26th-29th, 2009. The conference will have several sessions focused on the **Grand Environmental Challenges** that have been proposed by the AEESP community. We would especially like to encourage presentations focused on both research and education. An abstract template is available at www.aeespiowa.org. Abstracts are due April 3, 2009 and can be emailed to aeesp@engineering.uiowa.edu.



This year we are also inviting students to apply for the **2009 AEESP Grand Challenge Student Paper Award**. This is a competitive award and submitted papers will be reviewed by an Awards Committee. The format for the paper should follow that of *Environmental Science and Technology*, including citation format and page limits. Award winners will receive a \$500 travel award to present their papers at the 2009 AEESP conference. For more details on award eligibility and submission process, please see the student paper award guidelines posted at www.aeespiowa.org.

We hope you will join us!

AEESP 2009 Organizing Committee

Michelle Scherer (chair), Craig Just (co-chair), Tim Mattes (co-chair), Keri Hornbuckle, Gene Parkin, Jerry Schnoor, and Rich Valentine.

Grand Challenge #1: Water Sustainability (Sponsored by Hazen and Sawyer)

Addressing water sustainability through reuse: technological, policy, and educational challenges

Chairs: David Cwiertny, Sharon L. Walker, and Mark Matsumoto (University of California, Riverside).

The expanding human population, limits on available fresh water, and the projected effects of global climate change require that sustainable water practices be developed to meet future water needs. Paramount to water sustainability are water reclamation and reuse strategies including the use of treated wastewater for agricultural and landscape irrigation, habitat restoration, and recharge of underground drinking water aquifers. This session will focus on the engineering, policy, and societal challenges in implementing wide-spread water reuse strategies in urban, suburban and developing areas. Relevant topics for speaker presentations include:

- Current practices and novel approaches for treating and reusing wastewater;
- Current and future challenges associated with the implementation of policy related to water reuse practices;
- Infrastructure needs to support an increased dependence on water reuse;
- Educational approaches to prepare future engineers to be well-versed in water-reuse strategies.

Invited speakers scheduled to attend and participate in a panel discussion on water sustainability and reuse include:

Audrey Levine – US EPA, National Program Director for drinking water

Walter J. Weber – University of Michigan

R. Rhodes Trussell – Trussell Technology, Inc.

Brent M. Haddad – U.C. Santa Cruz

Mark R. Matsumoto – U.C. Riverside

Grand Challenge #2: International Environmental Education & Research

International Collaborations in Environmental Research and Education

Chairs: Volodymyr V. Tarabara (Michigan State University), Mark R. Wiesner (Duke University)

Session organized by PERMEANT (Partnership for Education and Research in Membrane Nanotechnologies)

The increasingly international scope of environmental science and engineering is being shaped in large part by the global nature of grand challenges facing the next generation of environmental scientists and engineers. These challenges range from climate change and water supply to establishment of international standards on the materials we produce. International collaboration in research and education is key to both resolving these problems and establishing an international community of environmental professionals that will address these issues. Preparing internationally-competent scientists and engineers thus becomes a need that is crucial for successfully countering the emerging environmental challenges. With this in mind, NSF created “Partnerships for International Research and Education (PIRE) program ...to catalyze a cultural change in U.S. institutions by establishing innovative models for international collaborative research and education.”

The proposed session will serve a forum for AEESP members to share their experiences with international collaborations involving education and research activities. Both research-oriented and education-oriented papers are invited. The focus of research-oriented talks will be on the following areas related to the proposed Grand Environmental Challenges:

- Emerging technologies for water quality control
- Environmental applications and implications of emerging technologies
- Novel materials including nanomaterials for safer, cleaner environment
- Environmentally-friendly water and energy technologies

The goal of the session is to promote knowledge exchange on issues critical for the successful creation of accessible, affordable, safe, and intellectually challenging study and research abroad experiences. Potential points of discussion include: (i) Opportunities and challenges of collaboration with international partners from countries across geographical, political, economical spectra; (ii) Models for initiating and sustaining international partnerships; (iii) Innovative educational approaches (e.g. co-advisership, cross-curriculum initiatives); (iv) Identifying, securing and sustaining financial support for international collaborations.

Grand Challenge #3: Managing the Nitrogen Cycle

Managing the Nitrogen Cycle – A National Academy of Engineering Grand Challenge

Chairs: Susan Powers (Clarkson University), Thomas Theis (University of Illinois at Chicago), Shelie Miller (Clemson).

Global increases in the release of anthropogenic reactive nitrogen (Nr) to the environment have resulted in major shifts in the earth's biogeochemical nitrogen cycle. These shifts have come about through three primary human activities: fossil fuel combustion, fertilizer application, and the widespread planting of legumes. Reactive nitrogen is implicated in a range of serious environmental and human health impacts ranging from hypoxia in the Gulf of Mexico and Chesapeake Bay due to ammonia and nitrate, to climate change due to nitrous oxide, to increased asthma rates due to formation of ground level ozone from nitrogen oxides. Biotic and abiotic transformations of nitrogen in the environment are part of a complex biogeochemical cycling that is greatly affected by anthropogenic activities. Collectively these transformations and their resultant impacts are referred to as the nitrogen cascade.

This session will be dedicated to understanding nitrogen sources, their environmental transformations, impacts on human and ecosystems, and the mitigation of these impacts. A key note presentation will be provided by Dr. James Galloway, University of Virginia, author of the seminal paper on the Nitrogen Cascade and current co-chair of the EPA Science Advisory Board's Integrated Nitrogen Committee. Other oral and poster presentations will be selected from submitted abstracts. Example topics include:

- Modeling or measuring the fate and transformation of nitrogen in air water and soil systems
- Inventory of nitrogen sources
- Connections between the air/water emissions and the resulting environmental and societal impacts
- Technologies and practices to reduce non-point nutrient loads and eroded soil to surface water
- Methods for the large scale mitigation of Nr in the environment and treatment systems
- Introduction of Nr and its impacts in undergraduate or graduate classes as an illustration of complex biogeochemical cycling and the role of anthropogenic activity in perturbing the cycle
- Example classroom case studies or projects related to nitrogen sources, fate, impacts, or mitigation

Grand Challenge #4: Carbon Capture and Storage

Science and Engineering Challenges in Carbon Capture and Storage (CCS)

Chairs: Catherine A. Peters (Princeton University), Subhasis Ghoshal (McGill University), Charlie Werth (University of Illinois at Urbana-Champaign)

Carbon capture and storage (CCS) refers to capture of carbon dioxide from stationary sources, transport, and disposal in geological formations, the deep ocean or mineral carbonates. Worldwide, there are nearly 5000 stationary sources large enough to be candidates for CO₂ capture, and their emissions account for more than 10 GtCO₂ per year. Geological formations have the potential to store 11,000 GtCO₂, sufficient capacity for hundreds of years of global CO₂ emissions. The IPCC has concluded that CCS may contribute as much as 50% to the cumulative worldwide effort to mitigate emissions of carbon dioxide.

Widespread adoption of this promising technology will require a sound understanding of the long term fate of carbon dioxide that is injected into geological formations. Potential complications derive from the relative buoyancy of CO₂, its potential to acidify formation waters, and the possibility that CO₂ can contain and mobilize other contaminants. Leakage of CO₂ would, at best, defeat the purpose, and at worst could cause CO₂ buildup in near-surface structures, contaminate potable aquifers, and increase frequency of seismic activity. In recognition of the possible environmental impacts of CO₂ leakage from target formations, the EPA has proposed requirements for CO₂ geologic sequestration (released July 2008) that are designed to ensure protection of underground sources of drinking water.

This session will highlight the research and educational activities aimed at building a sound scientific base for CCS development and preparing engineering graduates for this field. The fundamental research questions relate to the fate of CO₂ in target formation, its impact on water-rock reactions and structural integrity, the risk of leakage, the impact of leaked CO₂ on potable water, the optimal strategies for monitoring and verification. As the carbon mitigation industry emerges, environmental engineers will be expected to play an important role in the development of CCS. However the curricula at most U.S. universities presently do not prepare students for this role. All of the speakers will include a description of their innovative educational initiatives related to carbon mitigation.

Grand Challenge #5: Renewable Energy (Sponsored by Strand Associates, Inc.)

Renewable Energy: Research & Education

Chairs: Rick Diz (Gannon University) and Craig Just (University of Iowa)

This session would explore how we as a profession should educate our students and conduct innovative research in the area of renewable energy. The educational presentations could include the incorporation of energy-related topics into introductory and upper level courses, such as the interface between energy and water usage, waste treatment, food production, environmental justice, climate change, mineral extraction and refining, etc. Research topics could include the work being done by environmental engineering professors relating to the production of energy from biomass and other sources, as well as to the environmental consequences of nuclear, hydroelectric, wind, tidal (and wave), geothermal, and solar power. One such topic could be: “The Environmental Implications of the T. Boone Pickens Plan.”

Grand Challenge #6: Waterborne Disease

Innovative approaches for studying the abundance, environmental fate and disinfection of waterborne pathogens

Chairs: Joan Rose (Michigan State University), Tamar Kohn (Swiss Federal Institute of Technology, Lausanne) and Helen T. Nguyen (University of Illinois at Urbana-Champaign).

The occurrence of waterborne pathogens in drinking and recreational waters remains a serious threat to public health in all parts of the world. Alarmingly, waterborne disease outbreaks are directly related to heavy rainfall events and are therefore considered a growing public health risk associated with the anticipated effects of global warming. Research activities relating to waterborne disease have rapidly increased over the past two decades. Nevertheless, we are still lacking some of the most basic tools to efficiently study the fate and survival of pathogens both in environmental and water treatment settings. In particular, sensitive detection methods as well as tools to assess pathogen viability and infectivity are frequently lacking. In recent years novel methods for monitoring pathogens at low abundance, and for evaluating their viability, have emerged. We seek presentations that highlight these advances in diagnostics and their application for pathogen control and risk assessment. Topics include but are not limited to:

- New diagnostics for waterborne pathogens at the wastewater facility, at the watershed level, at the drinking water treatment plant, in the distribution system;
- Incorporating information from new tools in the decision making process
- Advances in -modeling the fate, transport and risks of pathogens in natural and engineered systems;
- International experiences for faculty and students on both research and education related to waterborne pathogens

Confirmed invited speakers:

- Rachel Noble, UNC (various molecular methods for detection of bacteria and viruses)
- Patrick Gurian, Drexel University (Decision making tools)
- Benito Marinas, University of Illinois at Urbana-Champaign (Disinfection for drinking water treatment, disinfection byproducts, disinfection technology for developing countries, international experience for students in research and education)

Grand Challenge #7: Economics in Environmental Research and Education

The Role of Economics in the Future of Environmental Research and Education

Chair: Gregory W. Characklis (University of North Carolina at Chapel Hill)

Decisions regarding society's most challenging environmental problems are made with attention to both scientific and economic arguments, with economic criteria playing an ever larger role. Whereas many environmental choices of the past involved benefits perceived to be well in excess of costs (e.g., chlorinated drinking water, secondary wastewater treatment), many current decisions involve a much narrower gap between the two. Economic terms and concepts have become ubiquitous in environmental policy debates, with discussions over climate change mitigation efforts often revolving around "discount rates", while concerns over "equity" frequently play a significant role when considering activities designed to promote sustainability. Even when discussing more traditional regulatory themes (e.g., drinking water standards), cost-benefit analysis has become a common (and federally mandated) part of the decisionmaking process. Economic principles also play an increasing role in the development of new regulatory schemes, with market- or incentive-based approaches receiving increased consideration. As a result, an awareness of economic principles, or better yet, an ability to incorporate economic concepts into environmental research, will be critical if environmental engineers and scientists wish to use their work to inform society's debate on how to best manage the most pressing environmental challenges. While the natural and social sciences can sometimes seem a bit remote, they can complement each other well, as engineering knowledge is often critical for determining the costs of various technological approaches to mitigating environmental impacts, while economics provides methods for valuing the benefits of the environmental quality improvements measured by scientists.

This conference session is intended to provide relevant examples of these types of collaborations, while also providing examples of fertile areas of current/future inquiry. The session will also address the challenges associated with introducing economic concepts to engineering and science students in the classroom. It is important that these students gain a greater understanding of the structure that economics provides for analyzing tradeoffs, an objective that goes far beyond the simple accounting techniques many students are exposed to in traditional "engineering economics" courses.

Grand Challenge #8: Flood of 2008

Science and Engineering Challenges Presented by Large-Scale and Episodic Floods

Chairs: Larry Weber, Witold Krajewski, and Keri Hornbuckle (University of Iowa)

Recent floods in Iowa and other Midwestern states have affected the lives of thousands and caused much destruction of property. At the University of Iowa campus alone, the losses are estimated to near \$250M and in the neighboring city of Cedar Rapids, losses exceeded \$1B. The floods exposed serious gaps in our scientific knowledge and engineering methods as well as many shortcomings of our social, economic, and political organizational structures. These events also energized the academic community of environmental engineers and scientists, bringing to the forefront numerous important and interesting physical and social science research questions.

This session will highlight the research and educational activities that examine the causes and impacts of recent floods in Iowa and elsewhere. The fundamental research questions relate to the natural and anthropogenic causes of the flood; environmental impacts on the landscape and in cities as a result of flooding; and engineering responses.