

CCEE NEWS

DEPARTMENT OF CIVIL, CONSTRUCTION, AND ENVIRONMENTAL ENGINEERING
COLLEGE OF ENGINEERING NORTH CAROLINA STATE UNIVERSITY | SPRING 2013



WAVE WATCHERS

CCEE RESEARCHERS INVESTIGATE COASTAL PROCESSES AND CHALLENGES AT THE COASTAL STUDIES INSTITUTE IN MANTEO

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**NC STATE
UNIVERSITY**



**COLLEGE OF
ENGINEERING**

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EDITOR Chris Frey

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Chris Frey (Chair), Chris Bobko (Student Feature Editor), Bob Borden, Lora Bremer (Development Editor), Joe DeCarolis (Co-Webmaster), Tasnim Hassan (Research News Editor), Ed Jaselskis, Paul Khosla (Awards Editor), Kumar Mahinthakumar (Co-Webmaster), Brina Montoya, Billy Williams (Features Editor), Emily Zechman (Student Groups Editor)

CONTRIBUTORS TO THIS ISSUE

Mort Barlaz, John Baugh, Lora Bremer, Francis de los Reyes, Joe DeCarolis, Joel Ducoste, Tasnim Hassan, Richard Kim, Brina Montoya, Ranji Ranjithan, William Rasdorf, Billy Williams, Emily Zechman

PRODUCTION STAFF

Jennifer Weston, Nate DeGraff, Sarah Stadler, Candice Wallace, College of Engineering

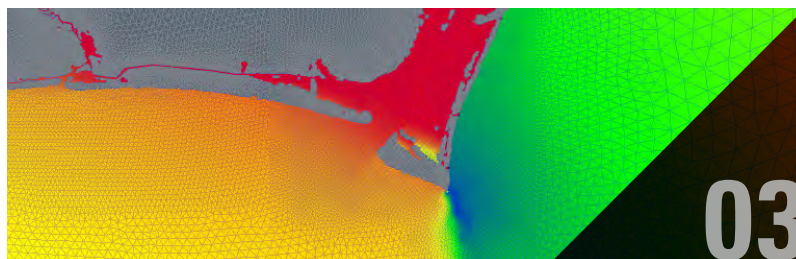
CCEE News is published by the Department of Civil, Construction, and Environmental Engineering to share information among faculty, staff, students, alumni and friends of the Department.



IN THE SPOTLIGHT

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A large CCEE contingent of students, faculty, alumni and supporters played a key role in the important gathering of transportation leaders and innovators.



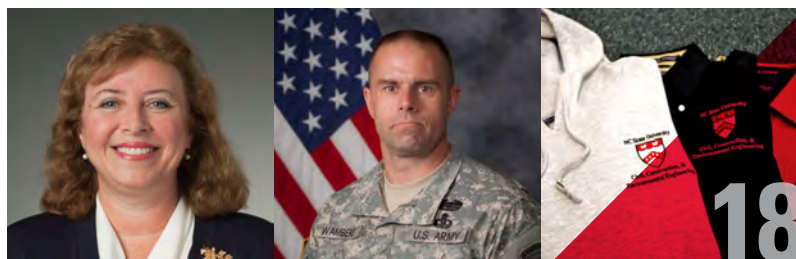
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LETTER FROM THE DEPARTMENT HEAD MORTON A. BARLAZ



The Spring 2013 semester is in full swing and going well. In December, we celebrated graduation for 65 undergraduates, 60 master's students and 10

who completed their PhDs. We were honored to have **Dan Rountree** as our graduation speaker. Dan is a 2004 graduate of our Construction Engineering & Management (CEM) program and currently serves as the multifamily development manager for Florida markets for Johnson Development Associates in Delray Beach, Fla.

This newsletter features five research briefs from our faculty, highlighting the Department's contributions to civil infrastructure in virtual project management, extending the life of our nation's roads, helping federal agencies understand the effect of storm surge on critical infrastructure, managing air quality in our national parks, and reducing building energy use. A feature article about our department's role in the Coastal Studies Institute describes research in coastal engineering and renewable ocean energy. These articles are great examples of how civil, construction, and environmental engineers are working to improve public welfare and environmental sustainability.

Two of our faculty have been recognized for their expertise by appointment to highly respected advisory positions for the US Environmental Protection Agency. Drs. **Chris Frey** and **Joel Ducoste** are both serving on the US EPA's Science Advisory Board, with Frey having been selected to chair the Clean Air Scientific Advisory Committee that reports directly to the EPA administrator.

Our student groups continue to bring a variety of extracurricular experiences to our programs including conference attendance, site visits and service projects as described in this newsletter. I would like to personally acknowledge and thank the leaders of our student groups for their drive and motivation to embrace all aspects of our profession through their leadership.

Among the most important things that we do is recruit new faculty to continue to build upon our research and education programs. As we go to press, we are hoping to fill four faculty positions, one of which will be the Edward I. Weisiger endowed faculty position in the CEM area. The Department is seeking to augment its strength in several areas including intelligent infrastructure, energy and the environment, and sustainable and resilient built and natural systems. I look forward to sharing information about new faculty in the Fall newsletter.

As you look through this newsletter, I hope that you get a sense of all of the wonderful accomplishments in our teaching, research and extension programs of which I am so proud. As everyone is aware, the economy is not as strong as we wish and our budget remains extremely tight. I have explained the budget reductions that we have experienced in past letters and asked our friends and alumni for help. Many of you have responded and your contributions are sincerely appreciated.

Please make a contribution to the Department a regular event. Your gifts provide help with the special things that make us excellent, whether it is field trips for undergraduates, allowing graduate students to make presentations at national conferences, or helping to recruit and retain the best students and faculty in the world. We need your support as we strive for excellence in times of decreasing public funding. Thank you. •

A handwritten signature in black ink, appearing to read 'M. Barlaz', with a long, sweeping horizontal line extending to the right.

Morton A. Barlaz
Department Head

CCEE AT NC STATE SUSTAINABLE INFRASTRUCTURE FOR SOCIETY

- \$17.6 million** in research expenditures
- 140** ongoing research projects
- 11** winners of CAREER and other NSF young faculty awards
- 47** faculty
- 359** graduate students
- 805** undergraduate students



RESEARCH UPDATES



Construction of preservation surface treatment to extend service life of pavement



Field sample of pavement surface treatment used for performance testing

EXTENDING LIFE OF ASPHALT PAVEMENT ROADWAYS

Asphalt pavements constitute 90 percent of US roadways. Increasing traffic volume is leading to roadway deterioration. Thus, preservation strategies are needed to prolong pavement service life. Preservation surface treatments (PSTs) have attracted attention as a promising pavement preservation strategy. PSTs are both energy-efficient and cost-effective. In North Carolina, approximately 8 percent of roadway pavement expenditures are spent on surface treatment, which preserves about half of the asphalt pavement roadways. A PST consists of a thin protective layer of asphalt

binder applied to the surface of existing pavement with or without aggregate. Asphalt binder is a bituminous material that binds aggregate particles together and seals old pavement surfaces. The National Cooperative Highway Research Program is sponsoring a project at NC State to develop asphalt binder performance standards for PST applications. Drs. **Y. Richard Kim** and **Cassie Hintz** and two PhD students, **Javon Adams** and **Mohammad Ilias**, are working on the project with researchers from the University of Wisconsin-Madison and the Asphalt Institute in Lexington, Ky. The

research team is investigating the effect of asphalt binder properties on the performance of surface-treated pavement samples through advanced testing techniques developed at NC State. Test equipment includes a mobile loading simulator for measuring performance under simulated traffic loading and a laser profiler for analyzing the surface texture of PSTs. The research outcome will enable highway agencies to select appropriate binders for PST application, leading to prolonged life of asphalt pavement roadways. •

VIRTUAL PROJECT MANAGEMENT

Dr. **Edward J. Jaselskis** is developing a Tele Engineering and Management (TEAM) Laboratory to enable construction project stakeholders to visualize, guide and contribute to various site operations from a distant location. The TEAM approach uses streaming technology to broadcast live video and audio from construction sites at any time. The off-site participants can instruct and guide the person at the site, known as the “drone,” to accomplish directed tasks, thereby saving significant cost and time.

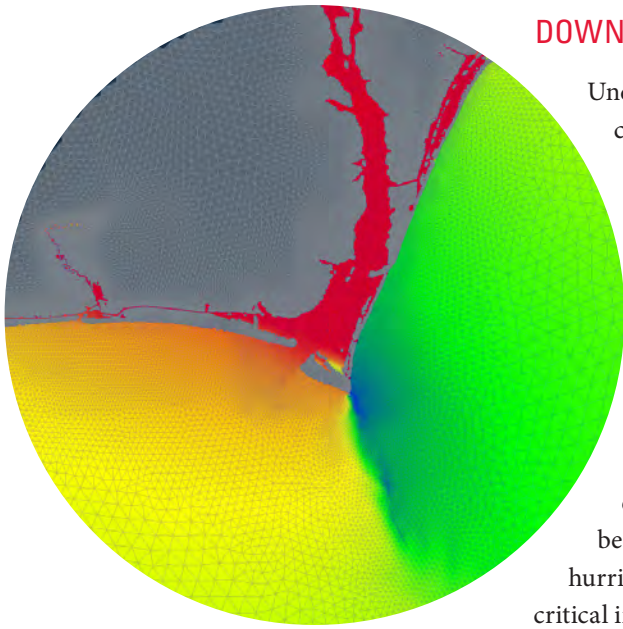
In the summer of 2012, the TEAM approach was evaluated on a virtual site

tour and used to check on-site progress at Mungo Homes, a residential construction company in Raleigh, NC. More recently, virtual erosion control inspections were performed on two NC State construction projects. These inspections included participants virtually checking sediment barriers, a sediment basin and perimeter control. The virtual participants were able to clearly view that the sediment trapping facilities were well maintained by the contractor. A virtual safety inspection has also been performed for Rodgers Builders, Inc., where the safety inspector was able to identify whether workers

were using appropriate personal protective equipment and in compliance with other safety practices.

The effectiveness of this new remote site monitoring approach continues to be evaluated for its benefit to the construction industry. Anticipated future extensions of this work are to enable physically challenged professionals to participate in virtual construction site visits and to facilitate training. •

DOWNSCALING STORM SURGE MODELS FOR INFRASTRUCTURE



In this simulation of water surface elevations in the Cape Fear area during Hurricane Fran (1996), red areas depict storm surge along the Cape Fear River and coastal areas near Wilmington, NC.

Understanding the effects of hurricanes in coastal regions is necessary for protecting the public and life-line services and for improving resilience. A limitation in moving from the science of storm surge modeling to its practical application in engineering infrastructure assessment is one of scale. Storm surge models necessarily operate over vast parts of the globe because that is the scale at which hurricanes operate. However, from a critical infrastructure perspective, assessment of performance and overall resilience occurs over a much smaller geographic region at the scale of levees and bridges. Because of the critical but computationally limiting issue of scale, Dr. **John Baugh's** research group has developed an approach whereby storm surge models can be down-

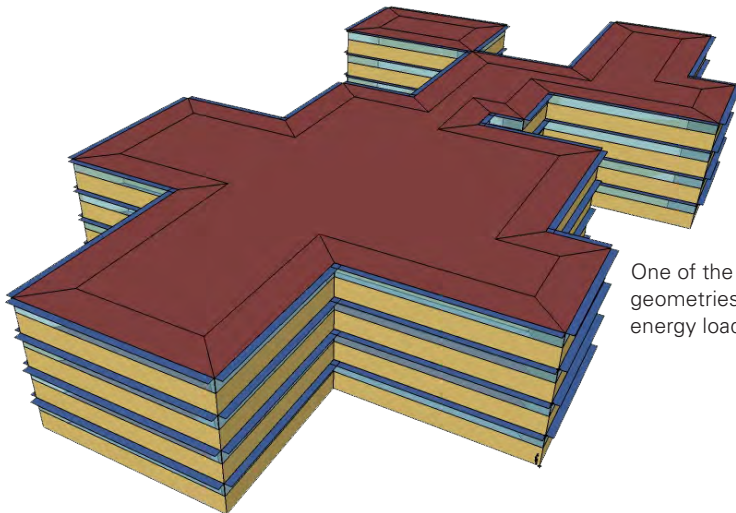
scaled to simulate effects on infrastructure for any change under consideration, such as the failure of a levee or the addition of a system of culverts. The group's subdomain modeling approach has been implemented in ADCIRC, a coastal ocean hydrodynamic code used by the US Army Corps of Engineers (USACE), the Federal Emergency Management Agency, and others. Bruce Ebersole at USACE's New Orleans District has noted that Baugh's approach, which was used in a recent project, yielded "considerable time and cost savings in the calculations" when applied as part of an investigation of the effect of pumping discharge from the Western Closure Complex in Louisiana on storm surge levels along the downstream communities. The Western Closure Complex is a key component of the hurricane storm damage reduction system for New Orleans. •

INTEGRATED BUILDING DESIGN FOR ENVIRONMENTAL SUSTAINABILITY

Sustainable buildings that are aesthetically pleasing and minimize resource consumption require interdisciplinary design teams. The traditional design process offers little opportunity for architects and engineers to collaboratively identify solutions that improve building energy performance. CCEE faculty Drs. **Ranji Ranjithan** and **Joe DeCarolis** and School of Architecture faculty **David Hill** and Dr. **Soolyeon Cho** are developing an improved integrated design process through both research and teaching activities. Research by CCEE alumna **Janelle Hygh** (MSCE 2011) found that building energy simulation tools were not integrated into the early building design process. She addressed this issue by constructing a simplified regression-based energy estimation model. The new model was developed from Monte Carlo simulations of a more complex building energy

model, EnergyPlus, in which numerous factors that affect building energy were varied and the most energy sensitive factors were identified. The resultant model is responsive to changes in 27 building design parameters (e.g., window-to-wall ratio, orientation), and can accurately predict the energy loads for a conventional rectangular office building. Such a model can assist in the early building design process by giving architects quick feedback on

energy performance in response to design changes. CCEE graduate student **Maged Al Gharably** is extending the model to predict energy loads for more complex building geometries. In addition, NC State faculty members are collaborating with members of the architecture and urbanism faculty at the University of San Paolo - Sao Carlos on a student exchange that will lead to collaborative research projects related to sustainable building design. •



One of the complex building geometries to be studied for energy load prediction



Real-world measurement of emissions of a snow coach at Yellowstone National Park

SPRING BREAK AT YELLOWSTONE TO MEASURE SNOW VEHICLE EMISSIONS

To support development of an environmental impact statement for Yellowstone National Park (YNP), the National Park Service engaged the University of Denver (DU) and NC State to measure emissions of over-snow vehicles (OSVs), including snowmobiles and snow coaches. Snow coaches are typically converted passenger vans for which wheels are replaced with snow tracks. Field measurements were made by graduate students **Gurdas Sandhu** and **Brandon Graver** of Dr. **Chris Frey**'s group, and additional data analysis was performed by **Jiangchuan Hu**. Dr. **Gary Bishop** and his group from

DU participated in field measurements. Each vehicle was measured in March 2012 on a snow-covered 32-mile route used by park visitors. Newer snow coaches were found to have low emissions with the exception of one underpowered conversion vehicle. Two diesel-powered snow coaches that had the latest emission control technologies to control nitrogen oxides and particulate matter also had very low emission rates. The smaller, higher revving engines of the snowmobiles produced much higher carbon monoxide emissions than the larger, lower revving engines of the snow coaches. Overall, the newer

snow coaches were found to be substantially lower emitting than earlier models measured in previous studies and to be lower emitting per passenger mile than snowmobiles. These data are being used by the National Park Service in air quality modeling studies and to decide on "Best Available Technologies" that will be allowed to operate within the pristine park. The results will be presented at the Annual Meeting of the Air & Waste Management Association this June in Chicago. •



The Research and Education Building at the Coastal Studies Institute in Manteo



The Institute's Marine Services Building

CSI: MANTEO

CCEE Faculty Investigate Coastal Processes and Challenges

Several CCEE faculty are leading research with the University of North Carolina system's Coastal Studies Institute (UNC-CSI). UNC-CSI's mission is to undertake research, offer educational opportunities, provide community outreach programs, and enhance communication among those interested in the unique history, culture and environment of the maritime counties of North Carolina. UNC-CSI research focuses on estuarine ecology and human health, coastal engineering and renewable ocean energy, public policy and coastal sustainability, and maritime heritage.

Dr. **Billy Edge** is the UNC-CSI Coastal Processes and Engineering Program Head and research project lead for the Renewable Ocean Energy program. This program focuses on using waves, currents and tidal movement to generate energy and includes engineering contributions from NC State, North Carolina A&T and UNC-Charlotte.

Dr. **Margery Overton** is one of the leaders of the wave energy assessment research. Dr. **Jie Yu** is contributing to an assessment of potential power generation from North Carolina's major inlets during both ebb and flood tidal exchange. A team led by Dr. **Mo Gabr**, in collaboration with Dr. **Joe DeCarolis**, is investigating the use of compressed air to store energy in deep ocean waters to reduce costs and variability of renewable energy generation. Gabr is also working with Edge on a study of the energy in the Gulf Stream and the technology that would be required to convert the kinetic energy into electric power that can be tied into the national grid.

UNC-CSI recently opened a new facility located in Manteo on Roanoke Island. With laboratories, the nearby ocean, bays, and piers, there are excellent and growing opportunities for faculty research and student education. The new campus includes a 50,000 square foot state-of-the-art

research and educational facility equipped with wet labs, as well as teaching labs and classrooms equipped with distance education technology. An 18,000-square-foot marine services building has a three-bay garage, fabrication shop, dive locker and boat slips. Environmentally sustainable construction practices for the new facilities have focused on minimizing the impact on the nearby waters and marsh areas.

UNC-CSI was formed in 2003. Its university partners include NC State, UNC-Chapel Hill, UNC-Wilmington, East Carolina University and Elizabeth City State University. •

For more information on the UNC Coastal Studies Institute, visit csi.northcarolina.edu.



A few of the NC State students at TRB: Gurdas Sandhu, Wenxuan Dong, Behdad Yazdani, Brandon Graver, Wenwei Che (visiting student from Hong Kong), Wan Jiao, Jiangchuan Hu, Bin Liu, and Ingrid Arocho



PhD student Gurdas Sandhu delivers a paper presentation.

CCEE MAINTAINS MAJOR PRESENCE AT TRB ANNUAL MEETING

The 92nd Annual Meeting of the Transportation Research Board (TRB), a division of the National Research Council (NRC), was held in Washington, DC, January 13-17 with a record 11,500 participants from around the world. There were nearly 5,000 presentations in approximately 850 sessions and workshops. The Department continued its tradition of being a major player in this critically important gathering of transportation leaders and innovators. The large NC State contingent included students, faculty, alumni and supporters.

This year, 35 students made the trip in conjunction with the student chapter of the Institute of Transportation Engineers (ITE). As usual, personal costs to students were kept low through generous support through the North Carolina Section of ITE, the NC State Transportation Founder's Fund, the Southeastern Transportation Center (STC), the new Southeastern Transportation Research, Innovation, Development and Educa-

tion Center (STRIDE) and the chapter's student-led fundraising activities. Chapter President **Abseen Anya** coordinated the months-long process of organizing the trip. The STRIDE reception included a student poster contest. The Department was represented with entries from Anya and Dr. **Katy Salamati** (PhD 2012), a past student chapter president.

In total, more than 30 papers were presented by researchers affiliated with the Department, and student researchers were co-authors on many of these papers. The ongoing success of CCEE student and faculty participation in TRB technical sessions is a clear validation of the quality of our students and the excellence and relevance of NC State research.

The CCEE Department and the Institute for Transportation Research and Education (ITRE) continued the tradition of hosting a reception at the meeting. The reception provided an opportunity for faculty and students to say "thank you" to alumni, friends and supporters

of the Department's integrated education and research mission. Nearly 200 guests joined current faculty, staff, and students at this year's reception, including former North Carolina Secretary of Transportation **Gene Conti** and distinguished alumnus Dr. **Michael Walton** (MSCE 1969, PhD 1921), recipient of the 2012 Frank Turner Medal for Lifetime Achievement in Transportation.

The reception would not have been possible without the generous support of Norfolk Southern, Kimley-Horn and Associates, McKim & Creed, AECOM, CDM Smith, Digiwest, ETC Institute, Fortress Mobile, HNTB, HW Lochner, Kittelson & Associates, Longistics, Martin/Alexiou/Bryson, Mulkey Engineers & Consultants, NC Ports, Parsons Brinkerhoff, Ramey Kemp & Associates, Stantec, TRAFFAX, TransTech Management, Union Pacific, AgileAssets, Econolite, IEM, R.M. Clarke Consulting and Troxler Electronics Laboratories. •



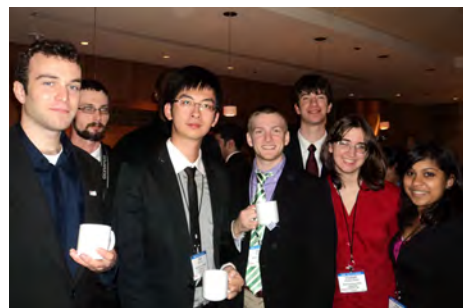
Behdad Yazdani (MS ENE 2012) presents his poster to Brandon Graver.



Abseen Anya, Dr. Nagui Roupail,
Dr. Chris Frey, and Bin Liu



William Reynolds (MSCE 2010) and
Dr. Billy Williams



Students at the NC State reception

AWARDS



CCEE faculty and students racked up university, national and international awards and honors over the past year.

› PhD student **Xiaoming Wang** was awarded best student presentation, PhD student **Florentino de la Cruz** was awarded second best student presentation, and MS student **Joe Weaver** was awarded second place in a poster session, all at the Global Waste Management Symposium, held in Phoenix, Az., Oct. 1–3, 2012. All three presented their research on municipal solid waste and landfills and are advised by Dr. **Morton Barlaz**.

› Recent BSCE graduates **Jared Hostetler** and **Matthew Woelfle**, and BS ENE graduates **Katie Dorety**, **Ruth Small** and **Andrew Spicer**, won second place in the Environmental Division at the annual Water Environment Federation (WEF) Student Design Competition for their project, “Stormwater Best Management Practices Retrofit, Durham Plaza.” This project resulted from the capstone design class, CE 480/481, taught by Dr. **Robert Borden**. The design competition took place at the WEF annual meeting in October 2012 in New Orleans, La.

› CCEE graduate students **Tate Rogers**, **Allison Reinert** and **Mehrnoosh Eslamiamirabadi** placed first, second, and third, respectively, in the Poster Competition at the 2012 Annual Conference of the NC American Water Works Association (AWWA) and Water Envi-

ronment Association (WEA) in Raleigh. Rogers, advised by Dr. **Bob Borden**, presented his research on improving sanitation (see page 17). Reinert, advised by Dr. **Detlef Knappe**, presented on drinking water treatment. Eslamiamirabadi, advised by Dr. **Joel Ducoste**, presented on wastewater treatment.

› Master’s student **Jory Wahlen** and PhD student **Wan Jiao** won student travel awards from the Society for Risk Analysis (SRA) and SRA’s Research Triangle Chapter to attend and present their research at SRA’s annual meeting Dec. 7–10, 2012, in San Francisco. Wahlen also received the SRA Microbial Risk Analysis Specialty Group Student Merit Award. Wahlen, advised by Dr. **Francis de los Reyes**, presented on health risk from pathogens in graywater, and Jiao, advised by Dr. **Chris Frey**, presented on exposure to air pollution in vehicles.

› Master’s students **Tate Rogers** and **Darion Colbert** won first place in the inaugural NC State University Sustaining Global Health Grand Challenge proposal competition for their proposal on using a low-cost wastewater treatment technology. They developed the idea in the Water and Sanitation for Developing Countries class taught by Dr. **Francis de los Reyes**.

› Dr. **Francis de los Reyes** was the 2013 Koh Lectureship Awardee at the 33rd Annual Meeting of the Philippine-American Academy of Scientists and Engineers, held in January 2013. He recently was elected vice-president and president-elect (2014) of the academy.

› Dr. **Billy Edge** will be inducted to the Academy of Distinguished Graduates of the Charles E. Via Department of Civil and Environmental Engineering at Virginia Tech. He holds BS and MS degrees from Virginia Tech.

› Professor Emeritus Dr. **Ajaya Kumar Gupta** organized and chaired the Eighth Nuclear Plants Current Issues Symposium: Challenges & Opportunities, held in Orlando, Fla., January 23–25. The symposium was sponsored by the US Nuclear Regulatory Commission and other organizations.

› **Roberto Nunez** has been appointed as a member of the American Concrete Institute (ACI) Publications Committee and the ACI Construction Liaison Committee, both for three-year terms effective this spring.

HONORS



Digital rendering of one of the house designs in ARC503 and CE 497/596

› The Association of Collegiate Schools of Architecture (ACSA) and the American Institute of Architects (AIA) has recognized the new course, ARC503 + CE497/596 The Problem of the House – Collaborative Studio, with the 2013 Housing Design Education Award. The course was developed by Drs. **Ranji Ranjithan** and **Joe DeCarolis** and by **David Hill** of the College of Design. Architecture and engineering students worked in collaborative teams to research and design innovative sustainable house prototypes. Student work has been exhibited at the Raleigh Convention Center and the AIA North Carolina Center for Architecture and Design.

› **Ingrid Arocho** and **Stephanie Vereen**, construction engineering PhD candidates working with Dr. **William Rasdorf**, were selected as participants on the NextProf Workshop held at the University of Michigan (UM) in September 2012. The workshop objective is to encourage academia as a career for members of underrepresented groups. Vereen was subsequently invited to give a research seminar and meet with faculty and students in UM's Department of Civil and Environmental Engineering.

› **Zachary Bugg** (PhD 2012), Dr. **Nagui Rouphail**, Dr. **Bastian Schroeder** (BSCE 2004, MSCE 2005, and PhD 2008) and **Brandon Nevers** (MSCE 2001) received a best paper award from the Transportation Research Board for their paper on auxiliary through lanes. Dr. **Katy Salamati** (PhD 2012), Schroeder, Rouphail and **Duane Geruschat** also received a best paper award for their paper on driver yielding behavior to pedestrians at roundabouts. Both papers will be published in *Transportation Research Record*.

Frey Appointed by EPA Administrator to Chair Clean Air Scientific Advisory Committee



Dr. **Chris Frey**, Distinguished University Professor of Civil, Construction, and Environmental Engineering, was appointed by US Environmental Protection Agency

Administrator Lisa Jackson to chair the independently chartered Clean Air Scientific Advisory Committee (CASAC) for two years. Frey began his new role Oct. 1, 2012.

The seven-member CASAC is required under the 1977 Clean Air Act to advise the administrator on the scientific and technical bases for EPA's National Ambient Air Quality Standards (NAAQS).

The standards protect public health and the environment based on the latest scientific knowledge.

CASAC, composed of scientists from outside the EPA, reviews extensive scientific and policy assessments prepared by EPA

staff, provides advice regarding whether existing air quality standards adequately protect public health and the environment, and provides advice regarding alternative standards, if needed. The committee's findings are communicated by the chair directly to the administrator and are used by EPA staff to revise scientific assessments and prepare rulemakings.

As CASAC chair, Frey also serves as a member of the EPA Science Advisory Board.

Frey has been a member of CASAC for four years, serving on panels for each of the NAAQS pollutants, which include ozone, particulate matter, nitrogen dioxide, sulfur dioxide, carbon monoxide and lead. These pollutants are either emitted directly, such as from cars and power plants, or formed in the atmosphere as a result of other pollutants.

Frey has made significant research and teaching contributions in the areas of measurement of real-world vehicle emis-

sions, evaluation of power plant energy use and emissions, exposure and risk assessment, and quantification of uncertainty in environmental systems models. His classes at NC State include Air Pollution Control, Air Quality Engineering and Environmental Exposure and Risk Analysis.

Frey earned his BS in mechanical engineering in 1985 from the University of Virginia, his MS in mechanical engineering in 1987 from Carnegie Mellon University, and his PhD in engineering and public policy in 1991, also from Carnegie Mellon.

He joined the NC State faculty in 1994. •

Ducoste Appointed to EPA Science Advisory Board



Dr. **Joel Ducoste** was appointed to a three-year term on the Science Advisory Board (SAB) of the US Environmental Protection Agency by EPA Administrator Lisa

Jackson. The SAB provides independent advice and peer review to EPA's administrator on the scientific and technical aspects of environmental issues.

Ducoste has also been reappointed to a second three-year term on the SAB's Drinking Water Committee, which provides advice to the administrator on

the technical aspects of EPA's national drinking water standards program.

"With my new appointment to the Charter SAB, I get the opportunity to help review scientific documents that may have been developed by all subcommittees or panels focused on various environmental science topics," Ducoste said. "In the Drinking Water Committee, we are always receiving new technical information from researchers in the environmental field that may influence our understanding of the fate and transport of pollutants or the removal of these pollutants with current or new processes."

Service on the SAB is "a unique opportunity to help the EPA achieve environ-

mental protection through the application of sound science," he said.

Ducoste is a professor in CCEE and an expert in modeling water and wastewater treatment process fluid mechanics using computational fluid dynamics (CFD). He holds bachelor's and master's degrees in mechanical engineering from Rensselaer Polytechnic Institute and a PhD in civil and environmental engineering from the University of Illinois at Urbana-Champaign. He joined the faculty at NC State in 1998. •

CCEE Hosts Two Shaw Lectures in Fall 2012



Dr. Jerry Schnoor

The Henry M. Shaw Lecture Series in Civil Engineering was endowed by the family and friends of Henry Shaw, a 1922 graduate in mechanical engineering. This fall the Department was fortunate to host two world-famous researchers focused on different aspects of civil infrastructure.

Dr. **Gian Michele Calvi** is a professor of structural design at the University of Pavia in Italy and founding and current director of the Postgraduate School in Understanding and Managing Extremes (formerly the ROSE school). Calvi's lecture, "A Historical Perspective on Engineers' Understanding of Earthquake Demands and Structural Response," pro-

vided a captivating discussion of the history of earthquakes and policies required to better protect society from seismic risk.

Dr. **Jerry Schnoor** holds the Allen S. Henry Chair in Engineering at the University of Iowa and is a member of the National Academy of Engineering and editor-in-chief of *Environmental Science and Technology*. He spoke on "Water Sustainability in a Changing World" and discussed drivers affecting water sustainability and potential solutions including adapting to a changing water world, direct and indirect potable water reuse, resilient water infrastructure, and more holistic management of the water cycle. •

HELP PLAN 60th ANNIVERSARY CELEBRATION OF CONSTRUCTION ENGINEERING AND MANAGEMENT (CEM) PROGRAM

2014 marks the 60th anniversary of the modern founding of the Construction Engineering and Management (CEM) program at NC State. In 1954, evolving from an earlier BS in Construction, the BS in Civil Engineering – Construction Option (CEC) program was started as a unique degree and became the first accredited construction engineering program in the nation. It was later renamed as the CEM degree and absorbed the briefly offered Construction Management program. The CEM program has grown in stature and

currently has six dedicated faculty offering eight undergraduate and 14 graduate construction courses. It offers the construction specialty in BS, MCE, MS and PhD degrees. About 3,000 students have graduated from our program over the years. To celebrate our 60th anniversary, the Department is planning a commemorative event and invites Construction, CEC, CM and CEM alums back to reconnect with the campus, other alums, faculty and current students. •

We are currently looking for volunteers who might be interested in helping to plan this event. This would involve suggestions for activities, reaching out to other alumni, and serving as a host during the event. We anticipate bi-monthly meetings which may be in person or by telephone.

Please contact Lora Bremer at (919) 513-0983 or lora.bremer@ncsu.edu if you are interested.



Alberto Alemán Zubieta provided an overview of the \$5.25 billion Panama Canal expansion. The expanded canal should be operational in 2015.

NC STATE ZIA LECTURE ON PANAMA CANAL EXPANSION DRAWS A RECORD 800 ATTENDEES

Three leaders behind the remarkable Panama Canal expansion project discussed their roles in one of the 21st century's most challenging engineering ventures before an audience of about 800 at the annual Paul Zia Distinguished Lecture on September 24, 2012. The event was hosted by CCEE, the Constructed Facilities Laboratory and the NC State Engineering Foundation.

Presentations by **Alberto Alemán Zubieta**, former CEO of the Panama Canal Authority; **Michael Newbery**, locks design manager with MWH Global; and **Joseph Cazares**, deputy program man-

ager and locks construction manager with CH2M Hill, offered a rare, behind-the-scenes look at the \$5.25 billion Panama Canal expansion project.

The expansion adds a new set of locks at the Atlantic and Pacific oceans that will double the canal's capacity, allowing more and larger ships to use the 100-year-old waterway. The expanded canal should be operational in 2015.

Support from 50 corporate sponsors enabled the Zia Committee, headed by **Pam Townsend**, vice president at AE-COM, to endow the Paul Zia Educational Fund, which provides a graduate schol-

arship to structures students. In addition, the committee established the Paul Zia Student Enhancement Fund, which provides funding for many activities that enhance the graduate experience and may include visits to sites featured during the Paul Zia Distinguished Lecture Series.

The 2013 committee headed by **Dean Penny**, principal, Kimley-Horn and Associates, has invited William H. Baker, engineer on Dubai's Burj Khalifa, the world's tallest engineered structure, to present on September 16, 2013, at the McKimmon Center. •

A VISIT FROM EMILY BROWN BLOUNT, FIRST WOMAN TO GRADUATE FROM CCEE



Emily Brown Blount, 1953

In 2012, NC State celebrated its 125th anniversary. In honor of this historic year, we invited the first woman who graduated from the CCEE program to visit campus and talk about her studies at NC State and her career in civil engineering.

Emily Brown Blount was the first woman to graduate in civil engineering at NC State, having received her BS in 1953 and a professional degree in civil engineering in 1954. She was also the first woman to be registered as a Professional Engineer and Professional Land Surveyor in North Carolina in 1960. In

1997, she received the R.V. Moss Lifetime Service Award from the NC Section of the Institute for Transportation Engineers. In 2006, she was inducted into the NC Transportation Hall of Fame.

Blount said that she was around engineering in her childhood, often going on field trips with her father, a highway engineer. She said, “He would take me out to a bridge, I’d see things, and I’d think, ‘I could do this.’” When Blount entered NC State, dormitories were designated for men only. She said, “I was lucky, I rented a room with this wonderful family on Vanderbilt Avenue. I had to study hard. But I wouldn’t say I didn’t have fun.”

After completing her NC State degrees, Blount joined the North Carolina Department of Transportation (NCDOT). There were only four engineers working in the Traffic Engineering Department at that time. She started as an associate traffic engineer, surveyed dangerous intersections, and evaluated speed limits. Subsequently, she designed traffic signals and railroad grade crossing signals and inspected signs along interstate highways. She remained with NCDOT until her retirement 40 years later in 1995.

Maintaining her professional licenses, Blount attends conferences and speaks with high school science majors and young women who may be interested in engineering.

She was awarded the 1978 Raleigh Engineers Club Outstanding Engineering Award. Dr. **Ralph Fadum**, head of CCEE at the time, said of Blount, “It took pioneers with persistence and stamina to break down the doors of false images that found no place for women in engineering. Today, these false images have disappeared. The role model played by people such as Emily Brown Blount contributed significantly to the opening of the engineering profession to women.”

At NC State today, women comprise 22 percent of both undergraduate and graduate students enrolled in civil engineering, which is close to the national average. Thus, the role of women in engineering is increasing, but the need to include women in the profession more fully remains. The CCEE Department is hosting the second Annual “We are WE” (Women in Engineering) Program in March 2013 to promote women in civil engineering. •

CCEE ENGAGES IN INTERNATIONAL WATER BATTLE

CCEE faculty and students competed in the Battle of the Water Networks II. This international competition pitted teams from academia, industry, and public utilities against one another to find the most effective design for a water distribution system. The challenge was to design the expansion of an existing system to supply water for new development. Awards for the 2012 competition were given in Adelaide, Australia, in conjunction with the 14th Water Distribution Systems Analysis Conference.

The NC State team was the only team from a US university. Drs. **Downey Brill, Kumar Mahinthakumar, Ranji Ranjithan** and **Emily Zechman** advised a group of six graduate students: **Venu Kandiah, Micah Jasper, Kristen Drake, Ehsan Shafiee, Mehdy Barandouzi** and **Andrew Berglund**.

To develop their solution, the team created new software that was run on CCEE’s 192 core parallel processing computer cluster. A paper about the design approach was presented by Kandiah and

was recognized with the Best Student Presentation Award.

The NC State team ranked third out of 14 teams and developed the design with the lowest cost. The team is preparing a journal article describing the approach used to create the design. •

NEWS FROM CCEE STUDENT GROUPS



The AGC student chapter toured a State Employees' Credit Union construction site. The tour was sponsored by Clancy & Theys and O'Brien Atkins.

AIR & WASTE MANAGEMENT ASSOCIATION (A&WMA)

The A&WMA student chapter, led by graduate student **Bin Liu**, is hosting many seminars, such as recent ones by Dr. **Lingjuan Wang-Li** from the Department of Biological and Agricultural Engineering and **Sean Mulligan** of AMEC Inc. The chapter participated in the University Open House to interact with prospective students. Members volunteered at the EPA/A&WMA Information Exchange in November. Students from the chapter will attend the Annual Meeting in Chicago in June. The student chapter participated with the RTP Chapter and the South Atlantic Section of A&WMA in a successful bid to host the 2015 international A&WMA Annual Conference and Exhibition in Raleigh, NC.

AMERICAN CONCRETE INSTITUTE (ACI)

In October 2012, students from the ACI student chapter attended the Fall convention in Toronto, Ontario, where they also participated in student competitions. The objective of the student competition was to design and build an Egg Protection Device to resist a high-impact load. The two NC State teams included **Alan Herndon, Elizabeth Phelps, Kristen Measimer, Lauren McCauley, Luke Perkins, Nick Blaser, Jennifer Kelley, Travis Wetteroff** and **Zach Anderson**. The chapter plans to travel to the Panama Canal this spring and conduct ACI Certification tests for students in Panama.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

In Fall 2012, the ASCE student chapter designed and built a steel bridge and a concrete canoe in preparation for the annual Carolinas Conference, to be held in Columbia, SC, in Spring 2013. Members volunteered at science, technology, engineering, and math (STEM) events at Weatherstone Elementary School in Cary, NC. Students also participated in ASCE Younger Member Group events, including a scavenger hunt. At regular seminars, invited speakers talked about dam engineering and construction law. Students received career advice at a meeting hosted by ASCE North Carolina Section board members.

ASSOCIATION OF GENERAL CONTRACTORS (AGC)

The AGC student chapter hosted speakers from Lithko Contracting, C.T. Wilson Construction, S.T. Wooten Corporation, Rentenbach General Contractors, BJAC Architecture, and Dave Simpson of the Carolinas AGC. McDonald York sponsored the annual Industry Bowling Night, where students and professionals networked. Many student chapter members traveled to Atlanta, Ga., to participate in the Regional AGC design-build competition and Leadership in Energy and Environmental Design (LEED) competition. Clancy & Theys, a general contracting company, and O'Brien Atkins, an architecture firm, sponsored a construction site visit at the 12-story State Employees' Credit Union building.

CHI EPSILON

NC State's Alfred P. Norwood Chapter of Chi Epsilon continued its tradition of honoring excellence by inducting 14 new student members during the Fall 2012 semester: **Austin J. Mack, Griffith L. Shapack, Catherine A. McMillan, Clinton B. Pruett, Molly J. Mitchell, Andrew T. Stutts, Robert C. Palmes Jr., Patrick N. Blanchard, Justin R. Barnes, Zachary J. O'Keefe, Andrew R. Rice, Brian R. Helgans, Jon D. Robertson, and Weslyn E. Clark.** The new members were honored at the November initiation ceremony and banquet at the NC State University Club. Guest speaker **Al Tice**, senior principal engineer and assistant vice president with MACTEC, spoke on the engineering challenges of moving the historic Cape Hatteras Lighthouse.

EARTHQUAKE ENGINEERING RESEARCH INSTITUTE (EERI)

The EERI student chapter kicked off its first semester on campus in Fall 2012. World renowned earthquake engineer Dr. **Gian Michele Calvi** gave the inaugural lecture on reconstruction after the L'Aquila Earthquake in Italy in 2009. Members are looking forward to a semester of community outreach and presentations by professional engineers.

ENGINEERS WITHOUT BORDERS (EWB)

The EWB student chapter plans to install a solar photovoltaic energy system at a school in Freetown, Sierra Leone, this coming summer. A separate water project team will travel to Sierra Leone to collect data for a well system and install biosand filters in an existing rainwater harvesting system. The Bolivia water project team will implement a rainwater collection and storage system. For all projects, teams of students work on technical design, fundraising and education initiatives. EWB work is supported in part by a \$4,000 grant from Boeing.

INSTITUTE FOR TRANSPORTATION ENGINEERS (ITE)

The ITE student chapter hosted guest speakers from the NC Department of Transportation and several engineering consulting firms. ITE student members interacted with professional members of the North Carolina Section of ITE (NCSITE) during "Trivia Night" at a local restaurant. The chapter won the Paul D. Cribbins Cup award for the outstanding student chapter within NCSITE in November. Student members **Michael Corwin** and **Tyler Hudson** were recognized with merit awards. The ITE Traffic Bowl team was victorious in the NCSITE Annual Meeting Traffic Bowl competition. As a fundraiser for the Transportation Research

Board annual meeting (see page o6), students volunteered to measure traffic on Dan Allen Drive for the NC State Office of Transportation. The chapter cleaned a stretch of Jones Franklin Road for its 15th year in the Adopt-a-Highway program. Chapter advisor Dr. **Billy Williams** hosted a holiday party for the students.

NC SAFEWATER

The NC Safewater student chapter hosted speakers from Dewberry, the John R. McAdams Company and Solutions-IES. Members volunteered with Hazen and Sawyer for a bi-annual stream clean-up at the Walnut Creek Wetland Center. Student members visited the Novozymes plant in Franklin, NC, and volunteered at a model water tower competition at the Neuse River Water Treatment Facility for elementary and middle school students. Members participated in the NC American Water Works Association and Water Environment Association (NC AWWA-WEA) Annual Conference in Raleigh, NC. Members also participate in monthly dinner meetings with young professionals in the Raleigh area.

PROFESSIONAL ENGINEERS OF NORTH CAROLINA (PENC)

The PENC student chapter hosted seminars by alumni and professional organizations and socials with local professionals, providing networking opportunities for students. In Spring 2013, the chapter will sponsor events with the John R. McAdams Company and the Navy's Nuclear Propulsion Program. PENC will also volunteer at NC State's Boy Scout Engineering Day in April and award Engineering Merit Badges.



Tyler Hudson gives the valedictory address.



Dan Rountree delivers the commencement address.

MORE THAN 120 RECEIVE DEGREES AT DECEMBER 2012 GRADUATION

At the Fall 2012 departmental baccalaureate ceremony, held December 14 at the McKimmon Center, 65 students were awarded undergraduate degrees. These included 47 in civil engineering, 8 in construction engineering and management, and 10 in environmental engineering. Master's degrees were awarded to 60 students, with 52 in civil engineering and 8 in environmental engineering. In addition, 10 doctor of philosophy degrees were conferred. All doctoral candidates were recognized and hooded by their advisors.

The audience of about 600 was greeted with opening remarks from department head Dr. **Morton Barlaz**. Dr. **Jim Nau**, associate head for undergraduate programs,

recognized **Tyler Blake Hudson**, who delivered the valedictory address. Hudson is from Dobson, NC. Nau recognized the members of Chi Epsilon, which is the National Civil Engineering Honor Society. The outgoing Chi Epsilon chapter president, **Landon Kent Talley**, delivered the Chi Epsilon address. Talley is from Rolesville, NC. His father, grandfather, and four uncles are engineers (four civil engineers and two electrical engineers) who attended NC State. Both Hudson and Talley have enrolled in graduate school in civil engineering at NC State.

Dan Rountree (BSCE 2004) gave the commencement address. He is development manager in Florida markets for

Johnson Development Associates, Inc. Rountree talked about how the civil engineering profession is entering an era of opportunity not seen since the Eisenhower era. He remarked, "graduates gathered here today are an essential and core driving force behind accelerating the economy of North Carolina and our country," adding, "we're all counting on y'all big time." He closed his remarks by encouraging the graduates: "Let us challenge ourselves to lead our generation forward and to cast aside any obstacles that stand between us and our American dreams." •



Stewart Farling, Tate Rogers, Dr. Tarek Aziz, Dr. Francis de los Reyes and Dr. Bob Borden test a waste removal system developed by Rogers.

NOBLE WORK: IMPROVING GLOBAL SANITATION

According to data tracked by the Bill and Melinda Gates Foundation, one in three people (that's 2.6 billion) don't have a safe place to use the restroom.

Environmental engineering graduate student **Tate Rogers** has spent the past year working on improving sanitation — a big problem given that disease spread by unsanitary latrines causes the deaths of 4,000 children each day. Rogers's idea came from an assignment in his undergraduate design course taught by Dr. **Bob Borden**, a CCEE professor.

Rogers wondered about using an age-old tool — the auger — to improve sewage management in developing countries by targeting an unsanitary but necessary job: the emptying of latrines by hand.

Under Borden's guidance last fall, Rogers's idea became one of 2,000 applications to land one of 61 water and sanitation

grants from the Bill and Melinda Gates Foundation. The first phase grant, for \$100,000, is to help design, produce and test the technology.

"Everyone liked the simplicity and cost effectiveness of my design," Rogers said. "It was a huge honor."

Now Rogers and his team (led by Borden) are prototyping and field testing the equipment. A stationary pipe is inserted around the auger to lift the waste up and out through a hose to a nearby truck or into smaller, transportable containers.

Since last fall Rogers has reduced the production cost to \$750 and estimates it will cost less than \$5 to empty a pit latrine using his device, compared to \$30 to \$80 for current technologies.

Rogers's was one of 30 teams invited to exhibit their technology at the "Reinvent the Toilet Fair" in Seattle. He also attend-

ed a water sanitation conference in South Africa with Dr. **Francis de los Reyes**.

Rogers consults with his professors regularly and his engineering studies always help. De los Reyes's class on sanitation in the developing world showed specifically how dangerous poor sanitation can be, he said.

For Rogers, the auger project has been a fascinating experience tackling a real-world challenge. "I've traveled, met interesting people and done helpful work. I feel blessed." •

FIRM OF THE MONTH: VIEWS FROM PARTICIPATING FIRMS

The idea for the Firm of the Month was suggested by the CCEE Departmental Advisory Board. The Firm of the Month program is our way of thanking and promoting our corporate partners while at the same time educating our students. This program provides participating firms with name recognition for recruiting and business opportunities, demonstrates to students ways that they can use their degrees after graduation, and provides information on employment opportunities.



ECS was thrilled to be chosen as the Firm of the Month for September 2012. Not only is our founder, **Henry Lucas** (BSCE 1973, MCE 1977), an NC State grad, but our business has thrived through the contributions of the many interns and team members who have been a part of CCEE. “Setting the

Standard for Service” isn’t just our tagline, it’s the foundation of our business. We commit to providing high quality and innovative services and strive to be the consulting firm of choice. We deliver value-added solutions in the related fields of geotechnical engineering, environmental consulting, construction materials and facilities. We support the CCEE Department because we know CCEE grads are motivated and capable of thriving in the unique culture that is ECS. We look forward to many more collaborative years with the students and faculty at NC State.



SEPI Engineering & Construction, Inc. (SEPI), was excited to be selected for the CCEE Firm of the Month program for October 2012. We are a firm that is proud

to have a number of graduates from NC State as employees and feel it is important to mentor our future engineering leaders. SEPI believes in giving back to the community, and we are actively involved in helping future NC State graduates meet their educational and career goals. We look forward to employing more NC State students as interns and full-time employees. The Firm of the Month program has enabled students to become more familiar with our firm and services. SEPI looks forward to participating again in the future.



Smith Gardner, Inc., was excited to be the CCEE Firm of the Month for November 2012. It is always a pleasure to stay connected with one’s alma mater, and with **Stacey Smith’s** (BSCEC 1992, MCE 2004)

involvement on the Department’s Advisory Board, we hope to further our support to the university and the Department. Smith Gardner, Inc., is an employee-owned, industry-leading solid waste consulting engineering firm committed to delivering sound, innovative solid waste solutions. We serve municipal, private, and industrial clients and provide technical assistance to the engineering community nationwide. This opportunity not only allowed Smith Gardner, Inc., to promote employment and business but also helped us communicate and connect with many students and faculty. We are committed to supporting student organizations and look forward to working with more Wolfpack alumni in the future.



The McAdams Company was honored to be selected Firm of the Month for January 2013.

Established in 1979, we are a premier, full-service land design firm providing professional services such as civil engineering, stormwater and environment, land planning and landscape architecture, and surveying and construction services for a variety of market sectors, including retail/commercial, residential, federal, municipal, institutional and environmental (mitigation banking, stream restoration, stormwater). Our company culture focuses on what’s best for the employees. Our unique work environment is conducive not only to outstanding productivity but encourages a familial camaraderie among our employees. Our relationship with CCEE allows us to recruit some of the brightest and most talented students and alumni that NC State has to offer. And we know – many of our current employees are Wolfpack grads! We welcome the opportunity to build collaborative relationships with the Department in the years to come.

CCEE ADVISORY BOARD 2013

Board Chair's Notes – January, 2013



I'm honored to chair the Industry Advisory Board. We serve as a resource for the Department head, his leadership team, and CCEE students. We offer career perspectives

and practical experience to the Department as it grows and shapes its future vision. The Board also supports development activities, student organizations, and major events such as the annual Zia Lecture.

I'd like to thank outgoing Board member **Elizabeth A. Sall** (BSCE 2003) and past chair **Michael B. Gwyn** (BSCEC 1980, MSE 1994), and welcome incoming Board members **Christopher Murphy** (MSCE 1999), **Bill Pope** (BSCEC 1983) and **Stacey Smith** (BSCEC 1992, MCE 2004). Outgoing Chair **Mike Creed** (BSCE 1973) deserves special recognition. Mike's extraordinary commitment of time and resources to the Department and university is much appreciated.

Finally, my compliments to Dr. **Morton Barlaz**, the faculty and staff. Each year you demonstrate new examples of scholarship, world-changing projects, creative research and award-winning programs. The CCEE leadership team is continuing a fine legacy of higher education and guidance to the current class of NC State students.

The next meeting of the Industry Advisory Board will be held in April.

Suzanne M. Beckstoffer, BSCE 1982
Board Chair

The Department receives valuable input from its Advisory Board. The Board maintains and fosters relationships with students, faculty, the Dean of the College of Engineering, the community, and alumni and supporters. The Advisory Board assists the department head in achieving department goals and objectives and provides counsel and advice from its unique perspective. The Board also advocates for the Department with the College of Engineering, the broader university and the community. Board members are also typically engaged in other ways, such as advising students in design courses, helping to connect faculty with industry stakeholders, and development. The Advisory Board meets each semester. Members serve for a four-year term.

The following distinguished alumni and friends of the Department currently serve on the Board:

Sepi Asefnia, BSCE 1993
SEPI Engineering & Construction

Suzanne M. Beckstoffer, BSCE 1982
(Chair)
Newport News Shipbuilding

Thomas W. Bradshaw, Jr.
NC State Ports Authority

Michael Creed, BSCE 1973
(Past Chair)
McKim & Creed

Heather Denny, BSCEC 1995
McDonald-York Building Co.

Barry Gardner, BSCEC 1975
Shelco Construction Co.

John Jenkins II, BSCE 1990
Stewart Engineering

Christopher Murphy, MSCE 1999
FDH Engineering, Inc.

Bill Pope, BSCEC 1983
Pope Custom Homes

Richard Rohrbach, BSCE 1981
Kimley-Horn and Associates

Stacey Smith, BSCEC 1992, MCE 2004
Smith Gardner, Inc.

David Simpson, BSCE 1981
Simpson Engineers & Associates, P.C.

Pam Townsend, BSCE 1984, MSCE 1987
AECOM

Hans Warren, BSCEC 1984
Warco Construction, Inc.

Tony Warner, BSCEC 1966
Warner Construction

Dr. James Wilson
NC State University
Edward P. Fitts Department of Industrial
and Systems Engineering

ALUMNI NEWS AND UPDATES

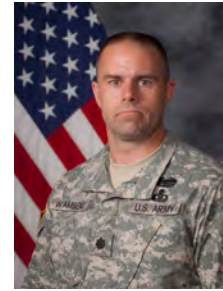
› **Daniel Findley**, P.E. (BSCE 2005, MSCE 2006, PhD 2011), recently participated in a mobility scholarship through the Transatlantic Partnership for Excellence in Engineering. Under this arrangement, he spent one month at the Polytechnic University of Valencia in Valencia, Spain, collaborating with researchers in the Highway Engineering Research Group.

› **Joseph M. ("Jay") Grantham, III**, (BSCE 2003, MCE 2005) has been recognized as one of the Top 20 under 40 in the Southeastern US by *Engineering News-Record*. He is a project manager/design manager at Parsons in Morrisville, NC. He has also been prominent in leading fundraising efforts for Duke Cancer Patient Support Programs to increase awareness of colorectal cancer.

› **Kenny Keel**, P.E. (BSCE 1991), was named the 2012 Engineer of the Year by the Professional Engineers of North Carolina in June. He was also appointed to the NC Rural Water Association Board of Directors in August. Kenny has worked for the Town of Hillsborough, NC, for 14 years as the town engineer/utilities director.

› **Robert C. Pantel**, P.E. (BSCEC 1970), is in Rota, Spain, working for the US Navy Facilities Engineering Command (NAVFAC) as a structural and civil engineer in the Public Works Department of the joint US and Spanish naval station. He was selected as 2011 Civilian Engineer of the Year for NAVFAC Europe, Africa and Southwest Asia.

› **C. Michael Walton** (MSCE 1969, PhD 1971) received the Frank Turner Medal for Lifetime Achievement in Transportation in January 2013 at the Annual Meeting of the Transportation Research Board in Washington, DC. This award is given biennially.



› **Brad Wambeke**, P.E. (PhD 2011), is a lieutenant colonel in the US Army and the battalion commander for the 4th Infantry Division's Headquarters and Headquarters

Battalion at Fort Carson, Colo. He commands about 900 soldiers, and they are currently preparing for a deployment to Afghanistan. Following command in 2014, he will serve as a permanent academy professor in the Civil and Mechanical Engineering Department at the United States Military Academy in West Point, NY.

› **Haibo Zhai** (PhD 2008) was recently promoted to research assistant professor in the Department of Engineering and Public Policy at Carnegie Mellon University in Pittsburgh, Pa. He conducts research on evaluation of the performance, emissions and cost of carbon capture technologies for fossil-fuel-fired power plants.

SHARE YOUR NEWS

Keeping your contact information current enables us to keep you up to date on events in the Department and elsewhere. Have a professional or personal update? We would like to hear from you!

Please send us your latest news (e.g., career accomplishments, awards, recognitions, marriage, births, retirement) so we may share your news in future issues. Send the following information and/or news stories to lora_bremer@ncsu.edu:

Name, Mailing & Email Address
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Work & Cell Phone Numbers
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Announcements

1,000 copies of this document were printed at a cost of \$2,791.

FDH ENGINEERING SPONSORS *CCEE NEWS*



FDH Engineering, Inc., is the proud sponsor of CCEE News. The multi-discipline consulting firm, founded in 1994, has an international presence, having worked on projects throughout the United States as well as Puerto Rico, the Virgin Islands, South America, Korea and Japan. Its staff includes more than 170 professionals at the forefront of their industry in structural engineering, geotechnical engineering, water

resources engineering and non-destructive testing. Additionally, FDH offers a broad array of services to the construction industry, including construction management, sustainable engineering and LEED consulting services. FDH has offices in Baton Rouge, LA, and St. Louis, MO, in addition to its headquarters in Raleigh. Printing of this issue of CCEE News is sponsored by FDH Engineering, Inc.

CCEE DEPARTMENT LOGO STORE



DepartmentLogoStore.com features apparel with the name and logo of the Department of Civil, Construction, and Environmental Engineering. Available items include polo and twill shirts, t-shirts, hooded sweatshirts, jackets and windbreakers. Items are available in a variety of sizes and colors. All apparel items are embroidered with "NC State University," the

Department's Achievement of Arms, and "Civil, Construction, & Environmental Engineering." Items can be shipped within the United States or can be picked up, free of shipping, in Cary, NC.

To view the available selection and to place an order, visit www.departmentlogostore.com.

INVESTING IN THE DEPARTMENT

We ask you to invest in our future and make a commitment to CCEE. Your gift will help us take CCEE to a new level of excellence. As a result, we anticipate having better educated and prepared students entering the work force which will raise the visibility and build the stature and prestige of the CCEE Department. There are many ways to give to the Department. Whether an annual gift, an endowed gift, or a one-time gift, it will have a significant impact on current as well as future students and faculty at NC State University.

Thank you for supporting CCEE.

Checks should be made payable to:
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Visit www.engr.ncsu.edu/foundation.

For more information, contact:
Lora Bremer, CCEE, Director of Development
Phone: 919.513.0983
Email: lora_bremer@ncsu.edu

North Carolina State University
Department of Civil, Construction, and Environmental Engineering
Campus Box 7908
Raleigh, NC 27695-7908

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