

NC STATE

Engineering

CCEE NEWS

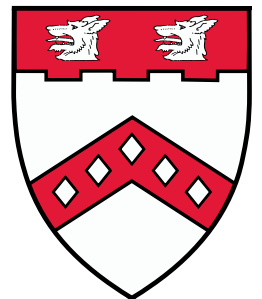
DEPARTMENT OF CIVIL, CONSTRUCTION,
AND ENVIRONMENTAL ENGINEERING
NC STATE UNIVERSITY | SPRING 2018

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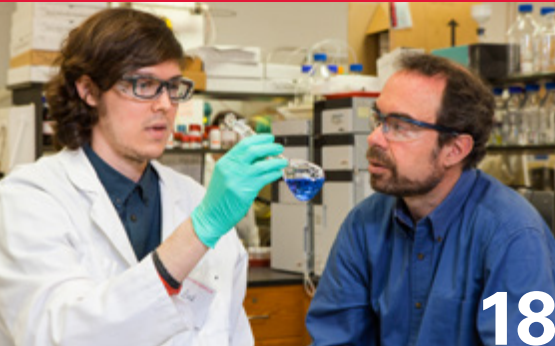
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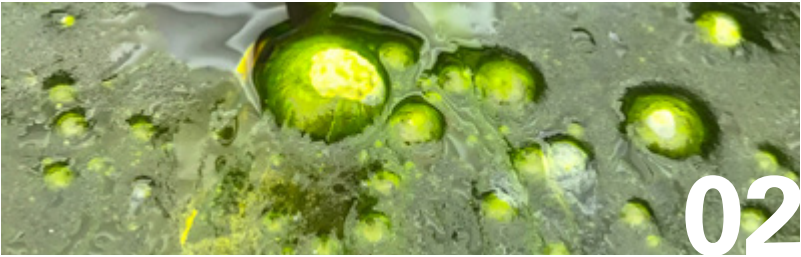


IN THE SPOTLIGHT

RESEARCH CONTRIBUTES TO SAFER DRINKING WATER

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Dr. Detlef Knappe’s work helped identify the presence of a fluorochemical called GenX in the drinking water being drawn from North Carolina’s Cape Fear River.



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ABOUT THE COVER

The new Wilshire Grand Center Los Angeles is the tallest skyscraper west of the Mississippi River. At the annual Zia Lecture Alumni Todd Whisenhunt spoke about the seismic design approach. Photo courtesy of Tammy Jow.

LETTER FROM THE DEPARTMENT HEAD MORTON A. BARLAZ



Dr. Morton Barlaz congratulates Saad Masood, who graduated in December 2017 with a BSENE.

Welcome to the Spring 2018 newsletter. It is a pleasure to update our friends on all that is going on in the department. I am writing this letter just after our December graduation. We recognized 70 graduates with a B.S. degree, 50 master’s students and 15 Ph.D.s. I always find the department’s graduation ceremony to be an uplifting reminder of our mission and our impact on the profession and civil infrastructure.

I am pleased to welcome Dr. **Josh Kearns** to our faculty. Josh joins us after completing his Ph.D. at the University of Colorado-Boulder and is part of NC State’s cluster in Global Water, Sanitation and Hygiene (WaSH). We wish a happy retirement to Distinguished Professor of Civil Engineering and Construction, Dr. Sami Rizkalla. Sami is retiring but plans to continue his research at the Constructed Facilities Lab.

This newsletter features research briefs from our faculty, highlighting the Department’s contributions to many aspects of civil infrastructure. Dr. **John Baugh** is working to improve the role of computer simulation in engineering design as it applies to a range of civil infrastructure including the seismic protection of buildings and the prediction of storm surge brought on by hurricanes. Drs. **Tarek Aziz** and **Dan Obenour** are improving our understanding of methods that can be used to study and ultimately reduce the occurrence of harmful algal blooms that adversely affect drinking water. Drs. **Cassie Castorena** and **Brina Montoya** are working to understand fundamental properties of aggregate base course that impact the performance and longevity of the nation’s roads. As all of you are aware, our contributions to civil infrastructure are often taken for granted, whether it is flood control, the efficient repair of bridges and buildings, high quality drinking water or traffic that flows smoothly. I continuously look for opportunities to educate students on their role in the design, construction and operation of sustainable infrastructure.

We continue to make progress on our new home on Centennial Campus. As I write this letter, we are reviewing construction drawings and looking forward to a groundbreaking event on April 20.

Finally, I want to take just a few lines to recognize the outstanding accomplishments of our faculty. Please see the Honors and Awards section for more information but to name a few: Dr. **Alex Albert** received the 2017 Journal of Construction Engineering and Management best paper award, Dr. **Joel Ducoste** was recognized with the College of Engineering George H. Blessis Advising Award for his contributions to student advising, and Dr. **Detlef Knappe** has become almost a household name in North Carolina as his research identified the release of a hexafluoropropylene oxide dimer acid, commonly known as GenX, to the Cape Fear River. The river serves as the source of drinking water for more than 200,000 North Carolina residents and his research has improved the safety of drinking water for the City of Wilmington.

As you read this newsletter, I hope that you get a sense of our accomplishments in teaching, research, and extension, and our contributions to sustainable infrastructure. As state support for our mission continues to decrease, we have become ever more dependent on your financial support. Your support provides help with field trips for undergraduates, allowing graduate students to make a presentation at a national conference, student support, and helping to recruit and retain the best students and faculty in the world. We need your support as we strive for excellence in all that we do. Please make a contribution to the department a regular event.

I always enjoy meeting people interested in the department. Please let me know if you are in the area and would like to tour our facilities.

Thank you.

CCEE AT NC STATE SUSTAINABLE INFRASTRUCTURE FOR SOCIETY

- \$19.9 million** in research expenditures
- 173** ongoing research projects
- 12** winners of CAREER and other NSF young faculty awards
- 49** faculty members
- 338** graduate students
- 777** undergraduate students

Paving the way for more sustainable road construction

The North Carolina Department of Transportation (NCDOT) maintains 80,000 miles of highway, all of which is built on a granular layer called aggregate base course (ABC). ABC is a common construction material and a key component in highway pavements. Most of us think of roads as the surface level of pavement or asphalt, but underneath those few visible inches there is most often a foot or more of ABC material. ABC provides cushioning for the surface layer, and if it does not perform properly the roadway will crack and form ruts.

Dr. **Cassie Castorena**, a transportation materials researcher, and Dr. **Brina Montoya**, a geotechnical and soils researcher, have combined efforts to identify the properties of ABC that most significantly affect its behavior. “Material properties, including the mineralogy, angularity, and texture, can influence the behavior of ABC, but the effect of these properties is not fully understood,” Castorena states.

The research is funded by NCDOT, whose specifications for creating ABC have changed very little since they were

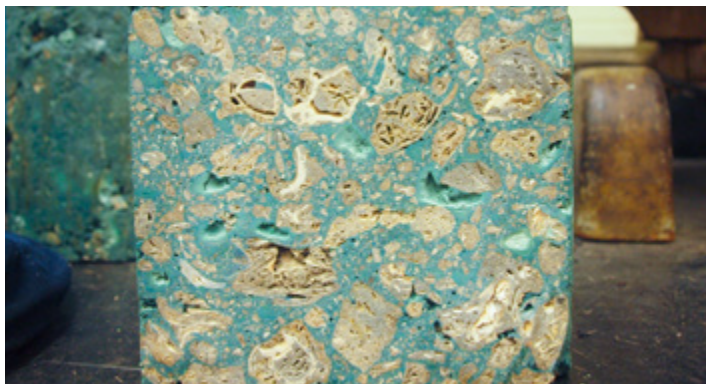
originally developed. “The good news is that the specifications have worked well, but we want to know why they are working, and to determine if we can make improvements. Even minor improvements could translate to major tax dollar savings as we build and maintain roads,” Montoya adds.

In North Carolina, the DOT has traditionally used virgin materials, quarried and processed locally, for ABC. ABC selection has largely focused only on achieving a certain size distribution of particles. “In the eastern coastal plain, there is typically more limestone in the ABC and it performs very differently than rock quarried in the piedmont. Is the material smooth and round, or rough and crushable. Is it oblong or equi-dimensional? Turns out these things make a difference,” Montoya says.

The study evaluated materials from five quarries throughout the state including two in the coastal plain and three from the piedmont including sites near Raleigh and Charlotte. “Each material was subjected to repetitive loading and we observed how the modulus changed at varying load levels,” Castorena reports.

“The outcomes of our experimental program have allowed us to link the material properties of the aggregate, like the shape and texture, to the performance of the material,” Montoya said. “We have developed an empirical relationship that will allow NCDOT to more economically assess ABC material and potentially even choose better mechanical properties during pavement design.”

A long-term goal of NCDOT is to begin to incorporate recycled materials, such as concrete, into the ABC layer. The results of this project will elucidate how different material properties will affect the performance of the pavement. This in turn will provide better guidance to NCDOT to design highway pavements with recycled materials in the future. ■



The fine aggregate in this aggregate base course soil sample has been dyed blue to aid in image analysis.

Natural hazards including wind, earthquakes, and floods threaten the built and natural environment, and engineering designs must account for their effects. With respect to flooding, for instance, climate change has created vulnerabilities at nuclear power plants. These vulnerabilities are being assessed by engineers using computer programs to simulate hurricane storm surge when designing protective structures.

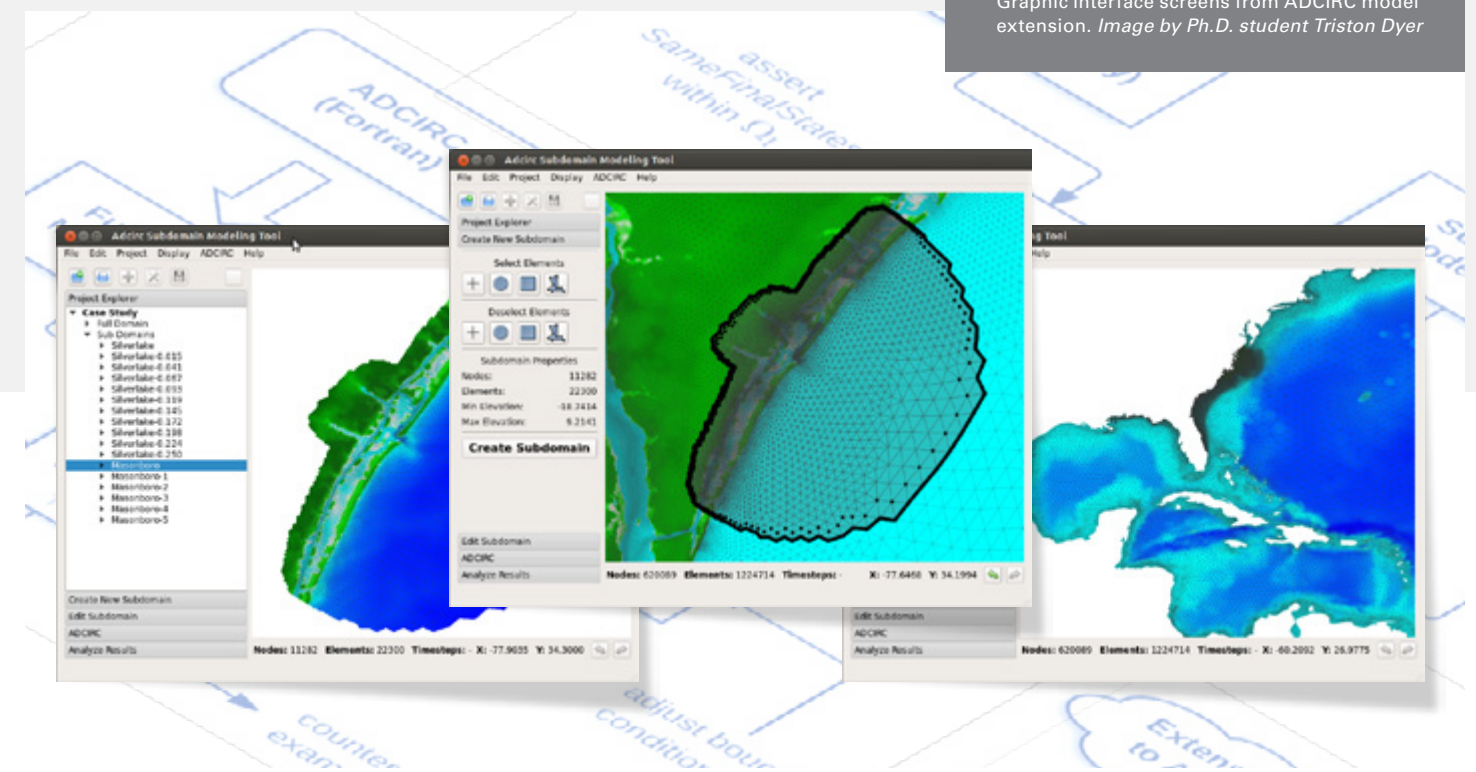
The role of simulation in engineering design highlights the importance of computer programs and the development practices that create them. CCEE and Operations Research Professor **John Baugh** and Dr. **Alper Altuntas** (Ph.D. 2016), a software engineer at the National Center for Atmospheric Research, have created new quality assurance approaches that are tailored to the kind of numerical and scientific software used by civil engineers.

How do quality assurance approaches help? In recent work, Baugh’s group developed an enhancement to ADCIRC, an ocean circulation model widely used by the U.S. Army Corps of Engineers (USACE) and Federal Emergency Management Agency (FEMA) to simulate hurricane storm surge. In some

scenarios, the enhancement allows computer time to be cut by orders of magnitude: a simulation that previously took about 1,000 hours of computer time now takes only 10. USACE itself noted the “considerable time and cost savings” afforded by Baugh’s enhancement in post-Katrina studies performed by its Flood and Storm Protection Division.

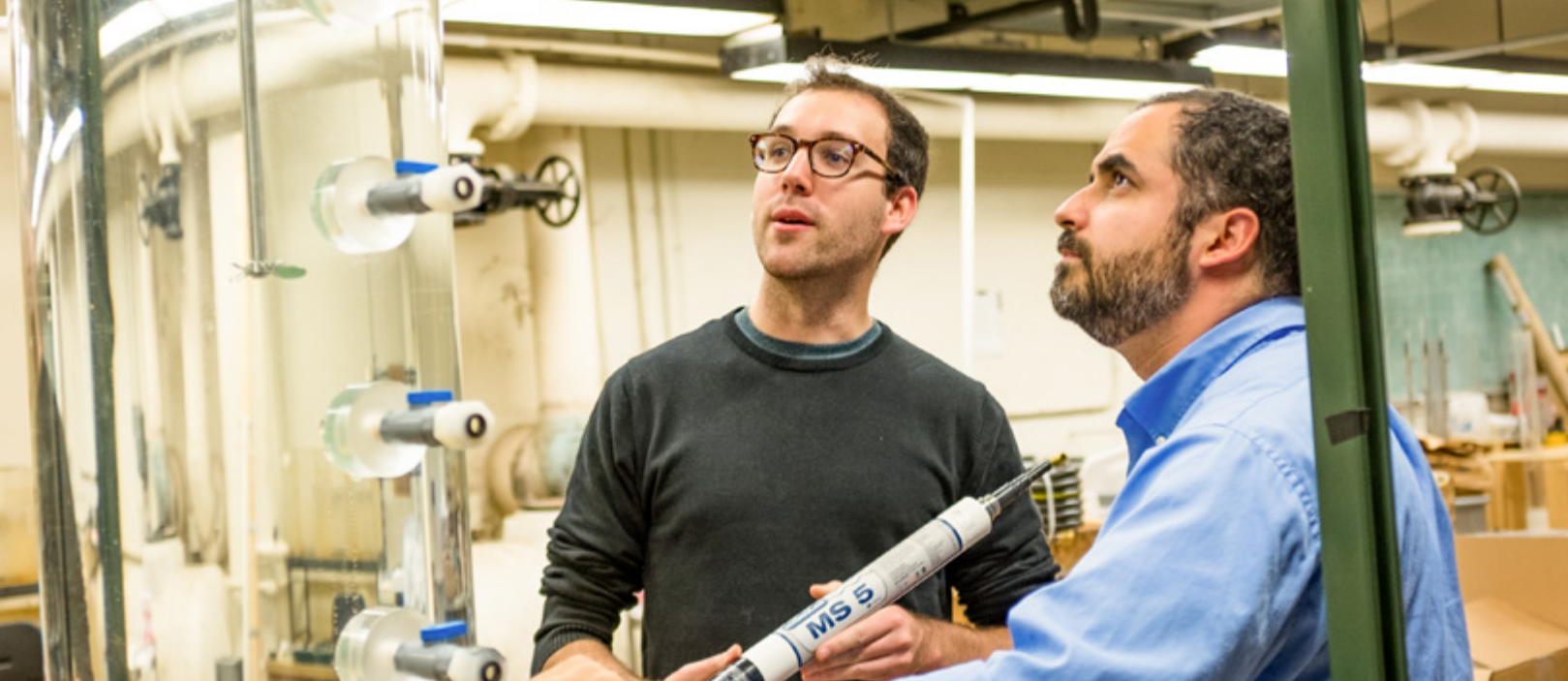
To ensure the accuracy of the enhancement, analyses by Baugh and Altuntas employ mathematical logic to describe the desired behavior of the software. The quality of the software can then be checked using state-of-the-art solvers that are able to sift through millions of potential errors that may arise from subtle software interactions and otherwise escape detection. Because the checks are exhaustive, quality assurance is obtained at a level beyond that provided by conventional software verification and validation approaches.

In ongoing research, Baugh and his research group are applying the same mathematical methods to other infrastructure problems that can benefit from large-scale physical simulation, including structural control for the seismic protection of buildings. ■



NEW RESEARCH PROJECTS

In the last four months of 2017, CCEE faculty members contributed to efforts that resulted in more than \$3 million of research support from federal, state, and private agencies and foundations. This support will enable 21 CCEE faculty members, their teams of graduate, undergraduate and postdoctoral researchers and their collaborators to address a diverse range of problems in support of sustainable infrastructure and the environment in North Carolina and throughout the world.

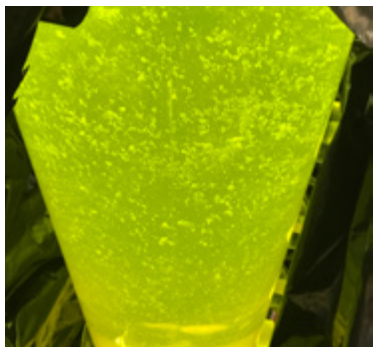


Master's student Alexandre Mangot (left) and Dr. Tarek Aziz examine one of the water reactor columns before beginning the mixing tests.

Do artificial mixing systems reduce harmful algal blooms?

Harmful algal blooms (HABs) are increasingly jeopardizing our water supplies. For one, they clog filters that are used at water treatment plants. In addition, they release compounds that negatively impact the taste and odor of drinking water and are difficult to remove during water treatment. Finally, HABs release compounds that result in the formation of carcinogens during the disinfection of our drinking water. A subset of the algae present in HABs, cyanobacteria, can produce toxins that are harmful to both human and animal life. In 2015, one such toxic HAB in Lake Erie resulted in the shutdown of a local water treatment facility.

Artificial mixing systems are used extensively in water supply reservoirs around the world to control the formation of HABs.



A light at the top of this water column simulates sunlight. Algal cells have clumped together.

Some cyanobacteria are buoyant and thus float to the water surface, outcompeting other algae for light. Artificial mixing is used to reduce the growth of cyanobacteria. "Even though these mixing systems have been used for decades, there has been very little research into how well they work," said CCEE

Professor **Tarek Aziz**. "I was part of a research team evaluating solar powered mixers used in Jordan Lake in Apex, North Carolina. After wrestling with the variable and uncontrollable conditions in nature, we realized that we could learn much more by conducting laboratory studies in which we could bring the reservoir to the lab. Lab studies allow us to carefully study the effects of light, mixing, and nutrient concentrations without the uncontrollable variability present in nature."

Aziz and a multidisciplinary team including CCEE professor **Dan Obenour**, and **Astrid Schnetzer**, a Phytoplankton Ecologist from the Department of Marine, Earth and Atmospheric Sciences, designed, modeled, and constructed three 2-meter tall acrylic reactors. The water column reactors (WCRs) include an artificial light and mixing system to simulate and control for variables common in the field.

The research showed that mixing was an important variable and that a thick algal scum developed on the surface of the WCRs in the unmixed and low-mix reactors, while the highly mixed system showed no noticeable surface accumulation of algae. "We are definitely seeing algal populations shift depending on the amount of mixing, but we're also finding that mixing has varying impacts on the algae depending on the community of organisms that are present in the water to begin with," Aziz reports. While results are preliminary, these findings are providing new insights into when artificial mixing may be able to suppress the formation of harmful algal blooms. ■

Dr. **SANKAR ARUMUGAM** and an NC State-based team were selected by the United States Geological Survey (USGS) to host the Southeast Climate Science Center (SECSC). The Center will receive \$6.5M over the next five years for research on the impacts of climate change in the Southeast. Dr. Arumugam will collaborate with other SECSC investigators to develop strategies to improve the water and ecological resilience of the Southeast region under climate change. SECSC will support two USGS global change graduate fellows within CCEE to participate in workshops and seminars focusing on structured decision making under climate change.

Dr. **ASHLY CABAS** received funding from the USGS to study how proper characterization of ground motion intensity influences seismic hazard assessment. The study will compare current practices for input motion selection, identify shortcomings in these practices, and investigate how they affect ground motion intensity measures. Outcomes will include recommendations for improvements to existing input motion selection procedures for specific geotechnical engineering analyses such as site response analysis, liquefaction assessment and seismic slope stability.

Drs. **CASSIE CASTORENA**, **SHANE UNDERWOOD**, and **RICHARD KIM** were awarded funding from the Federal Highway Administration to improve the Asphalt Mixture Performance Tester (AMPT) cyclic fatigue test procedures. AMPT cyclic fatigue testing is used to predict pavement performance for both pavement design and analysis. The results of this project will enable the widespread implementation of AMPT fatigue testing in the U.S.

Dr. **FRANCIS DE LOS REYES** and Dr. **MICHAEL HYMAN** (NC State Microbiology) received funding from the US Agency for International Development (USAID) to investigate the microbiome of "carnivorous" pitcher plants in North Carolina and in the Philippines. The goal is to describe the microbial communities

and enzymes within these unique plants, as they may have biotechnological and industrial importance. For example, the plants have been found to harbor fungi that have enzymes that work in tandem that could be used to catalyze the production of ammonium chloride, an inorganic salt used in 90 percent of fertilizers worldwide. The same enzyme tandem holds promise in health and medical fields with the production of oxaloacetate, a possible anti-aging agent. The project will fund a visiting scholar from the Philippines, Nathan Alcantara, to conduct research at NC State.

Dr. **ANDREW GRIESHOP** and NC State collaborators from the College of Natural Resources were part of a team awarded a 5-year, \$5 million grant under the NSF Partnerships for International Research and Education (PIRE) program to establish the Energy Poverty PIRE in Southern Africa (EPPSA) program. EPPSA, led by researchers at the Carolina Population center at the University of North Carolina, will build a partnership of five research universities in North Carolina, Malawi, Zambia and Zimbabwe to address the pressing problem of 'energy poverty' — the lack of access to electricity and reliance on biomass fuels for basic energy needs — in Southern Africa. The team will conduct evaluations of a range of ongoing and planned energy interventions in the region and study the population and environmental dynamics that impact transitions to modern energy sources in the region.

Dr. **DETLEF KNAPPE** and colleagues in NC State's Center for Human Health and the Environment received funding from the National Institute of Environmental Health Sciences (NIEHS) to conduct a community-based study to assess human exposure to GenX in Wilmington, NC. GenX is a fluorochemical recently discovered in the drinking water of more than 200,000 North Carolinians. The team will analyze the blood, urine, and drinking water of Wilmington residents for GenX and related perfluorinated chemicals. Blood and urine samples will also be used for a range of clinical tests to assess health risks from exposure.

Dr. **KNAPPE** and Dr. Kevin O’Shea in the Department of Chemistry at Florida International University received a grant from the NSF to design sorbents for drinking water and industrial wastewater treatment of per- and polyfluoroalkyl substances (PFASs). PFASs are contaminants of emerging concern because of their toxicological properties, widespread presence, and persistence in the environment. Most water treatment technologies are not effective for PFAS control.

Dr. **JASON PATRICK** was selected for a Young Investigator Award from the Air Force Office of Scientific Research (AFOSR) to develop fiber-reinforced composites with built-in self-healing and self-sensing capabilities. The multifunctional materials platform will rely on internal microchannels for liquid healing agent delivery in combination with embedded fiber optics for light-based curing/sensing. Intended outcomes of the interdisciplinary research are to enhance the safety, reliability, and resilience of composite infrastructure in a wide array of applications including aerospace and civil engineering.

Dr. **JEREMIAH JOHNSON** received NSF funding for an on-going project to study the environmental impacts of providing power system reliability using energy storage. The overall goal is to identify strategies for distributed storage to improve environmental outcomes including reduced emissions. The project combines power systems, battery degradation, and environmental impact models to optimize environmental performance of the energy system.

Drs. **MERVYN KOWALSKY** and **JAMES NAU** received funding from the Alaska Department of Transportation (AKDOT) to study the seismic behavior of the Anchorage Port Access Bypass, a major bridge that is believed to suffer from several seismic vulnerabilities. The research aims to quantify the behavior of the structure through modeling and testing, and ultimately develop retrofit techniques to improve the structure. This work

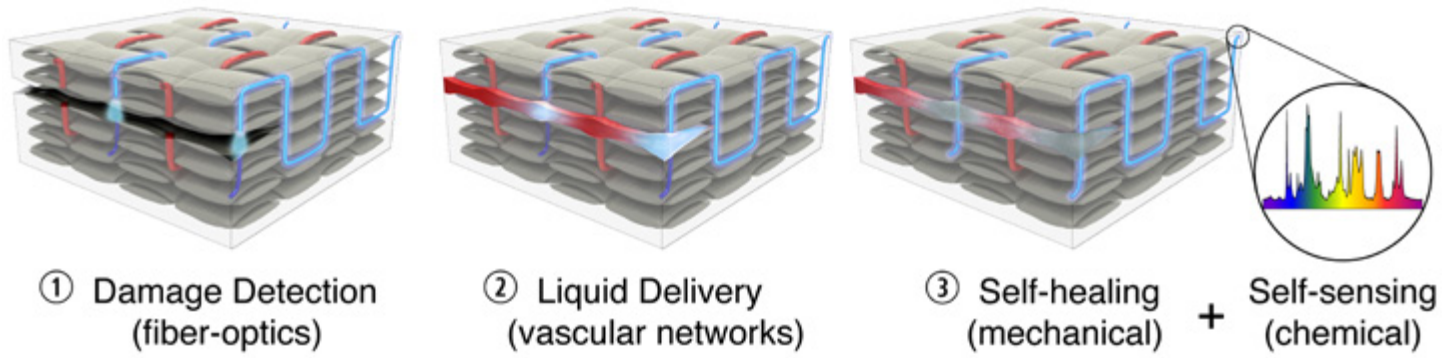
will aim to further advance a steel bridge design developed at NC State over the last 10 years that has been used only for new construction thus far. The technique will eventually be adapted for retrofit of bridges such as the Anchorage Port Access structure.

Drs. **MURTHY GUDDATI** and **SHAMIM RAHMAN** received funding from the NC Department of Transportation (NCDOT) to field test a new nondestructive testing method to estimate the depth of pile foundations of bridges across North Carolina. Named Effective Dispersion Analysis of Reflections (EDAR), the method was co-developed by Guddati and Ph.D. student Vivek Samu. The new NCDOT project complements an ongoing AKDOT collaborative project with Dr. Mervyn Kowalsky to develop and field test various pile foundations in Alaska.

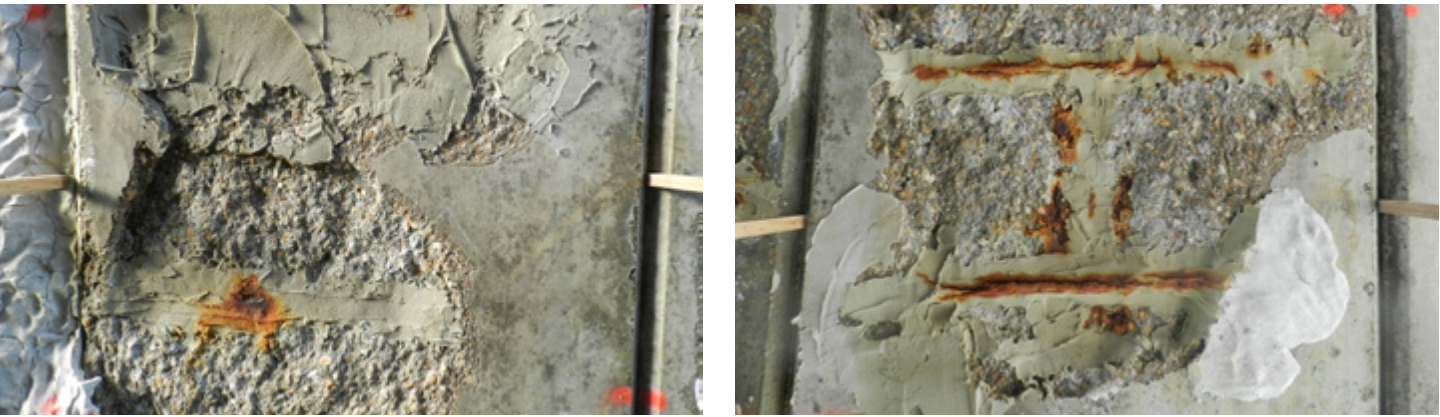
Dr. **ALEJANDRA ORTIZ** received an Early Investigator Grant from the NC Space Grant Consortium to investigate NC coastal marsh loss at Mackay Island and Roanoke Marsh. Dr. Ortiz and her students will work with Google Earth Engine and satellite data to automatically identify and quantify the amount of marsh land that has disappeared over the last 34 years to understand the processes that may drive land loss.

Drs. **RAHMAN, ORTIZ**, and **MOHAMMED GABR** received funding from the Coastal Studies Institute NC Renewable Ocean Energy Program (NCROEP) to investigate how ocean bed dynamics might impact the long-term stability of marine hydrokinetic devices (MHKs). MHKs are anchored to the ocean floor and are used to generate energy from waves and ocean currents. Dr. Rahman’s team will use numerical modeling to investigate how bed slope and wave conditions impact erosion and stability of the ocean floor around an MHK.

Drs. **RUDI SERACINO** and **GREG LUCIER** received NCDOT funding to develop a new mechanically fastened and prestressed



A schematic diagram of a multifunctional composite material that combines fiber-optics with microvascular networks to achieve in situ self-healing/sensing. Image by J. Patrick



Typical levels of deterioration that can be repaired using a carbon fiber reinforced polymer system.

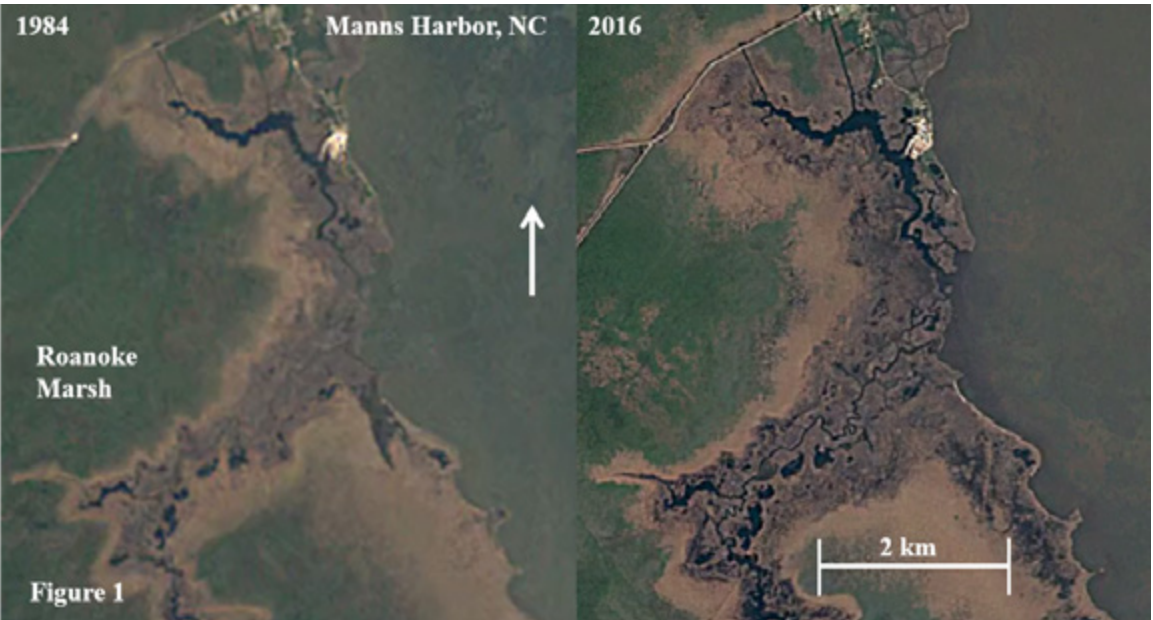
carbon fiber reinforced polymer (CFRP) system to retrofit prestressed concrete bridge beams. The temporary retrofit will be designed to extend the service life of existing bridges without the need for load restriction or closure, until the bridge can be scheduled for major repair or replacement. This research is partially funded through NCDOT’s membership in NC State’s NSF Industry/University Cooperative Research Center on Integrating Composites in Infrastructure (CICI).

Dr. **ALEX ALBERT** received funding from the Job-Site Safety Institute for research focusing on improving hazard recognition levels and safety outcomes in the construction industry. The research will involve field tests to evaluate the efficiency of newly developed hazard recognition interventions with the goal of reducing injuries at construction workplaces.

Dr. **H. CHRISTOPHER FREY** received funding from the Urban Air Initiative to measure the effect of fuel ethanol content and octane rating on fuel economy and emissions for five selected gasoline vehicles and four fuel blends. For each vehicle and fuel, measurements will be made with portable emission measurement systems for gaseous and particle exhaust emissions. The measurements will take place on a 110-mile predetermined route under real-world operating conditions. The results will help determine the influence of fuel properties on vehicle fuel economy and emissions.

Dr. **JAMES LEVIS** received support via the RTI Scholars program to work as an RTI University Scholar in 2018. His research will focus on developing real-time life-cycle tools to help researchers, scientists, managers, and decision-makers

make screening-level decisions in system design and development phases. Initial applications will focus on sustainable materials management and the use of nanomaterials in wastewater systems. These tools will provide critical information to help ensure product and technology sustainability. ■



Timelapse Imagery from Google Earth Engine of Roanoke Marsh Island south of Manns Harbor for 1984 and 2016 showing increased water coverage on the marsh interior. Image by Dr. Alejandra Ortiz.

NEW FACULTY

Josh Kearns brings expertise in water treatment for developing communities

Dr. **Josh Kearns** joined the CCEE faculty in January as an assistant professor. Kearns is a member of the new NC State Global WaSH (Water-Sanitation-Hygiene) faculty cluster.

Kearns' research interests include field detection of pollutants and chemical hazards in drinking water sources along with the development of affordable and locally managed mitigation technologies. Kearns and colleagues pioneered the use of biochar, a charcoal-like material generated from local biomass, as an adsorbent for use in water treatment. Biochar is used to remove chemical toxins such as herbicides, pharmaceuticals, and industrial pollutants. He has more than 10 years' experience

environmental science, and engineering to understand and repair ecological harms and empower marginalized peoples," Kearns says.

Kearns earned a B.S. in chemistry, with a minor in environmental engineering, at Clemson University in 2000. He completed his M.S. in environmental biogeochemistry from the University of California-Berkeley in 2005, followed by a Ph.D. in environmental engineering from the University of Colorado-Boulder in 2016. Since 2008, he has worked intermittently as a visiting researcher with Dr. Detlef Knappe in the CCEE department.



Dr. Josh Kearns deploys water quality monitoring equipment in a canal in Burma.

working in WaSH development with villages and community-based organizations in southeast Asia. He also conducts an ongoing field research and WaSH practitioners' education program with a community-based organization in central Mexico.

Kearns grew up in West Virginia, where from a young age he witnessed environmental damage done by resource extraction and industry, along with economic hardship endured by local communities. "I've taken a crooked path through life, but the common thread has been my passion for using chemistry,

In his first semester, Kearns will be teaching a course on Water and Sanitation in Developing Countries. He also plans to develop an environmental organic chemistry course with a sub-focus on environmental sampling and analytics in challenging locations.

Kearns enjoys trail running, swimming, and bicycle camping. He's also passionate about playing Bluegrass, Newgrass and traditional Appalachian music on the mandolin, and performs locally with the acoustic trio Fabius Page. ■



Dr. Rizkalla in the Constructed Facilities Laboratory.

Distinguished Professor Sami Rizkalla retires

Dr. **Sami Rizkalla** has retired after 17 years in the Department of Civil, Construction, and Environmental Engineering. Since 2000, Rizkalla has served as a Distinguished Professor and as Director of the Constructed Facilities Laboratory. Prior to his time at NC State, Rizkalla was a leader in the establishment of the Canadian Network of Centers of Excellence, referred to as ISIS Canada (Intelligent Sensing for Innovative Structure). The research network was headquartered at the University of Manitoba where he was a professor of civil engineering. Dr. Rizkalla earned both his M.S. (1974) and Ph.D. (1976) in civil engineering from NC State, after completing his undergraduate studies at Alexandria University in Egypt.

Rizkalla's research focuses on reinforced and prestressed concrete structures, and high performance materials including reinforcing steel, concrete and fiber-reinforced polymer (FRP) composites — all of which contribute to enhancing the sustainability and resilience of critical civil infrastructure. His research has informed multiple national design guides and codes used in structural engineering practice worldwide. Dr. Rizkalla served as director of the NC State site of the NSF Industry–University Cooperative Research Centers (IUCRC) for Repair of Buildings and Bridges with Composites (2002 – 2009) and Integration of Composites into Infrastructure (2009 – 2017).

Since joining NC State in 2000, Rizkalla's research has been published in more than 100 peer-reviewed journal articles as well

as numerous conference papers. He has received 18 awards from both national and international organizations including the American Society of Civil Engineers, the American Concrete Institute, the Precast/Prestressed Concrete Institute, the Swiss Federal Laboratories for Materials Science and Technology, and the International Institute for FRP in Construction. He has been recognized as a Fellow in seven professional societies.

Rizkalla will continue to be involved with ongoing research on strengthening steel structures, optimizing the reinforcement for compact L-shaped concrete girders, and improving the shear transfer mechanisms for thermally efficient concrete wall panels. ■



The ZIA Lecture features a behind the scenes look at design and construction of the Wilshire Grand Center



The mat pour for the Wilshire Grand Los Angeles took 18.5 hours - the longest recorded mat pour in history.
Photo provided by Turner Construction.

Stewart Theatre in the Talley Student Union was near capacity for the 16th annual Paul Zia Distinguished Lecture in September. Almost 700 attendees listened as panelists described their role in the design and construction of the Wilshire Grand Center in Los Angeles. At 1,100 feet, the skyscraper is the tallest building west of the Mississippi, and one of the tallest ever built in this country. It was developed at a cost of more than a billion dollars and was the first new skyscraper in L.A. in almost three decades. Configured with floor to ceiling glass in the hotel rooms and offices, the mixed-use site is an iconic addition to the visual character of downtown Los Angeles. It is regarded as a design and engineering feat, especially given that L.A. is an earthquake 'hot zone.' The program featured three speakers, including CCEE alumnus **Todd Whisenhunt** (MSCE 2004).

We wanted to make an impact on the skyline.

Architect **Tammy Jow**, the project director and senior designer with AC Martin, the architectural firm responsible for the design, began the symposium. "We wanted to create the new nucleus of L.A. with both indoor and outdoor experiences. One of our big ideas was to put a sky lobby on the 70th floor, so that everybody who stays at the hotel gets the views," she continued. A high-speed elevator takes visitors to the sky lobby in less than one minute.

The iconic building has a "sail" on top that rises 100 feet above the 70th floor sky lobby,



Tammy Jow, project director and senior designer with AC Martin.

and finally a spire that extends another 173 feet. "When we originally conceived the idea for the sail we designed double trusses. Then structural engineering came in, and reality struck," Jow relayed, eliciting a collective laugh from an audience consisting primarily of engineers, before she turned the podium over to structural engineer Todd Whisenhunt.

You get to know your building better

Todd Whisenhunt, a vice president with Thornton Tomasetti, began by explaining the structural scope of the massive and complex building. The basement, five floors deep, supports the 73-floor tower and is also laterally engaged with the structure. "With any tall building you begin the lateral design with wind parameters and then move to the seismic design," Whisenhunt explained. The team utilized simulation models and also performed a wind tunnel study using a model of the Wilshire Grand to design for high level winds, and also to make sure that even in low level winds people inside the structure would not feel it move.



Todd Whisenhunt, vice president with Thornton Tomasetti, spoke of the seismic design solutions that were engineered for a skyscraper in earthquake prone Los Angeles.

The Los Angeles area is considered one of the most earthquake prone areas in the country. As Whisenhunt began explaining the approach to the seismic design, he showed the audience a Faults and Seismic Activities map of the area. He explained that the team used Performance Based Design (PBD) as opposed to code-based design because PBD allowed for more innovation. "In the long run, you learn more about your building using Performance Based Design," he said.

However, while allowing for more innovation, PBD demands significantly more analytical effort than code-based design. The team used computer models incorporating time-history records from 11 actual earthquakes to simulate the shaking that would occur in the Wilshire Grand. And of course they had to plan for extreme seismic conditions, referred to as Maximum Considered Earthquake (MCE) or, as Whisenhunt pointed out, what is often called “the big one.” Based on seismic hazard analysis, an MCE is an earthquake that is expected to occur once in approximately 2,500 years.

It’s all about keeping things consistent.

Brendan Murphy, vice president and operations manager with Turner Construction, began the final segment of the program by explaining the challenges of demolishing the 1950s-era building that stood where the new Wilshire Grand was to be built. Because of seismic considerations, the existing building could not be imploded, but rather had to be demolished floor by floor. “We created a system. We were able to take down one floor every five days, and we recycled 100 percent of the concrete and structural steel,” Murphy explained. The demolition took 12 months, and during that time the construction firm created a sequence for the construction phase that worked on a four-day cycle. “The trades embraced the cycle, and even with 1,200 tradespeople employed on the construction crew, we only got off the building cycle three times,” Murphy said. He likened it to an orchestra, and at one point said “the civil engineers tie the whole orchestra together.”



Brendan Murphy likened the design and construction of the building as an ‘orchestra’ and said “the civil engineers tie the whole orchestra together.”

After the demolition came another record setting attribute of the Wilshire Grand Center. Pouring the mat, which Murphy referenced as “17 feet

and 6 inches of concrete cake,” took 18.5 hours, which is the longest mat pour in recorded history.

The department would like to thank the Zia Lecture committee including Chairwoman **Christine Nguyen Herrick**, P.E. (BSCE 2011). You can find out more about the lecture series including opportunities for sponsorship, and a sneak preview of next year’s topic, at zialecture.com. ■

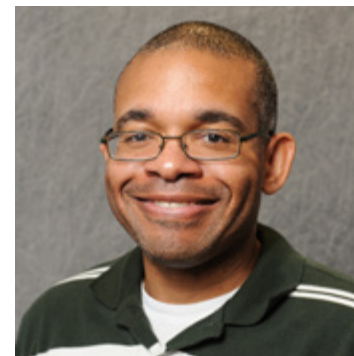


AWARDS & HONORS



Dr. Alex Albert

Dr. **ALEX ALBERT**, assistant professor of construction engineering, received the 2017 *Journal of Construction Engineering and Management* best paper award for a paper titled “Development and Testing of a Personalized Hazard-Recognition Training Intervention.” Co-authors include Ph.D. students Idris Jeelani and Roger Azevedo and E.I. Clancy Distinguished Professor Ed Jaselskis.

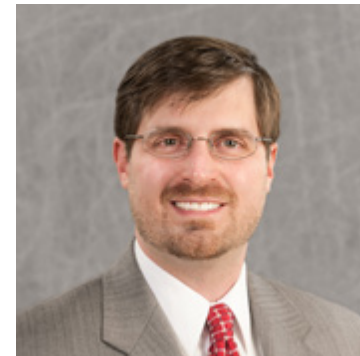


Dr. Joel Ducoste

Dr. **JOEL DUCOSTE**, professor of environmental engineering, was awarded the NC State College of Engineering 2017-18 George H. Blesis Advising Award. The award recognizes faculty members who consistently and willingly give their time and effort to advising, counseling and mentoring students and assisting student groups. It is also a continuing memorial to George H. Blesis, a faculty member whose interest in undergraduate education and advising serves as an example today.



Dr. H. Christopher Frey



Dr. Gregory Lucier

Dr. **H. CHRISTOPHER FREY**, the Glenn E. Futrell Distinguished University Professor of Environmental Engineering, received an Excellence in Review Award from the journal *Environmental Science and Technology*, in recognition of going “the extra distance to write reviews that were truly exceptional.” Only 18 award recipients internationally, and only seven in the U.S., were selected based on about 10,000 reviews submitted to ES&T in the past year.



Dr. Sami Rizkalla

Drs. **GREGORY LUCIER**, **SAMI RIZKALLA**, and **PAUL ZIA** were selected for the Precast/Prestressed Concrete Institute’s (PCI’s) Martin P. Korn Award for 2017. This award recognizes a paper published in the *PCI Journal* that is most “worthy of special commendation for its merit as a contribution in design and research to the advancement of precast and prestressed concrete.” The award was given for their paper titled “Dapped Ends of Prestressed Concrete



Dr. Paul Zia

AWARDS & HONORS



Mr. Roberto Nunez

Thin-Stemmed Members: Part 1, Experimental Testing and Behavior.”

Mr. **ROBERTO NUNEZ**, lecturer and senior construction extension specialist, was selected as a keynote speaker at the First International Symposium of Cement and Concrete Technology held September 21-22, 2017 in Cuenca, Ecuador.



Dr. Rudi Seracino

Dr. **RUDI SERACINO**, professor of structural engineering, was selected for the honorary title of adjunct professor at the University of Adelaide in Australia.



Liliana Velasquez Montoya

Two CCEE graduate students received awards at the American Shore and Beach Preservation Association's (ASBPA's) National Coastal Conference. **LILIANA VELASQUEZ MONTOKA** (advised by Dr. **Margery Overton**) received the Student Educational Award. This award is given annually to a student who, through his or her research,



Nelson Tull

is furthering the state of science of coastal or riverine systems as it relates to the goals and mission of the ASBPA. **NELSON TULL** (advised by Dr. **Casey Dietrich**) received an award for his poster titled “Improving Accuracy of Real-Time Storm Surge Inundation Predictions Using GRASS GIS.”

Ph.D. student **ADITYA SINHA** won a \$5,000 Graduate Research Scholarship from Jacobs Engineering to support research on the composition of gaseous organic compounds in emissions from cookstoves like those used in developing countries. Sinha will conduct the work under the supervision of Dr. Andy Grieshop in collaboration with scientist Dr. Ingrid George from the US Environmental Protection Agency (EPA) National Risk Management Research Laboratory in Research Triangle Park, NC.



Shawnak Doshi

Senior **SHAWNAK DOSHI** was chosen as the student chapter member of the Year from the American Society of Civil Engineers NC Section. Doshi has been an active member of ASCE since 2014 and is currently student chapter president for NC State University. In addition to serving as president, Doshi has held multiple officer positions and has operated as the concrete canoe captain for the past two years.



To honor and inspire: CCEE establishes Alumni Hall of Fame

The first group of CCEE Hall of Fame inductees was honored at a ceremony on Centennial campus in early November. Shown here are some inductees and their families, as well as family members of posthumous inductees.

CCEE has established an Alumni Hall of Fame, and the first recipients were inducted at a ceremony on November 3rd. At the induction ceremony, CCEE Department Head Dr. Morton Barlaz reminded the audience that the civil engineering curriculum at NC State was established in 1895. To date, the department has awarded approximately 10,500 Bachelor of Science degrees, and more than 3,000 master's and Ph.D. degrees. “Given this long and esteemed history, the department, along with members of the CCEE Industry Advisory Board, decided it was time to create an Alumni Hall of Fame to acknowledge some of our distinguished alumni and permanently commemorate their accomplishments,” Barlaz said.

Heather Denny (BSCE 1995), CEO of McDonald York Building Company, served as chair of the Hall of Fame Committee. “The idea came about as a way to inspire our current students and faculty, and to celebrate the accomplishment of those extraordinary graduates who have used their education to excel,” Denny added.

The first group of inductees included 19 individuals who were previously selected as Distinguished Engineering Alumni (DEA) by the College of Engineering. “Since these individuals have already been named to the highest award offered by the College of Engineering, we knew we wanted them as part of the CCEE Hall of Fame,” Director of Development Lindsay Smith said. “Going forward, we will add three to five individuals each year through a nomination and review process,” Smith added. Most nominees were able to attend the ceremony, and many were accompanied by family members. For posthumous

awardees, family members of most were present to accept the awards. The year of graduation for inductees ranged from 1929 to 1977. Short biographies for each inductee were read, providing an impressive list of accomplishments of our CCEE alumni. The bios can be found at www.ccee.ncsu.edu/bios-hall-of-fame. ■

List of 2017 CCEE Hall of Fame Inductees

- Colonel William D. Alexander, III, '53 (posthumously)
- Mr. Stephen F. Angel, BSCE '77
- Mr. Ray Bryan, Jr., BSCON '53 (posthumously)
- Mr. Jimmy D. Clark, BSCE '74
- Dr. Michael W. Creed, BSCE '74, MSCE '84
- Mr. Glenn E. Futrell, BSCE '63, MSCE '65
- Mr. Paul N. Howard, Jr., BSCE '45 (posthumously)
- Mr. Johnie Hooper Jones, BSCON '53 (posthumously)
- Mr. James F. Kelly, BSCE '44 (posthumously)
- Dr. T. William Lambe, BSCE '42 (posthumously)
- Mrs. Barbara H. Mulkey, BSCE '77, MSCE '84
- Mr. B. D. Rodgers, Jr., BSCE '49 (posthumously)
- Mr. W. Tilford Smith, BSCE '29 (posthumously)
- Dr. Eli Sternberg, BSCE '41, Dr. of Humanities '63 (posthumously)
- Ms. Pamela B. Townsend, BSCE '84, MSCE '87
- Mr. Ed Vick, BSCE '56, MSCE '60 (posthumously)
- Dr. C. Michael Walton, MCE '69, Ph.D. CE '71
- Mr. Robert G. Wright, BSCON '68
- Mr. G. Smedes York, BSCE '63, Dr. of Humanities '09

Local solutions to global sanitation challenges: CCEE researcher leads interdisciplinary team with new \$1.2 million grant



CCEE alumnus Tate Rogers (left) and Francis de los Reyes (center) field test the Flexcrevator in Zambia.

The Global Water Sanitation and Hygiene (WaSH) faculty cluster led by Dr. Francis de los Reyes from the Department of Civil, Construction, and Environmental Engineering includes researchers from the College of Agriculture and Life Sciences, the College of Humanities and Social Sciences, and the College of Natural Resources. The goal of the Global WaSH cluster is to address water and sanitation issues by developing new technologies that are context sensitive, practical, and take advantage of developments in energy, environmental processes, materials science, data technologies, design and ecology. Advances in public health and environmental research are required in an interconnected world with increasing population and environmental pressures.

Nearly two billion people on earth use pit latrines as the primary way to defecate and urinate. These pits fill quickly with human waste and large amounts of trash including rags, plastic bags, bottles, and hair. People often remove waste manually, exposing workers to a host of human pathogens without sufficient protection. While mechanized ways to remove raw sewage from latrines exist, these devices are often expensive and clog frequently from high volumes of garbage.

In fall 2017, Global Water Sanitation and Hygiene (WaSH) cluster lead Dr. **Francis de los Reyes** received a \$1.2 million grant from the Bill and Melinda Gates Foundation to improve and test the market for a novel pit latrine emptying device, the Flexcrevator. The aim of the project is to redesign the prototype machine so it is widely adopted by pit emptying service providers and entrepreneurs, and also ensure that the enhanced Flexcrevator can be economically manufactured in developing countries.

The Flexcrevator is the newest generation of a series of prototypes, with the first design invented by NC State alumnus **Tate Rogers** (B.S.'11 M.S.'13) in 2011. The Flexcrevator is comprised of two main components - a vacuum cube and an external trash excluder. Fecal sludge is vacuumed into a drum via a hose attached to an external trash excluder. The trash excluder in its current version is a rotating auger that pushes trash away during fecal sludge pumping.

This project requires diverse expertise from around the world. The NC State team works closely with Catapult Design, a Colorado based non-profit design firm with a rapid prototyping machine shop in Nairobi, Kenya. Rogers returns to the project as a consultant from Triangle Environmental Health Initiative (Tri-EHI), a company he founded in 2017. Dr. de los Reyes also set up partnerships and field testing sites across the African continent. The team traveled to Lusaka, Zambia to perform initial testing with German development agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) last November. The group interviewed stakeholders including pit latrine emptiers, members of the Lusaka city council, local utilities and private business owners.

“Everyone we talked to emphasized the need to keep the process as hygienic as possible, so we are working with our design partners both here in the U.S. and in Nairobi to do some design adjustments, rapid prototyping, and more field testing” said **Jocelyn Tsai**, Global WaSH Cluster program coordinator. Plans are to return to Zambia in the spring of 2018 to showcase the final design and put it through another round of field tests. ■

Ongoing research collaborations with CCEE professor and former Ph.D. students lead to international air quality solutions

Dr. **H. Christopher Frey**, the Glenn E Futrell Distinguished University Professor in CCEE, and several Ph.D. students that he has advised continue to collaborate on air quality research and education. Most recently this was evidenced at the Fifth International Symposium on Regional Air Quality Management in Rapidly Developing Economic Regions, (5RAQM) held in Guangzhou, China in November.

Frey spoke at the conference on the role of portable emission measurement systems to answer technical and policy questions. Dr. **Junyu “Allen” Zheng** (Ph.D. CCEE 2002), a professor of environmental engineering at Jinan University in China, served as secretary-general of the conference and delivered a talk on quantification of volatile organic compound emissions. Dr. **Joshua Fu** (Ph.D. CCEE 2000), a professor in the Department of Civil and Environmental Engineering at the University of Tennessee-Knoxville, spoke on assessment of the effectiveness of SO₂ emission control in China.

“The number of attendees at this year’s conference has more than doubled since the previous one held in 2014,” Frey said. “It’s encouraging that China is proceeding full steam ahead on air quality science and policy.” One of the highlights reported at this year’s meeting is that for the last four years, the ambient levels of fine particulate matter (PM_{2.5}) have been decreasing, which is a major success story.

Frey is also an adjunct professor at the Hong Kong University of Science and Technology (HKUST). HKUST Ph.D. student **Zhiyuan Li** spent the spring of 2017 at NC State working with Frey on measurement and modeling of human exposure to air pollution during transportation. **Wenwei Che**, a research assistant professor at HKUST, spent the spring of 2013 in Raleigh working with Frey while she was a Ph.D. student. Frey and Che are now working on measurement and modeling of human exposure to both indoor and outdoor air pollution and have co-authored several journal papers. Frey also works closely with colleagues in mainland China. For example, in 2016, Frey hosted **Zhuangmin “Daisy” Zhong**, a Ph.D. student at South China University of Technology, to learn from the NC State experience in measuring real-world vehicle emissions. Zhong was one of the student organizers of the 5RAQM.

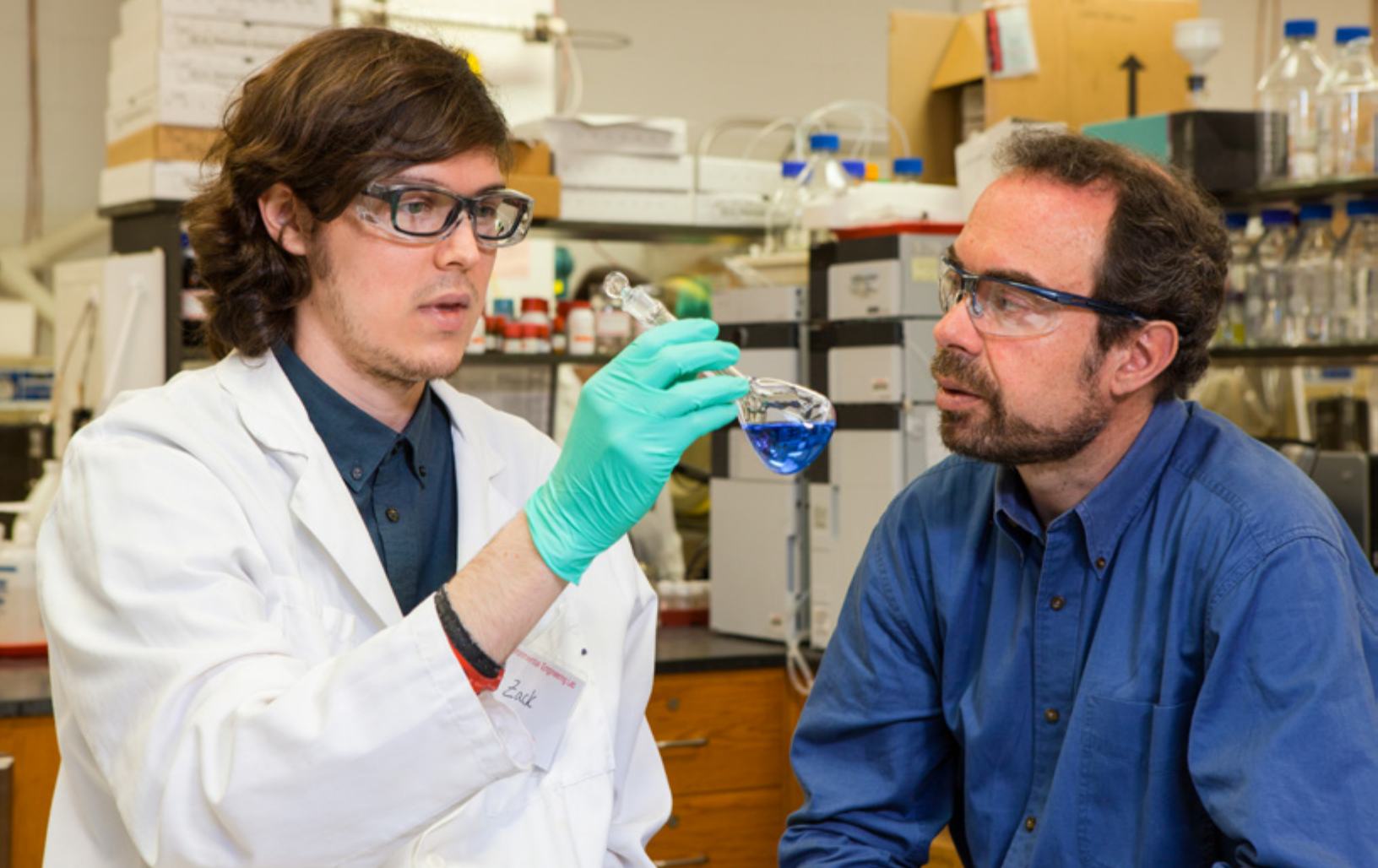
Frey’s collaborations with former students include a project called “PRAISE HK” which was created to measure and model personal exposure to air pollution throughout Hong Kong. You can see Dr. Frey’s presentation at go.ncsu.edu/frey_HK_exposure. ■



The CCEE Department was well-represented at the Fifth International Symposium on Regional Air Quality Management in Rapidly Developing Economic Regions, held in Guangzhou, China in November. (R to L) Allen Zheng (Ph.D., 2002), Christopher Frey and Joshua Fu (Ph.D., 2000).



In Guangzhou, Frey provided an overview of vehicle emissions research.



Ph.D. student Zachary Hopkins, left, and Dr. Detlef Knappe work together in the environmental lab at the Department of Civil, Construction, and Environmental Engineering

CCEE professor Detlef Knappe's research contributes to elimination of contaminant discharge into Cape Fear River

For several years, Dr. **Detlef Knappe** and his research group have collected water samples along the Cape Fear River basin in North Carolina, and then analyzed those samples in the laboratory. The work began as an effort to design better water treatment processes that would lead to safer and better tasting drinking water. Along the way, Knappe developed a curiosity about fluorochemicals, or perfluorinated compounds. The substances he is concerned about have names like

Many times researchers spend decades working behind the scenes to meet the challenges of society. In 2017, the work of Dr. Detlef Knappe was thrust into the public spotlight when he discovered contaminants in the drinking water supply for the City of Wilmington, NC.

perfluorooctanoic acid (PFOA), perfluorosulfonic acid (PFOS), and hexafluoropropylene oxide dimer acid (HFPO-DA) which is also known as GenX. These chemicals fall into a category referred to as unregulated contaminants, so no one was actively monitoring for their presence. Most of us have not heard of these chemicals and can't pronounce their names. These compounds are used in many everyday products including non-stick cookware, as well as our clothing and carpeting, where they confer stain and water resistance.

Things changed dramatically late in 2016 when Knappe's research group, working closely with researchers at the U.S. Environmental Protection Agency's National Exposure Research Laboratory in Research Triangle Park, issued a report describing high levels of a fluorochemical with the trade name GenX in the drinking water supply for the city of Wilmington, North Carolina

and surrounding counties. The Cape Fear River basin is the source of drinking water for about 1.5 million North Carolina residents. Knappe's research not only helped identify the source of the GenX contamination, but also highlighted that the chemical passes untouched through conventional and advanced drinking water treatment processes. GenX is a surfactant used to manufacture fluoropolymers such as Teflon, and it is also generated as a by-product in the manufacturing of other fluorochemicals. Fluorochemicals are implicated in increased rates of cancers and suppression of the immune system.

Public outcry was swift and by June 2017, the discharge of GenX and related fluorochemicals into the Cape Fear River was drastically reduced by the manufacturer. State officials also demanded that the manufacturer stop all discharges of fluorochemicals or run the risk of losing their wastewater discharge permit. Following an unreported release of a GenX precursor into the river in early October, the North Carolina DEQ moved to revoke the discharge permit of the fluorochemical manufacturer.

Since early June, the name GenX has practically become a household word in North Carolina, and Knappe has become a trusted expert for residents and journalists. He communicates regularly with staff in the North Carolina Departments of Environmental Quality (DEQ) and Health and Human Services (DHHS) about GenX and other emerging contaminants. In addition to the time spent conducting the research at NC State, Knappe has spoken at several public forums in front of hundreds of concerned citizens as well as to North Carolina lawmakers and members of the Environmental Management Commission. In September of 2017 Knappe was appointed to serve on the NC Science Advisory Board, a panel of 16 experts who advise DEQ and DHHS.

Knappe and his team, including post-doctoral research associate **Nadine Kotlarz**, Ph.D. students **Zachary Hopkins**, **Chuhui Zhang**, and **Amie McElroy**, and B.S. student **John Merrill**, are continuing to investigate challenges posed by GenX and other unregulated contaminants in the Cape Fear River basin. For example, efforts are also focused on 1,4-dioxane, a manufacturing by-product and likely human carcinogen. Knappe's team has worked together with residents in impacted communities to identify home filtration options that effectively remove emerging contaminants from tap water. His research group is also working closely with drinking water utilities and consulting firms to identify effective treatment options for emerging contaminants.

Knappe is also a co-investigator on a team of researchers who are studying GenX exposure and health effects through a grant funded by the National Institutes of Health. In a community-based study of 400 Wilmington area residents who are served by the public water utility, the research team is analyzing blood, urine, and drinking water samples to investigate GenX levels in the body as well as possible liver and thyroid function effects from exposure. All results will be shared with the community as a whole, and with individual participants.

"I am pleased that officials moved quickly on this issue once it came to light," Knappe said. "The good news is that levels of GenX and related fluorochemicals have dropped substantially in the drinking water of more than 200,000 North Carolina residents. But it's important to remember that many other unregulated contaminants are still being discharged into our drinking water sources. Sometimes these chemicals are referred to as emerging contaminants, but that is quite misleading since in cases like GenX and 1,4-dioxane, they've been discharged into our waterways for decades." ■



Dr. Detlef Knappe and his research team gathering water samples from the Haw River during spring of 2016. This particular study was focused on determining the levels of a compound known as 1,4-dioxane.

All in the family. How one alumni family stays connected to the department

Glenda Gibson, P.E. (BSCE 1987) and **Terry Gibson**, PE (BSCE 1988; B.S. Math Ed 1987) have both had highly successful engineering careers, often together, starting at the North Carolina Department of Transportation (NCDOT) and now at leading international firm Mott MacDonald. With two children who are also NC State graduates, and now with a position on the Department Advisory Board, the Gibsons have kept their NC State connections and engineering careers ‘all in the family.’

For more than thirty years, the Gibsons have steered their professional lives to allow each other to grow, and they have navigated the demands of managing two careers while raising a family. Through it all, they agreed that valuing people and building authentic relationships at work and at home is the key to success and satisfaction.

When Glenda Gibson graduated from NC State, she had already worked four summers with the North Carolina Department of Transportation (NCDOT). “It was the summer I worked in roadway design when I said to myself, ‘this is it, this

is what I want to do,’” Glenda remembers. She spent the first 10 years of her working life with NCDOT, with frequent promotions that put her in a management role. She and Terry married shortly after college and he was also working for NCDOT. However, with Glenda working on the design side, and Terry working on the

construction side, they rarely saw each other at work, or for that matter, at home. “I was working 14-16 hours a day seven days a week, managing two shifts of people, and often dropped back by Raleigh Beltline construction projects at 2:00 am,” Terry recounts.

“He would leave before I woke, and come home after I had gone to bed,” Glenda adds. “With our work schedules, my children were getting the worst of me, and I was getting the worst of them. Together, after much prayer, we decided that I would resign to focus on our children.”

While Terry continued to earn more recognition and responsibility in NCDOT, Glenda started working for a private engineering firm that allowed her the flexibility to work from home, part time. Later, she began her own company, Gibson Engineers.

“I began to be approached by several firms who wanted to purchase my company, but each time I asked myself if their culture matched my beliefs.”

– Glenda Gibson

“We don’t do anything as individuals. We surround ourselves with excellence, and we value our employees and our clients.”

– Terry Gibson

“I was interested in the business side of engineering and I began with pursuing what I knew – roadway design,” Glenda said. The other thing she ‘knew’ was that allowing people the flexibility they need to stay connected to their family made good sense. “No one who ever came to work at Gibson Engineers left,” Terry adds. “That’s the kind of culture she built.”

As Gibson Engineers grew and broadened its areas of expertise, firms began to approach Glenda about purchasing the company, Glenda recalls. “Each time I asked myself if their culture matched my beliefs.” Finally, it was a meeting with a representative of Hatch Mott MacDonald, where Glenda felt confident that her values and culture aligned and she agreed to sell her firm. Hatch Mott MacDonald is now Mott MacDonald, and the international, employee-owned firm has more than 16,000 employees around the world. Glenda works at the Fuquay Varina location as senior vice president and is in charge of both personnel and financial project management for North Carolina and Georgia.

While Glenda was building her own firm and eventually selling, Terry continued to advance at NCDOT. He moved from state roadway construction engineer to division engineer for Division 6, which included the Fayetteville area. “I spent 10 years there, and it was probably the favorite time in my career,” Terry said. “I worked with incredible people, and we implemented an asset management approach that saved the department lots of money. Our people also developed a portable coffer dam technique to repair culverts which saved the people of North Carolina more than 20 million dollars.” When Terry was offered the state highway administrator position, which is the highest staff position

within NCDOT, he turned it down. Twice. “I was concerned that if I accepted that position, there would be nowhere in North Carolina that Glenda and her company could work that wouldn’t look as if there were ethical or legal conflicts,” Terry recounts. “I did not want the job if it was going to put her out of business,” he adds. Eventually, the Gibsons were able to have formal legal stipulations put in place to avoid any conflicts of interest, and Terry Gibson served as the state highway administrator and chief engineer for NCDOT for five years.

As fate would have it, they now both work at the same place again. After Terry retired from NCDOT in 2014, it didn’t take long for job offers to come his way, and one was from Mott MacDonald. Again, Terry’s main concern was not negatively affecting Glenda’s career. They worked it out. He serves as a vice president and highway and bridge practice lead for the U.S. His office is upstairs, and their duties do not intersect or overlap often.

“We don’t do anything as individuals,” he adds. “We surround ourselves with excellence, and we value our employees and our clients.”

The Gibsons remain connected to NC State. Their son Benjamin earned a bachelor’s degree from CCEE in 2013, and their daughter Sydney graduated with a communications degree and a minor in business in 2016. Glenda now serves on the Department Advisory Board. “I see it as a way into a university that I love,” Glenda says. “We hire a lot of young engineers here at Mott MacDonald, and I appreciate the fact that the department cares what the industry is looking for. Being able to speak to what we as an industry need from the university — that’s a big deal to me.” ■



Terry and Glenda Gibson are both CCEE alumni. They both currently work in the Fuquay Varina office of Mott McDonald, the company that purchased Glenda’s company Gibson Engineers.

Share Your News

There are thousands of alumni of the Civil, Construction, and Environmental Engineering Department. We have alumni working throughout the nation, and around the globe. We invite you to provide us with updates about what you’re doing - both in your professional life and your personal life. We aspire to create a community of alumni that remain connected to the department and to each other. We’re interested in career accomplishments, awards or recognitions, as well as retirements. We also want to keep your contact information current so we can keep you up to date on events within the department.

Send your information to Julie Dixon at jwdixon2@ncsu.edu:

Name, Mailing and Email Address
Company Name and Address
Degree, Major and Class Year
Announcements

Also, we invite you to connect with us on Facebook and Twitter to keep up with the latest news.

 www.facebook.com/ccee.ncsu
 @NCStateCCEE



Students chosen for the first group of CCEE Student Ambassadors include L to R: Sierra Schupp, Kevin Carney, Maddie Macmillan, Jenifer Badra, Emma Entead, Amanda Privette, Hannah Queen, Sam McNeely (standing) and Thomas Lewis.

Student Ambassadors will promote CCEE from a peer perspective

Nine students were chosen last fall for a new CCEE Student Ambassador program. The program will provide students with an opportunity to strengthen their communication and leadership skills, while filling an increasing need of the department. “We get a lot of requests from groups ranging from the Boy Scouts or Girl Scouts, to high school science classes, to civic groups, who would like to tour the department or find out more about what we teach and our research” said Dr. **Rudi Seracino**, professor of structural engineering and associate head for undergraduate programs. “We also have prospective students and their parents who come to campus for tours and would like to know more about our department and the profession. Our student ambassadors can provide meaningful insights and perspective to their peers,” Seracino continues.

The student ambassadors will also represent the department at College of Engineering events such as the annual Open House, as well as career fairs, information sessions, and classroom visits. The students were chosen in part based on their ability to speak confidently and knowledgeably about opportunities

within the department. “We expected students to have personal experience with programs such as study abroad, undergraduate research, co-op and internships, as well as leadership within student organizations,” Seracino said. They also have to be committed, flexible, collaborative and proactive. Each will be expected to participate in about five events per semester.

Of the nine student ambassadors, three are seniors, four are juniors and two are sophomores. Their areas of interest range from general contracting, to structures, water resources, alternative energy, and sustainable infrastructure. Jennifer Badra is a junior who plans to graduate in May of 2019. She is in the civil engineering degree program with an interest in structures. “I am involved with the student ambassadors program because I want to be able to reach out to undecided or misinformed students on what civil, construction, and environmental engineering really is and help them with their career decisions,” Badra said. “I want to share my knowledge and passion with them and I think in turn I’ll learn more about my major and career opportunities.” ■

STUDENT GROUPS

There are more than a dozen chapters of professional organizations available for CCEE students. Membership is a way to meet peers, make industry connections, strengthen leadership skills, and engage in community service. Participation offers the chance to attend conferences, compete against peers from other institutions, learn outside of the classroom, and interact with professional engineers.

AMERICAN CONCRETE INSTITUTE (ACI)

In October, 10 students participated in the Egg Protection Device (EPD) Competition at the semi-annual ACI Convention that was held at the Disneyland Convention Center in Anaheim, California. The competition calls for teams to design and build the highest-impact-load resistant plain or reinforced concrete EPD. “The goal is to protect an egg from impact as a weight is dropped from increasing heights over the student-designed concrete protective device,” said Alexandra Farraher, president of the student chapter. “We’ve realized we had some flaws in our designs and casting, and our concrete could have been stronger. This semester we are designing earlier, so we can cast sooner for the concrete bowling ball competition that takes place at the Spring ACI conference.”

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

In October, student members worked alongside members from the local professional chapter of ASCE for the semi-annual stream clean-up of Hare Snipe Creek located at Lake Lynn Park in Raleigh.

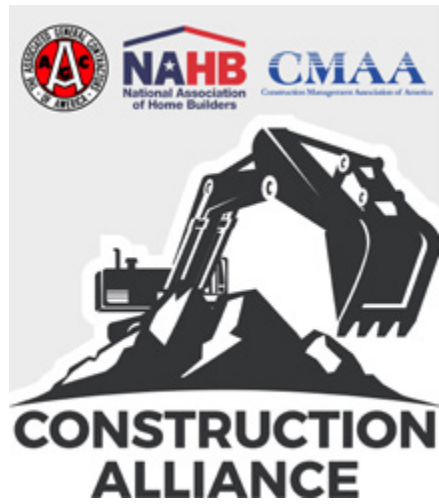
“Service is an important part of our club,” said senior Shawnak Doshi, who serves as president of the student chapter. Morgan Hobson, a junior in civil engineering, said “The stream clean-up taught me the importance of serving our community by preserving our environment through a team effort. Events like these bring us closer to the community and help us maintain a positive culture outside of the classroom.”

THREE STUDENT GROUPS JOIN TO FORM THE CONSTRUCTION ALLIANCE

The Construction Alliance represents the Associated General Contractors of America (AGC), the National Association of Home Builders (NAHB), and the Construction Management Association of America (CMAA) student chapters at NC State. “Student leaders and faculty advisors decided to bring these three student chapters into one to better accommodate the needs of students who are curious and interested in the construction industry,” said senior Leslie Paley, public relations officer for the Construction Alliance.



ASCE student chapter members work with the Raleigh professional chapter twice yearly to clean up local streams.



Barnhill Construction hosted a group of students to tour the 18-story office tower/retail space and two six-story apartment buildings that are under major construction renovation in the Warehouse District in downtown Raleigh. “It was

great to see how a building can be completely renovated and how connections are made between the new slab and the old masonry wall while keeping the outer shell of the building in place” said graduate student Parth Malhotra, who is treasurer for the Construction Alliance. “We also discussed and viewed a diagonal column that was cast to span across multiple floors.”

Members of the Construction Alliance represented NC State in the Associated Schools of Construction (ASC) annual competition in Peachtree City, Georgia, competing against six other southeastern universities. The team was given 10 hours to create a full bid including a schedule, estimate, and risk analysis for a bridge rehab located outside of Washington, D.C. Members of the professional team who had actually completed the project a few months prior to the competition served as the judges. “We did not place, however the judges were impressed by our

creative construction methods and our scheduling strategies,” said Leslie Paley. “I learned a lot about risk mitigation, scheduling, and how to better work as a team when it is crunch time. We worked well together as a team and on top of learning a lot – we had fun in the process.”



CCEE students competed in the Associated Schools of Construction competition in Georgia.

ENGINEERS WITHOUT BORDERS (EWB)

In October, the NC State University Engineers Without Borders (EWB) chapter sent three students to Milwaukee, Wis. to attend the 2017 EWB-USA National Conference. Senior John Merrill, majoring in environmental engineering, presented a poster titled “A novel handwashing system design for urban and peri-urban developing communities” on recent work on the Sierra Leone Water Systems Project to create handwashing stations at their partner community.

In November, the chapter was invited to present at the College of Engineering (COE) Homecoming Weekend Kick-Off. Club

officers shared the stage with NASA Astronaut and NC State alumna Christina H. Koch and COE Dean Louis Martin-Vega while presenting recent progress with international projects located in Guatemala and Sierra Leone.



Rahul Kathard (top) and Michelle Listener (above) presenting at the College of Engineering Homecoming Weekend Kick-Off.

PROFESSIONAL ENGINEERS OF NORTH CAROLINA (PENC)

In September, the student chapter of PENC hosted two local Girl Scout troops to assist them in earning their engineering badge. Part of the badge requirement included an interviewing exercise in which the young scouts addressed questions to a group of CCEE graduate students with the aim of understanding the many roles of environmental engineers. Then the graduate students facilitated laboratory exercises including a series of filtration processes. “The filtration exercise was intended to teach the scouts about drinking water treatment and give them a chance to make predictions about the quality of the water after treatment,” said Ph.D. student Amie McElroy, who is the professional chapter liaison. ■



Ph.D. student Yi Chun Lai assists with water filtration exercise for the Girl Scouts.



Girl Scouts learn about water filtration processes.



Members of the Construction Alliance toured an office tower being constructed in the warehouse district of downtown Raleigh.



John Merrill, left, seen here on site in Sierra Leone during a 2017 trip.

Recognizing our corporate sponsors

There are many ways to support the department including annual contributions or an endowment that provides ongoing funding for department initiatives. Current endowments contribute toward scholarships and awards at both the graduate and undergraduate level, support for our advancement fund, and professorships that enable us to provide ongoing funding to some of our very best faculty members who are pursuing promising new research.

Our corporate sponsors provide support for all aspects of our mission. Sponsorships are also available for this newsletter, the welcome back ice cream and our graduate symposia. These symposia allow students to prepare a poster to describe their research and make a presentation to the local engineering community. The activities of our student groups (see page 23) are also dependent on external financial support.

The Firm of the Month program recognizes corporate partners who have made an ongoing commitment to the department. It allows us to thank and promote our partners while educating our students about current engineering practice. Firms prepare a series of slides for our monitor in the lobby and also display posters throughout Mann Hall to highlight notable projects. Firm of the Month provides participating firms with name recognition for recruiting and business opportunities, demonstrates to students the ways that they can use their degrees after graduation and provides information on employment opportunities. Our most recent Firms of the Month include Crowder and Clancy & Theys Construction.



2017 Corporate Donors

The firms listed here have provided endowments or made contributions from August 2017 through December 2017. Many on the list have supported multiple activities in the department

AECOM	Duke University	IQ Contracting, LLC	SEPI Engineering
Alpha & Omega Group, P.C.	ECS Southeast, LLP	J.E. Dunn Construction Co.	Simpson Engineers & Associates
Andrew Consulting Engineers, P.C.	Ellinwood + Machado, LLC	LHC Structural Engineers	SKA Consulting Engineers, Inc.
Barnhill Contracting Company	Exxon Mobil	McDonald York Building Company	Solutions - IES, Inc.
Brasfield & Gorrie	Fluhrer Reed	McKim & Creed	Stantec Consulting, Inc.
CALYX Engineers & Consultants	Fluor	Mead & Hunt, Inc.	Structural Engineers Association of NC Triangle Chapter
Carolinas Chapter of American Concrete Institute	General Contractors Association of Raleigh	MI Engineering, PLLC	Styro Systems Carolina, Inc.
Cary Oil Foundation, Inc.	Haskell Company	MM Systems Corporation	Terracon Consultants, Inc.
CDM Smith	Hazen & Sawyer	Penta, An OBG Company	The Professional Engineers of NC-Central
CT Wilson Construction	HDR Engineering	Pope Custom Homes, Inc.	WSP USA Administration, Inc.
Dewberry	Honeywell Aerospace	Ross Linden Engineers	
		S&ME, Inc.	

We plan to include this list in every issue. If your company was inadvertently omitted, then please accept our apologies and contact Lindsay Smith at lksmith4@ncsu.edu.



Engineering education in the 21st Century

Groundbreaking scheduled for Engineering Building Oval

After years of dreaming, planning and fundraising, there is great excitement as we look forward to the groundbreaking ceremony for EB Oval. EB Oval is the fourth engineering building on the Centennial Campus and will be built next to the Hunt Library. The building will serve as the home for CCEE, the Edward P. Fitts Department of Industrial & Systems Engineering, and the Engineering Dean’s office. CCEE will occupy about 59,000 net square feet of the 225,000-square-foot, four-story structure. The building will allow us to bring much of the department together in one place. EB Oval will be certified as LEED silver or higher.

The building will provide modern laboratories, collaborative workspace for students and faculty, and a dedicated work area for student groups. Engineering on display is a major theme and visitors will learn about the mission of each research laboratory. Beyond the improvements and expansion to all of our space, we are excited by the opportunity to design for the needs of future generations of aspiring engineers.

For the first time in the history of NC State, the College of Engineering is expected to raise a substantial portion of the building’s cost. Of the 60 million dollars to be raised, more than 27.5 million has been committed to date. We continue to ask

for financial partners to achieve our goal and have created many ways for alumni and friends to participate.

The Cornerstone Society offers naming opportunities for all of our classrooms, offices, student group spaces, and research laboratories. Donors may also choose to name spaces in other buildings on Centennial Campus, including the department’s Constructed Facilities Lab. Dean Martin-Vega established both the Dean’s EB Oval Club and the Young Alumni EB Oval Club to encourage giving at all levels.

We are pleased to have dedicated the Frank and Doris Culberson Atrium in Engineering Building 1 in recognition of their leadership gift to EB Oval. Gifts to support the building may be pledged over a five-year period. If you are interested in participating, please contact Lora Bremer (919-513-0983 or lfbremer@ncsu.edu).

“It is exciting and gratifying to guide the development of each lab design, knowing that the work we do now will serve our students and faculty for decades.”

– Dr. David Johnston

Here is where we are so far

- Construction drawings issued for review - December 2017
- Groundbreaking ceremony - April 20, 2018
- Doors open - Fall 2020 semester

ALUMNI BRIEFS

SUZANNE M. BECKSTOFFER (BSCE 1982) was elected president of the Society of Naval Architects and Marine Engineers for 2019-2020. SNAME is an international professional society serving the maritime and offshore industries and their suppliers. SNAME has over 6,000 members in 85 countries around the world. Suzanne is a former member of the Department’s Advisory Board.

JAY DAWKINS (BSCE 2010) launched PublicInput.com, a community engagement software platform for government agencies. The software supports public outreach, online surveys, and interactive meeting tools for over 50 public agencies including NCDOT, the City of Raleigh, and Austin, Texas.

MICHAEL B. FORSYTH, P.E. (BSCE 2011, MSCE 2013) was recently hired by Kimley-Horn and serves as a structural engineer in the Raleigh office. He specializes in vertical structures including multi-story residential, parking, and office space utilizing reinforced concrete, masonry, and steel construction. He has enjoyed living near Raleigh and working on projects throughout the region.

WILLIAM O. KEITH (BSCE 2017) is a design engineer at MI Engineering, PLLC, assisting with bridge design, inspection, and transportation hydraulic design. He joined the staff in June of 2016.

HEATH KENT (BSCCEM 2012) recently accepted a position with Brushy Mountain Builders, Inc., a family owned general contractor that serves Western and Central North Carolina. He will assist in their future growth and development. Heath is actively involved in recruiting, club sponsorships, class projects, and information sessions for NC State students. He was previously employed by Lithko Contracting, working as a project engineer, territory safety lead, and senior project manager at sites throughout North and South Carolina.

RYAN REPOFF (MSENE 2015) recently started a position as an environmental engineer at Arconic Inc. in Texas. He manages the environmental programs at two aluminum manufacturing plants in San Antonio and Texarkana. Ryan is also working towards obtaining his professional engineering license.

Department Advisory Board

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

Jennifer Brandenburg
BSCEC 1986
Volkert

Heather Denny, Past Chair
BSCEC 1995
McDonald-York Building Company

Christine Herrick
BSCE 2011
Kimley-Horn & Associates

Joe Hines
BSCE 1991
Timmons Engineers

Jonathan Holtvedt
BSCE 2015 MCE 2017
Balfour Beatty

Tyler Highfill
BSCE 1992, MSCE 1994
Highfill Infrastructure Engineering, P.C.

Glenda Gibson
BSCE 1987
Mott McDonald

John Lucey
McKim & Creed

Tonya Mills
BSCE/BSENE 1994
Tri Properties, Inc.

Mike Munn
BSCEC 1995
The John R. McAdams Company

Dan Pleasant
BSCE 1972, MCE 1973
Dewberry

Bill Pope, Vice Chair/Nominating Chair
BSCEC 1983
Pope Custom Homes

David B. Simpson
BSCE 1981
Simpson Engineers & Associates

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

Alan L. Stone
BSCE 1987, MSCE 1989
Hazen and Sawyer

Gray Talley, Secretary
BSCEC 1998
Shelco, Inc.

Steve Thomas
BSCE 1984, MSCE 1986
Sepi Engineering

Hans G. Warren, Jr.
BSCEC 1984
Warco Construction, Inc.

Mike Wayts
Freese and Nichols, Inc.

Investing in the Department

We ask that you invest in the future of the department to help us take CCEE to a new level of excellence. Our goal is to prepare our students to enter the workforce with the highest caliber education so that we continue to raise the visibility and build the standing and prestige of CCEE. You can choose an annual gift, an endowed gift, or a one time gift. Outright gifts of cash can be made by simply writing a check payable to NC State Engineering Foundation, Inc. Please indicate on the check, or with a note, the purpose of your gift and that it is directed to CCEE.

Checks should be mailed to
NC State Engineering Foundation, Inc.
Campus Box 7901
Raleigh, NC 27695

Use your credit card with our online feature at www.engr.ncsu.edu/alumni-and-giving/ways-to-give. Drop down menus will allow you the chance to specify that you want your gift to be directed to our department or to the Engineering Oval Building Project Fund.

For more information contact:

Lindsay Smith, CCEE Director of Development
Phone: 919.515.7738
Email: lksmith4@ncsu.edu

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