

**NC STATE**

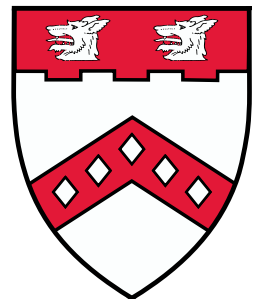
Engineering

# CCEE NEWS

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

## **IMPACT! HOW RESEARCHERS IN CCEE IMPROVE YOUR DAILY LIFE**

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# IN THE SPOTLIGHT

## IMPACT! HOW RESEARCHERS IN CCEE IMPROVE YOUR DAILY LIFE

PAGE 06

From clean water and air to safer infrastructure, our research is having an important impact on the lives of people around the world. This special eight-page section shows just a few of the ways in which we are making a difference.



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## ABOUT THE COVER

CCEE researchers are using fiber-reinforced polymers for both repair of existing bridges and making new ones stronger. The department is working with NCDOT on designing a replacement for the Harker's Island Bridge, seen on the left side of the cover image. Learn more about these and other research impacts in a special eight-page section starting on page 06.

# LETTER FROM THE DEPARTMENT HEAD MORTON A. BARLAZ



Dr. Morton Barlaz

Dear Alumni and Friends of the Department:

Welcome to our Fall 2018 newsletter. Along with the buzz that the return of students brings, we are excited to announce that the construction of our new home, now named Fitts-Woolard Hall, is underway and we will move to the new building in time for the Fall 2020 semester.

More broadly, this is also an exciting time for civil, construction, and environmental engineers. There is increasing recognition of the need to rebuild infrastructure in the U.S., and I am confident that, as a society, we will find a way to make important infrastructure investments over the next decade. In this issue, we feature a selection of the work that our faculty and students are leading in many different aspects of civil infrastructure in both the U.S. and abroad. As described on pages 6-13, our faculty are having important impacts in areas from rapid bridge repair to construction safety to clean water and longer lasting roads. It is noteworthy that our faculty are also conducting research on air quality, safe drinking water, treatment of human waste, and seismic protection in underdeveloped countries in Africa, Asia and Latin America.

I am especially proud to announce that Dr. Francis de los Reyes was recently awarded first prize in the RELX Group Environmental Challenge 2018 for his work on the development of the Flexcrevator to clean pit latrines. He was recognized in Stockholm as part of World Water Week in August.

There have been some changes to our faculty in the last few months. We are pleased to welcome Dr. Angela Harris. Angela earned her Ph.D. and did postdoctoral research at Stanford, and her position completes NC State's cluster in Global Water, Sanitation and Hygiene (WaSH). I am also pleased to share that Dr. Billy Williams has been selected as the new Director of the Institute for Transportation Research and Education. He assumed the Director position in August. I extend my sincere thanks to Dr. Downey Brill, who served as Interim Director during the search.

In each newsletter, we ask readers to consider making a financial contribution to the department, and many of you have responded. I am most appreciative and humbled by your support and commitment to the success of the department. As a believer in community involvement, I hope to increase the percentage of our alums who give back to the department. We have an estimated 10,900 living alums and only about 2 percent are supporting the department annually. Imagine the programs that we could support if this number increased to 5 or even 10 percent. As described on page 27, your financial contributions help ensure that we continue to offer the very best education to our students.

On a personal note, I had the opportunity to spend eight days paddling about 75 miles of the Allagash Wilderness Waterway in northern Maine in July. The trip gave me lots of time to relax and think about all of the opportunities that are available to our students and alumni to contribute to the well-being of society.

As we go to press, parts of North Carolina have suffered from devastating flooding as a result of Hurricane Florence. The department has provided three teams of researchers with rapid response funding to study various aspects of the storm's effects including sanitation, impacts on dunes and roadways, and the use of social media as a tool to assist with rescues. While we cannot undo the damage and human suffering, I am sure that the data collected by our faculty will be used to help manage the next catastrophic event.

Sincerely,

Morton A. Barlaz  
Distinguished University Professor  
CCEE Department Head

## CCEE AT NC STATE SUSTAINABLE INFRASTRUCTURE FOR SOCIETY

- \$20.3 million in research expenditures
- 156 ongoing research projects
- 14 winners of NSF CAREER and other young faculty awards
- 50 faculty members
- 339 graduate students
- 772 undergraduate students





Scene from coastal road damage after a hurricane. Photo courtesy of WCTI News 12.

## Can we predict the level of scour during coastal storms?

The erosion of sand or soil around bridges or piers is called scour, and scour can greatly affect the stability of these structures. Scour is a major challenge for coastal communities, especially during storms. In addition to adversely affecting manmade structures, scour also can destroy sand dunes, resulting in degradation of the adjacent beaches and roads.



Test sites at Jennette's Pier.

CCEE Distinguished Professor **MO GABR** worked with a research team, including Dr. Lindsay Dubbs from the University of North Carolina Coastal Studies Institute, to assess the magnitude of scour at Jennette's Pier, located in Nags Head, North Carolina. They utilized a device developed by Dr. Gabr called the ISEEP (in-situ erosion evaluation probe). The ISEEP is a vertical water-jet probe that is portable and is used to obtain data on scour potential both spatially and at increments of depth below the ground surface — a capability that is unique to the ISEEP. After severe storms, the probe can be deployed rapidly

over a large area to assess scour, including soil conditions near critical infrastructure like bridges. The ISEEP can also be used to detect areas prone to high scour rates under future storms and allow for targeted soil stabilization measures.

Another method to monitor scour is to attach an acoustic beam device to a pier piling. As scour occurs, the device monitors the distance from the sensor to the seabed over time. Comparing data gathered by the ISEEP prior to a storm event with independent results from an acoustic beam device, the researchers verified ISEEP's ability to assess and predict wave-induced scour around one of the Jennette's Pier pilings. The results made it possible to predict scour for wave heights of 1 to 5 meters and wave periods that ranged from 8 to 17 seconds, thus incorporating the range of likely conditions at the site.

The research was funded by the Department of Homeland Security (DHS) Science and Technology Directorate through the DHS Coastal Hazards Center of Excellence. Research and development findings have led to a new American Society of Testing and Materials international standard, including recommended testing schemes for using the ISEEP. ■



ISEEP is portable, allowing measurements to be taken near bridge pilings.

## Could concrete made using fly ash keep sewer pipes from backing up? New research spells potential win-win.

Overflowing or blocked sewage lines are a growing problem in North Carolina. More than 10,000 sewage overflows occur annually, backing up toilets, drains, and causing the release of raw sewage into the environment. These overflows cost taxpayers hundreds of thousands of dollars in clean up and maintenance. It is estimated that up to 50 percent of sewer line blockages are caused by the accumulation of solids that form from fat, oil, and grease (FOG) deposits.

Drs. **JOEL DUCOSTE** and **MOHAMMAD POUR-GHAZ**, and Ph.D. student **SAMRIN KUSUM**, are investigating methods to reduce the ability of FOG deposits to form and adhere to sewer line surfaces by developing alternative concrete materials using fly ash and other low-calcium aggregates. Preliminary laboratory results show that FOG deposits on concrete made with fly ash were insignificant compared to the deposits that adhered to concrete made only with cement.

"We anticipate that, as aging sewer systems get replaced or extended due to increasing population, the new concrete infrastructure would utilize our proposed alternative concrete materials with fly ash supplemented binder materials," Ducoste says. "We also want to assess the durability of these structures over long exposure to harsh environments to determine if they can be used as grease interceptors in addition to sewer pipe or manhole structures."

"The cost of fly ash is about 1/3 the price of traditional cement binders, so the cost savings could be significant, and the results of this research have other implications for

North Carolina's citizens as well," Pour-Ghaz explains. More than 5.5 million tons of coal ash is produced in North Carolina from coal-burning power plants, and our state is ranked 9th in the US in coal ash generation. There are 37 ash ponds in the state, and the majority of them are not equipped with leachate collection systems to protect groundwater. The increased use of fly ash in infrastructure materials, such as in the production of pipelines, could introduce a way to utilize the fly ash generated by coal-fired power plants and contribute to reducing the risk of future contamination of water resources.

The work is funded by a grant from the Water Resources Research Institute (WRRI) of the UNC System. ■



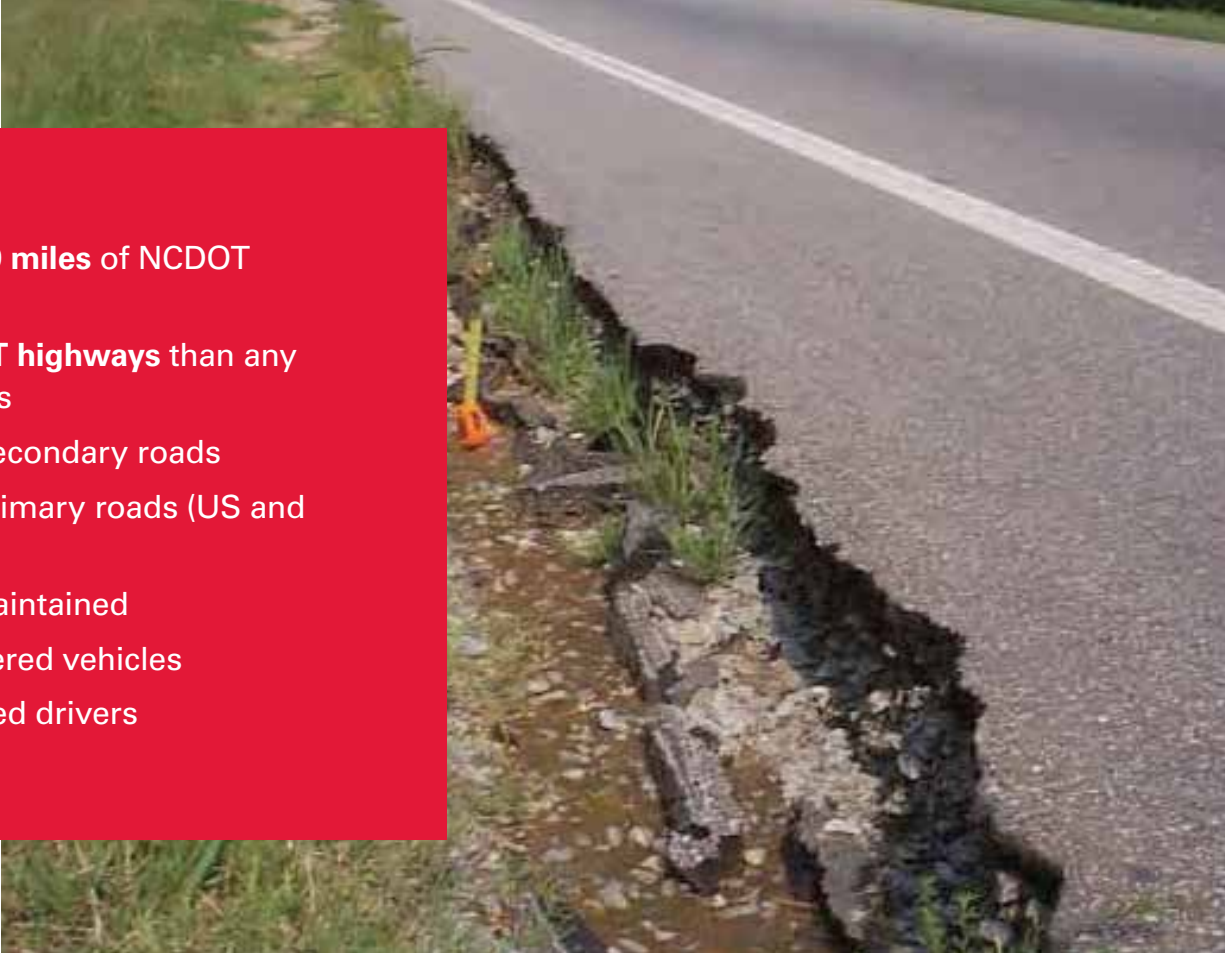
Typical structural concrete



Alternative structural concrete developed

Fat, oil and grease deposition on the surface of concrete prepared with 100 percent cement (left) versus 75 percent fly ash blended with 25 percent cement (right) after 14 days of submergence in synthetic wastewater.

- **More than 80,000 miles** of NCDOT highways
- NC has **more DOT highways** than any state except Texas
- **65,000 miles** of secondary roads
- **15,000 miles** of primary roads (US and NC routes)
- **13,500 bridges** maintained
- **8.7 million** registered vehicles
- **6.9 million** licensed drivers



Unpaved shoulder deterioration on a North Carolina highway. Photo courtesy of NCDOT.

## How fast are our roads deteriorating?

There are more than 80,000 miles of roads within the North Carolina State Highway System. While we tend to notice pavement or bridge conditions, the transportation system is comprised of many more assets, including unpaved shoulders, drainage ditches, cross line pipes, guard rails, signs, and pavement markings. Although paving and bridge maintenance are the largest budget items, the ability to predict how other roadway assets are deteriorating would allow for Departments of Transportation (DOTs) to prioritize expenditures and better plan for future maintenance needs.

Dr. **WILLIAM RASDORF** and Ph.D. candidate **ALI ALMALKI** created a deterioration model using field data collected from the NCDOT between 2012 through 2016. They compared the conditions of unpaved shoulders over time. Results showed that unpaved shoulders on primary and secondary roads deteriorate 2.5 to 3 times faster than shoulders on interstate roads. The results also showed that secondary roads had the largest average annual percent deterioration (about 6 percent) and that deterioration is highest in the coastal and mountain regions and lower in the Piedmont.

The researchers then developed a cost-condition model to

predict the extent of deterioration of unpaved shoulders based on maintenance expenditures. The model was used to predict the condition of an asset at the end of 2017 and 2018. The results obtained from the cost-condition model compared well with the NCDOT actual field measured condition ratings for year 2017, thus providing a degree of model validation.

The new cost-condition model was used to predict the condition rating through 2022 based on varying assumptions of expenditures on shoulder maintenance. It was found that, even if no funds are used to maintain unpaved shoulders, their condition will not deteriorate at an unacceptable rate. Thus, a short-term decrease or elimination of maintenance can be managed without serious deterioration of the asset, allowing for budgetary needs in other areas.

These results could improve NCDOT's maintenance process. A limitation of previous NCDOT models was the assumption of a 100 percent deterioration rate if no improvements were made in any year. This research, based on a robust field data set, provides a more realistic deterioration rate based on five years of asset performance. ■

## NEW FACULTY



Dr. Angela Harris

### Angela Harris brings expertise in improving global access to safe drinking water and sanitation

Dr. Angela Harris joined the department as an assistant professor in August 2018 as part of the interdisciplinary Global Water, Sanitation, and Hygiene (Global WASH) faculty cluster. She conducts research related to water, sanitation, and child health in developing countries. Her research seeks to better characterize human exposure pathways of fecal contamination and develop methods to interrupt pathogen transmission to protect human health. Harris has worked on research projects in Tanzania, Kenya, and Bangladesh, and looks forward to collaborating with her fellow WASH cluster professors in high-impact research to improve the lives of marginalized people.

Harris earned her Ph.D. (2015) and M.S. (2010) in environmental engineering from Stanford University. She received her B.S. in chemical and biomolecular engineering from the Georgia Institute of Technology (2009). Harris most recently

was a post-doctoral fellow at Stanford University and taught undergraduate students in addition to continuing her research.

Harris is co-teaching CE 250, Introduction to Sustainable Infrastructure, this fall. She also plans to offer a course related to public health engineering, which introduces concepts in environmental health microbiology and intervention strategies to interrupt disease transmission pathways. As part of that course, she will train students in conducting meta-analyses of existing literature to gain broader insight into various topics related to environmental health and engineering.

Harris is originally from Georgia, and is excited to make her way back to the South. She looks forward to exploring the mountains, beaches, and Southern cooking in North Carolina. ■



CCEE professor Dr. Billy Williams was named as the Director of the Institute for Transportation Research and Education (ITRE) effective August 6<sup>th</sup>.

Dr. Williams is a recognized expert in the areas of analytical and simulation modeling of traffic operations and transportation networks,

intelligent transport systems, and the application of rigorous statistical methods to a broad range of transportation applications, including traffic condition forecasting and traffic flow modeling.

Williams joined N.C. State in 2002 after three years on the faculty of the Georgia Institute of Technology. A North Carolina native, Dr. Williams earned his bachelor's and master's degrees from NC State and his doctoral degree from the University of Virginia. He has collaborated closely with ITRE researchers since joining the NC State faculty and looks forward to helping ITRE's talented and visionary research family continue to build on its well-deserved reputation as a national and international leader in transportation innovation.

## Why and how research matters

*You might not have thought about it this way, but the results of research and teaching taking place in the Department improve your everyday life. Research findings touch us all — right here at home in North Carolina, throughout the country, and around the globe. The impact cannot be underestimated. The work of our civil, construction, and environmental engineers has an impact on the air you breathe, the food you eat, the water you drink, the energy you consume, the roads you drive, and the bridges you cross.*

*Read on for just a few examples of how the faculty, and the students we're teaching, play roles in designing and building sustainable infrastructure for the 21<sup>st</sup> century.*

An aerial view of the Cape Fear River near Wilmington, NC



### Is the water that you are drinking safe?

Dr. **Detlef Knappe** wants to make sure that when you turn on your tap, the water that flows is safe to drink. After Knappe's team discovered that an industrial contaminant known as GenX was being released into the Cape Fear River watershed, he worked closely with policy makers to identify the industrial site responsible, and make sure the harmful substance was no longer allowed in the water supply.

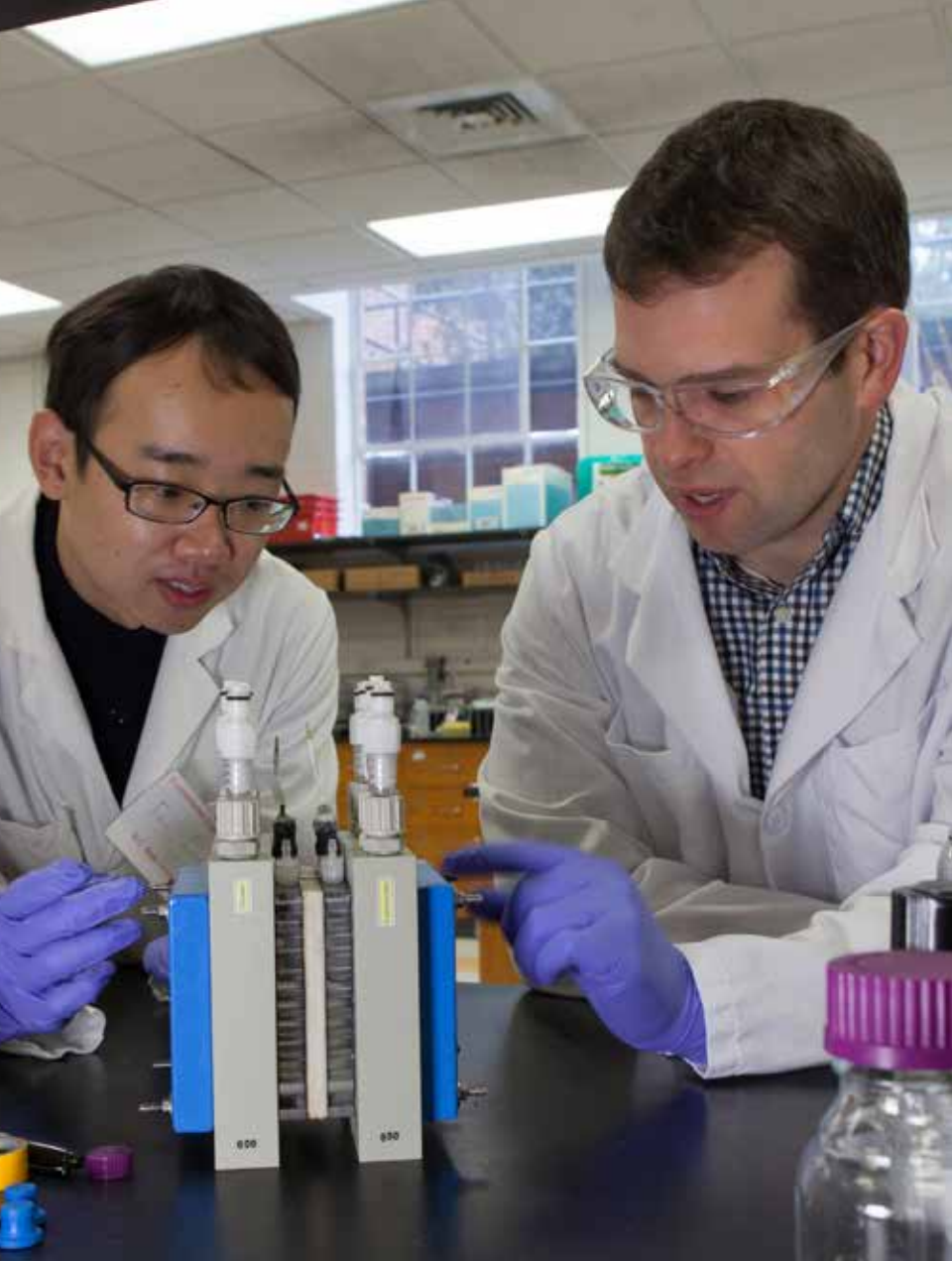
Knappe is now conducting multi-disciplinary research as a member of the Center for Human Health and the Environment at NC State. Using blood and urine samples from North Carolina citizens exposed to the contaminated drinking water, the study seeks to better understand the human health effects of exposure to contaminants in drinking water.

Under Knappe's guidance, CCEE researchers are also developing new filtering materials to remove contaminants from water. Using material based on graphene oxide, somewhat akin to an activated carbon filter, the research could provide solutions that might be used in both centralized water treatment plants and household filters.

# Where the rivers meet the sea — harvesting clean and renewable energy.

Dr. **Douglas Call** is passionate about finding new ways to produce clean and sustainable electricity, including by capturing energy from the coastal salinity gradients that exist throughout the world. Freshwater rivers that flow into salty oceans are one example of such a gradient, and there is about 1 Terawatt of power that could be harnessed from coastal salinity gradients. One TW is equivalent to 5 billion barrels of oil or 1 billion tons of coal per year.

Dr. Call is researching an electrochemical technology that can generate electricity from the controlled mixing of river and ocean waters. By better understanding how water quality impacts the performance of the technology, he seeks to develop new materials to improve power output from a wide array of water types.



# Saving lives by making construction sites safer.

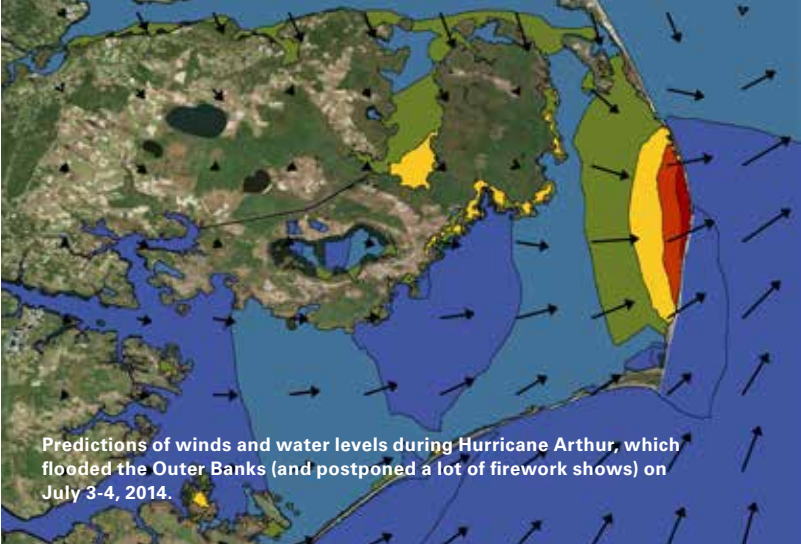
When it comes to construction site safety training, Dr. **Alex Albert** and his colleagues do not believe that one size fits all. Instead, workers should be treated as individuals and trained to recognize safety hazards based on visual examinations of their workplace. Just as someone searches for groceries on a shelf, a construction worker can learn to scan their workplace and recognize hazards. Dr. Albert’s research uses eye-tracking devices worn by workers to help customize their training.

The research is yielding knowledge that will be developed into personalized education modules that can be shared with construction workers representing small contractors who are rarely served by the research community.



# How can we predict storm surge and flooding anywhere along our coast?

During hurricanes, most storm damage and loss of life are caused by waves and flooding, which destroy infrastructure in coastal communities. Drs. **Casey Dietrich** and **John Baugh** are developing numerical models to predict when the flooding will start, which regions will be affected, and for how long. These predictions are shared in real-time with stakeholders around the state, including NC Emergency Management (NCEM), to help make decisions about which areas to evacuate and where to deploy resources. Predictions have been shared during each of the past few hurricane seasons, including during Hurricane Matthew in 2016, when Dr. Dietrich visited NCEM to discuss flooding forecasts as the storm was approaching North Carolina.



The forecasting team is ready for this season, and ongoing research will continue to improve their models. The US Army Corps of Engineers and the Federal Emergency Management Agency have also utilized CCEE’s research results.

Unlike hurricanes and other storms that scientists can track - allowing for advance warning - **earthquakes are not predictable**. They can strike at anytime, sometimes causing massive loss of life and economic devastation.

# How can we better design and build infrastructure to withstand earthquakes?

Drs. **Mervyn Kowlasky** and **Ashly Cabas** and their students want to increase the resilience of civil infrastructure in earthquakes. Their research groups are working to understand what happens to buildings, water systems, bridges, and other critical "lifelines" such as telecommunication networks during an earthquake, and then to develop protective structural designs. Dr. Cabas’s research is focused on understanding how strong ground motions and the seismic waves that propagate near the surface during an earthquake are affected by local soil and other geologic conditions — and how the specific characteristics of the ground motion affect structural response. Researchers on her team work with large global ground motion databases, and develop analytical models to improve predictions of the seismic response of a specific site.

Dr. Kowlasky’s research ranges from material and structural testing to understanding how structures respond to earthquakes. An example of this work includes a collaboration with the Alaska DOT to retrofit the Anchorage Port Access Bypass, a 1975 bridge that connects the port to downtown.



Computational analysis by the NC State team suggested that the existing welds connecting the columns to the superstructure would not efficiently allow the dissipation of the energy of an earthquake. The team is now conducting half-scale tests to confirm the computational model and develop retrofit plans that could be used for this, and similar structures. “The bridge was state-of-the-art when it was built, but we have knowledge and technology today that was not available 40 years ago,” Kowlasky explains.

What are the direct and indirect costs of bridges being taken out of service? Detours, weight or speed restrictions, or closures, can cost millions of dollars while a bridge is being strengthened, repaired, or replaced.

## Strengthening or rapid repair of bridges using traditional and non-traditional materials.

Dr. **Rudi Seracino**’s team is working with materials such as fiber-reinforced polymers (FRP) to retrofit bridges. These non-corrosive composite materials made of continuous carbon or glass fibers embedded in a polymer matrix can be used as internal reinforcing in new concrete structures, or bonded to existing structures to strengthen or repair them. FRPs are used to retrofit aging bridges and to rapidly repair bridges and other critical civil infrastructure after damage incurred during earthquakes and other natural disasters, as well as from the corrosion caused by de-icing salts or saltwater.



CCEE researchers are currently working with NCDOT to incorporate design criteria using FRP techniques developed in our department to design and replace the bridge to Harker’s Island along the NC coast. Seen here is the existing bridge which is crossed, on average, 3,600 times a day.

## How can we make our asphalt roads last longer?

With more than 2.5 million miles of asphalt roads in the U.S., finding a way to more efficiently construct them, and make them last longer, has significant economic and environmental impact. Working closely with the Federal Highway Administration, Dr. **Youngsoo “Richard” Kim** and his colleagues have created performance-related specifications (PRS) for asphalt pavements. The team, which also includes Dr. **Murthy Guddati**, uses advanced test methods, mechanistic models, and data analysis to predict the performance of asphalt pavement. FlexPAVE™, the pavement performance prediction program used in the PRS, is currently used by several state DOTs and more than 120 researchers around the world. The PRS allows rational decisions on pay factors, provides greater potential for the construction of higher quality pavements, and allows contractors to be more innovative and more competitive, which in the long run results in better and more efficient construction practices.

## Can ‘sensing skins’ predict structural failures before they happen?

Medical doctors take lots of measurements of our body’s performance that are not visible to the naked eye, such as glucose levels or blood pressure, and they use this information to make predictions about a person’s overall health. Dr. **Mohammad Pour-Ghaz** is developing analogous monitoring techniques for civil infrastructure. Sensing skins that provide detailed information at the material-level regarding degradation, corrosion and cracking can be used in critical infrastructure such as nuclear power plants, or oil refineries. These sensing skins, which can be painted on, or attached like wallpaper to a structure, can be applied to existing or new infrastructure. The skins allow for the detection of chemical, electrochemical and physical changes in materials at a very minute level. Dr. Pour-Ghaz and his team are also developing a hybrid imaging modality that will combine data from various types of monitoring and create a corresponding graphic image for engineers to evaluate the overall health of an individual structure.



During structural testing on a full-scale beam, the sensing skin monitors the formation of cracks only a few micrometers wide that are extremely difficult to detect by visual inspections.

## Green lights and ‘green’ drivers: Can we incentivize individual drivers to operate their vehicles more efficiently and save energy?

With more than 260 million registered vehicles in the U.S., saving a few drops of fuel per trip is good for the environment and for reducing our need for petroleum. Dr. **Nagui Rouphail** and his team have been testing the effectiveness of customized driver feedback information and monetary incentives on increased fuel efficiency. Participants in the study have their vehicle equipped with a tracking device, called Intelligence to Drive (or i2D). The device monitors fuel use and driving style, such as levels of accelerations and speeds. Drivers then access a secure website to view information on how they drive, and receive guidance on how they can save on fuel. Driving is scored each day and monetary incentives, such as gift cards, can be earned for increasing fuel efficiency. Initial results indicate this type of incentive program works.



We also have Researchers working in developing countries where resources are scarce, and infrastructure limited. **One-fifth of the world's population lives in "energy poverty,"** lacking access to electricity to light or heat their homes, or cook their food. This energy poverty leads to many other issues such as lack of clean water or wastewater services. This section gives just a few examples of how our work around the globe affects the health and well being of those living in very different circumstances from our own.

## Low-cost water filtration technology for remote areas.

Dr. Josh Kearns is exploring another facet of resource scarcity – lack of access to clean drinking water. Chemical pollution of the environment, including water sources, is more severe in the developing world, in part because these regions lack regulations for the use and disposal of toxic chemicals. Many people in remote villages do not have access to a centralized source of treated drinking water and instead rely on local solutions.

Dr. Kearns is currently working in both Southeast Asia and central Mexico to develop low-cost, point-of-use water filtration systems that can be built and implemented in small villages. His work has focused on the use of biochar and bonechar. These are charcoal-like substances that can be produced from locally sourced materials including wood and bone, and act as absorbents, filtering out harmful chemicals from drinking water.



## Cleaner Cookstoves as one approach to solve 'energy poverty' and lessen air pollution.

More than 3 billion people rely on burning wood, dung, or charcoal for cooking. The results of this? Indoor air pollution that leads to ill health and premature deaths, and affects air quality and climate around the globe.

Dr. Andy Grieshop has ongoing research in Africa and India, in which he is evaluating improved stove technology for cleaner cooking. His research addresses what technologies might work in certain areas, including understanding human choices and how to encourage people to adopt new technologies successfully.

## When there's no such thing as just "flushing it away."

Dr. Francis de los Reyes also works toward improving the lives of millions who live in areas where defecating in open latrines is still the norm. With collaborations in the Philippines, India, China, South Africa, Belgium, and Malawi, Dr. de los Reyes has developed technology and processes that allow local solutions to treating human waste. His research team has developed a device known as the Flexcrevator, which is used to empty fecal sludge from pit latrines. The Flexcrevator is being field tested at sites throughout Africa with the goal of making sure its use will be adopted by local service providers, and that it can be efficiently manufactured in local economies.

# NEW RESEARCH PROJECTS

In the first part of 2018, CCEE Faculty contributed to research that received more than \$7 million of support from federal, state, and private sources. This support will enable 30 CCEE faculty members, their research teams, and their collaborators to address problems facing infrastructure and the environment in North Carolina and around the world. The following summaries represent a small selection of these projects. A complete list, including multiple projects supported by the NCDOT, can be found on our website.

Drs. **FRANCIS DE LOS REYES** and **JOEL DUCOSTE** received funding from the US National Science Foundation (NSF) to study the anaerobic conversion of food wastes to methane, which can be used for energy. This study will use ecological theory to link microbial communities to operating conditions and reactor functions. The goal is to develop reactors that are better — have higher methane yields and are more resilient and resistant to changes in the type and amounts of food waste added.

Dr. **DOUGLAS CALL** was awarded a grant from NSF to work on a new method to convert nitrogen gas from the atmosphere into ammonia for fuel and fertilizer. Along with several NC State collaborators, Dr. Call will optimize the unique capabilities of electricity-generating bacteria to fix nitrogen gas in response to an electrical driving force. The aim is to develop a sustainable ammonia production alternative to the energy-intensive Haber-Bosch industrial process used currently.

Dr. **JOEL DUCOSTE** is leading a team from the NC State College of Engineering for a Bridge to the Doctorate fellowship program sponsored by NSF. The program will support 12 underrepresented STEM students during the first two years of their Ph.D. studies.

Dr. **SANKAR ARUMUGAM** is part of an international research team that received funding from the US Geological Survey (USGS) to study changes in runoff and evapotranspiration in natural watersheds and human-altered landscapes. This global synthesis project will focus on how changes in land-surface water fluxes vary due to human activities like reservoir construction and urbanization.

Drs. **CALL** and **DETLEF KNAPPE** received funding from the Strategic Environmental Research and Development Program (SERDP) to study a new approach to remove perfluorinated contaminants from water. These contaminants are widely present

in groundwater and surface water and can be harmful to human health. The goal is to improve the ability of activated carbon sorbents to capture these compounds by electrically charging the carbon surface.

Dr. **ALEX ALBERT** received funding from the National Institute for Occupational Safety & Health (NIOSH) to develop and test new interventions to improve hazard recognition among construction engineers and managers. The effort is expected to make an important contribution toward reducing injury rates in the construction industry.

Drs. **EMILY BERGLUND** and Caren Cooper from NC State, along with Drs. Marc Edwards and Kelsey Pieper at Virginia Tech and Dr. Adrienne Katner at Louisiana State University, received funding from the US Environmental Protection Agency (EPA) to reduce hazards from lead in drinking water. This project focuses on helping consumers understand how to protect themselves from lead. Dr. Berglund is developing statistical and machine learning models to predict lead as a function of water supply, neighborhood, and plumbing materials.

Dr. **H. CHRISTOPHER FREY** has amassed a unique database of the real-world activity, energy use, and emissions of more than 200 light duty gasoline vehicles. He received funding from the US EPA, via Eastern Research Group, to develop a standardized database of these measurements. These data are expected to be used by EPA for evaluation and calibration of the national emission inventory model 'MOVES' (Motor Vehicle Emission Simulator).

Dr. **TASNIM HASSAN** is part of a group that received funding from the US Department of Energy to investigate failure mechanisms of diffusion welds in compact heat exchangers (CHXs) through experimental and analytical studies. The primary

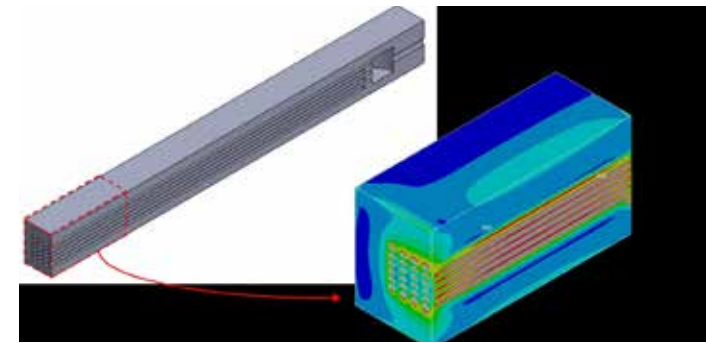


Diagram of test specimen and analysis results for a compact heat exchanger (CHX).

objective is to enable the accelerated commercialization of high temperature CHXs for use in nuclear power generation systems. The research involves six universities, one national lab, and four companies, under the leadership of University of Wisconsin.

Dr. **MERVYN KOWALSKY** was awarded funds from the California Department of Transportation (Caltrans) to study the seismic behavior of high strength reinforcing steel. Production of such steel is rapidly increasing, yet our understanding of its behavior is limited, especially for applications in earthquake prone regions. Through material tests developed at NC State, large scale seismic tests and computational modelling, Dr. Kowalsky will develop models to predict the performance of bridges designed with high strength steel subjected to seismic attack.

In other Caltrans-funded work, Dr. **SHANE UNDERWOOD** will work with researchers at Arizona State University to understand how improving roadside water infiltration affects safety. Increasing roadside infiltration is a strategy that allows states to meet National Pollution Elimination permit requirements, but can lead to softer soils, which increase vehicle rollover potential. This research will characterize soils with varying amendments and compaction and use 3D vehicle simulations to develop guidelines that permit greater infiltration without negatively affecting driver safety.

Dr. **TAREK AZIZ** is part of a team, (led by Dr. Michael Burchell of NC State's Department of Biological and Agricultural Engineering), that received funds from the NC State Water Resources Research Institute to study nitrogen removal from constructed wastewater treatment wetlands. The research team will monitor an existing constructed wetland system and conduct experiments to develop insights into constructed wetland operation and maintenance to ensure nutrient removal over time.

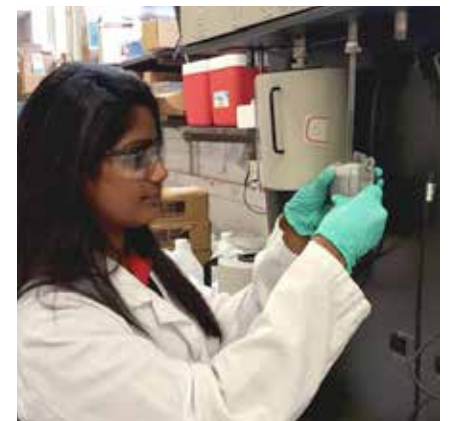
Dr. **ALEJANDRA ORTIZ** received funding to study the impact of wave energy converters on the ocean floor from the North Carolina Renewable Ocean Energy Program. This research

will use numerical modeling to study the impact of sediment and waves on renewable ocean energy devices. This effort will help managers understand the long-term maintenance and management requirements for renewable marine energy devices.

Drs. **DAN OBENOUR** and **SANKAR ARUMUGAM** received funding from the NC Policy Collaboratory to develop and apply models to study nutrient (nitrogen and phosphorus) dynamics in Jordan Lake and its associated watershed. This research will quantitatively assess major hydroclimatological and anthropogenic factors controlling watershed nutrient loading and algal growth in the reservoir over a multi-decade study period. Study results will help inform future management strategies to protect water quality in this major water supply reservoir.

Drs. **AZIZ** and **OBENOUR** received funding from the NC Policy Collaboratory to investigate the connection between excessive nutrient loads (i.e., eutrophication) and harmful algal blooms in Jordan Lake. Leveraging prior models developed to understand lake mixing dynamics, they will design new biological models capable of predicting water quality issues related to algal blooms. They will also conduct lab experiments using novel water column reactors under conditions similar to Jordan Lake to better understand the potential impacts that various water quality factors may have on the occurrence and intensity of harmful algal blooms.

Dr. **JOSH KEARNS** received funding from the NCSU Office of Global Engagement to establish a research exchange between NC State and the University of Sri Jayewardenepura in Sri Lanka. Drs. Kearns and Meththika Vithanage (University of Sri Jayewardenepura) are supervising a study of the use of low-cost biochar adsorbents made from wood and municipal solid waste for control of toxic organic compounds and heavy metals in leachate from open dumps in Sri Lanka. The research is conducted by students Janhavi Kulkarni (NC State) and Sarangi Madhavi (University of Sri Jayewardenepura/Open University of Sri Lanka). ■



Visiting researcher Sarangi Madhavi (University of Sri Jayewardenepura/Open University of Sri Lanka) characterizing the pore structure of biochar adsorbents used to treat leachate from open dumps in Sri Lanka

CCEE played prominent role in 2018 AWMA conference



Dr. Frey with panelists. From left to right: Michael P. Walsh, Susan Collet, H. Christopher Frey, Alberto Ayala, Rashid Shaikh, and Eric Stevenson.

CCEE faculty, students, and alumni were prominent at this year’s Annual Conference of the Air & Waste Management Association, held in June 2018 in Hartford, Conn. Dr. **H. Christopher Frey** delivered the 48th Annual Critical Review on “Trends in Onroad Transportation Energy and Emissions.” Dr. **Morton Barlaz** received the Richard I. Stessel Waste Management Award. Alumnus Dr. **Joshua Fu** (Ph.D., 2000) received the Lyman A. Ripperton Environmental Educator Award. Graduate students **Nikhil Rastogi**, **Weichang Yuan**, and **Tongchuan Wei** delivered papers in the main technical program, and graduate student **James East** presented in the student poster competition. Rastogi won first place and Yuan won second place for best student papers in the main technical program, and East won first place in the student poster award. In addition, alumnus Dr. **Provat Saha** (Ph.D., 2017) received a second place best dissertation award. Rastogi, Yuan, and Wei are advised by H. Christopher Frey, East is advised by Dr. **Fernando Garcia Menendaz**, and Saha was advised by Dr. **Andy Greishop**.

Frey delivers Critical Review on Transportation at A&WMA Annual Meeting

Frey’s presentation quantified national and global trends in transportation energy use and emissions, and evaluated key factors that affect these trends. For example, whereas the U.S. had only 8,000 motorized vehicles in 1900, there were over 268 million vehicles in 2017. Air pollution from vehicles was one of many converging factors that led to the 1970 Clean Air Act and

the formation of the U.S. Environmental Protection Agency. Air pollution from vehicles is still a significant threat to human health, based on estimates of as many as 240,000 premature deaths globally each year from exposure to particles emitted from vehicles. With 1.3 billion vehicles as of 2015, and rapidly growing new vehicle sales, especially in China, India, and Indonesia, transportation energy use, greenhouse gas emissions, and other air pollutant emissions are likely to continue to increase.

Looking ahead, Frey also assessed the potential role of alternative fuels, electric vehicles, autonomous vehicles, other management strategies, and regulations. His presentation was based on a review paper published in June 2018 in the *Journal of the A&WMA*. ■



On behalf of the Air & Waste Management Association, Pat Brush presents H. Christopher Frey with a certificate of appreciation for preparing and delivering the Critical Review.

AWARDS & HONORS



Dr. Morton Barlaz receives the Stessel Award from Chris Nelson, president of the Air & Waste Management Association, on June 28, 2018 in Hartford, Conn.

Dr. **MORTON A. BARLAZ**, Distinguished University Professor and department head, received the Richard I. Stessel Waste Management Award from the Air and Waste Management Association. The Stessel Award is given to an individual or organization with outstanding achievements in the science and art of waste management. Barlaz received the award in recognition of his work regarding management, prevention, and regulation of waste. He was also cited as a distinguished educator in the field of waste management.



Dr. Cassie Castorena in the lab with Ph.D. student Sonja Pape.

Dr. **CASSIE CASTORENA**, associate professor of transportation materials, received the 2018 Transportation and Development Institute (T&DI) of the American Society of Civil Engineers Outstanding Younger Member Award. This award recognizes younger members (under 36 years of age) for their professional contributions to transportation engineering. Castorena received the award in July 2018 during the Awards Dinner Banquet of the T&DI International Conference on Transportation & Development (ICTD) in Pittsburgh, Pa.



Dr. Joel Ducoste mentors a student attending a graduate informational session sponsored by the College of Engineering

Dr. **JOEL DUCOSTE** received the 2018 George H. Blessis Outstanding Undergraduate Advisor Award given by the College of Engineering. The award recognizes faculty members who consistently and willingly give their time and effort to advising, counseling, and mentoring students and assisting student groups. Ducoste is passionate about encouraging underrepresented students in STEM fields, including the pursuit of graduate-level study and research.

Dr. **DETLEF KNAPPE**, professor of environmental engineering, was honored with a Green Tie Award from the North Carolina League of Conservation Voters. Knappe received the Catalyst Award, presented to an individual who has taken exceptional



Dr. Detlef Knappe and UNC-Wilmington scientist Dr. Larry Cahoon were honored for their research, which detected GenX in the Cape Fear River

action to create change and/or bring attention to an important environmental issue. Knappe was recognized for his research, which resulted in the identification of a contaminant known as GenX in the drinking water supply that affects more than 200,000 North Carolina residents. GenX is the trade name for an unregulated fluorochemical used in the manufacture of non-stick cookware and water-repellent apparel.



Dr. Gregory Lucier



Dr. Sami Rizkalla



Dr. Paul Zia

Drs. **GREGORY LUCIER**, **SAMI RIZKALLA**, and **PAUL ZIA** received the 2018 T. Y. Lin Award from the Structural Engineering Institute. They received this honor for their paper entitled “Dapped Ends of Prestressed Concrete Thin-Stemmed Members: Part 1, Experimental Testing and Behavior,” published in the Precast/Prestressed Concrete Institute’s *PCI Journal*.



Dr. Casey Dietrich

Drs. **CASEY DIETRICH** (coastal engineering) and **FRANCIS DE LOS REYES** (environmental engineering) received 2017-18 NC State Outstanding Teacher Awards in recognition of their classroom teaching. Recipients of the Outstanding Teacher Award (OTA) become members of the Academy of Outstanding Teachers for as long as they remain NC State faculty. The awards are presented by the Office of the Executive Vice Chancellor and Provost and the Office of Faculty Development at NC State.



Dr. Alejandra Ortiz

Dr. **ALEJANDRA ORTIZ** received the Gulf Research Early Career Fellowship from the National Academy of Sciences to investigate the long-term health of the Mississippi Delta Plain. This research will focus on quantifying the processes driving land loss on the Mississippi Delta Plain using remote sensing, numerical modeling, and fieldwork.



Dr. Francis de Los Reyes

Dr. **FRANCIS DE LOS REYES**, professor of environmental engineering, was the first prize winner of the RELX Group Environmental Challenge 2018. The RELX Group Environmental Challenge was launched in 2011 and is awarded to projects

that best demonstrate how to provide sustainable access to safe water where it is presently at risk and/or access to improved sanitation. De Los Reyes received the award for the Flexcravator, an innovative pit latrine emptying device that can empty trash-filled pits at a competitive cost, removing the need for high-risk and unsanitary manual methods. Dr. de los Reyes received the award in Stockholm in August during World Water Week.



Dr. Richard Kim

Dr. **YOUNGSOO RICHARD KIM**, Jimmy D. Clark Distinguished University Professor and Alumni Association Distinguished Graduate Professor, made two keynote presentations at international conferences in summer 2018. The first presentation, entitled “Sustainable and Renewable Asphalt Technology,” was given on May 30 in Jeju Island in Korea at the 2018 International Conference for Road Engineers. The second keynote presentation, entitled “Asphalt Mixture Performance-Related Specifications and Performance-Engineered Mix Design,” was given on June 19 in Fortaleza, Brazil, at the 2018 International Society for Asphalt Pavements (ISAP) Conference. The ISAP conference is a premier international conference in asphalt pavement engineering and is held every four years.



Dr. James Levis

Dr. **JAMES LEVIS**, Research Assistant Professor of Environmental Engineering, has received a Fulbright U.S. Scholar Program award to the Technical University of Denmark in Lyngby, Denmark. Levis will research and lecture as part of a project to develop and enhance state-of-the-art life-cycle assessment models to support sustainable waste resource management. Levis is one of more than 800 U.S. citizens who will teach, conduct research, and/or provide expertise abroad for the 2018-2019 academic year through the Fulbright U.S. Scholar Program.

Several CCEE graduate students received awards at the departmental graduate reception. The Thomas W. Griffin Endowment award was presented to **JINUNG DO**, who is advised by Drs. **BRINA MONTOYA** and **MO GABR**. Do was nominated for his leadership in the Geo-Institute Graduate Student Organization and excellence in his research. His research focuses on mitigating scour adjacent to foundations for offshore hydrokinetic devices using bio-mediated soil improvement techniques. The Bruce Edward Mathews Transportation Engineering Scholarship award was presented to MSCE student **RUSS SMITH**, who is advised by Dr. **GEORGE LIST**. Smith’s

research focuses on assessing the reliability performance of freeway facilities making use of data fusion techniques to establish and understand cause-and-effect relationships between traffic conditions and travel times/rates. Ph.D. student **VIVEK SAMU** received the Thomas G. Coffey Graduate Award. Advised by Dr. **MURTHY GUDDATI**, Samu’s research focuses on the use of effective dispersion analysis of reflections (EDAR) to assess the condition of bridges. EDAR is a non-destructive method that combines innovative use of signal processing combined with mathematical manipulations based on wave propagation theory to estimate the depth of embedded pilings.

Ph.D. student **ZACHARY HOPKINS** won the first-place Fresh Ideas Poster award from the American Water Works Association’s (AWWA’s) North Carolina Section for his poster entitled “Occurrence and Treatment of Per- and Polyfluoroalkyl Substances in the Cape Fear River.” He received the award at the June 2018 AWWA Annual Conference & Exposition in Las Vegas, Nev. Hopkins was also awarded the Thomas R. Camp Scholarship from AWWA. This scholarship is sponsored by CDM Smith and is given to outstanding graduate students doing applied research in the drinking water field. Hopkins is advised by Dr. **DETLEF Knappe**.

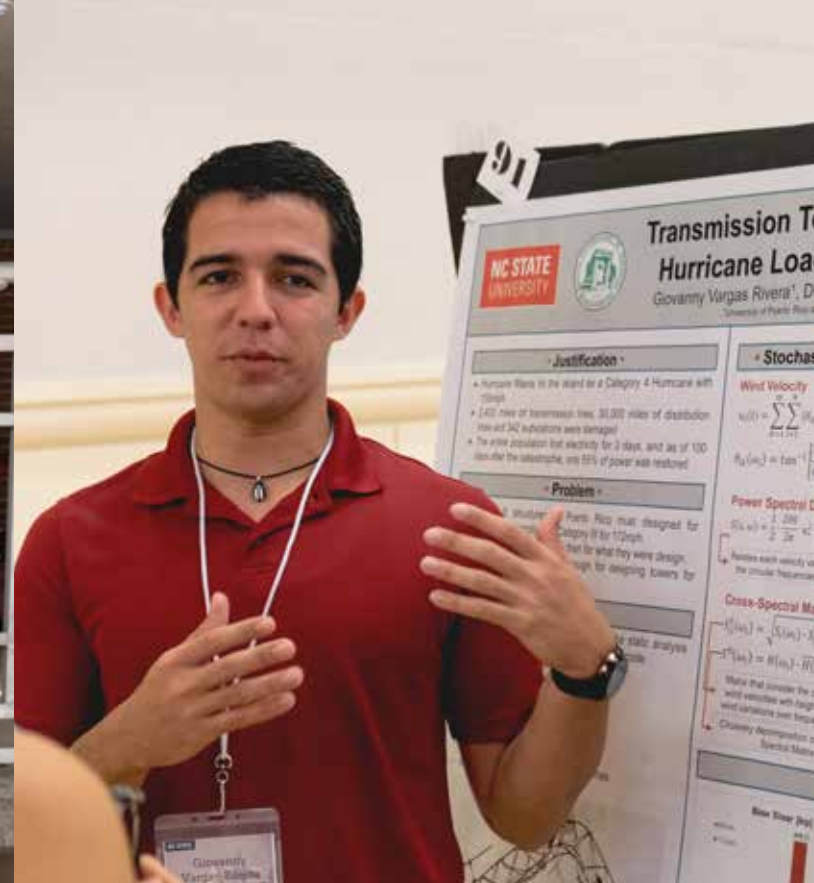
Ph.D. student **ADITYA KESKAR** was one of 14 awardees to receive the Linda Latham Scholarship at the 2018 American Council for an Energy-Efficient Economy Summer Study on Energy Efficiency in Buildings. The award is given to young leaders in energy efficiency research in honor of Linda Latham, who pioneered the expansion of the energy star program in the United States. Keskar works with Professor **JEREMIAH JOHNSON** investigating the trade-off between demand response and energy efficiency in buildings. ■



Left to right: David LaFrance, Zachary Hopkins, Michael Zafer, Brenda Lennox.



RISE is an eight-week program that allows undergraduates and graduates from both inside and outside the department to spend the summer learning about research while being mentored by faculty and post doctorate researchers. This year we welcomed participants from Brazil, the Republic of the Congo, India, Mexico, Nigeria, Peru, Puerto Rico, Sri Lanka and the United States. U.S. students are from Florida, Maryland, Massachusetts, Michigan, New Mexico and North Carolina.



RISE participant Giovanny Vargas Rivera is a senior at the University of Puerto Rico at Mayagüez. His research topic included an analysis method for non-linear dynamic wind analysis for the design of power transmission towers. After two devastating hurricanes hit Puerto Rico in 2017, Rivera became interested in solving future challenges regarding transmission tower failures.



Arpit Bhardwaj's home university is the Indian Institute Technology (IIT) Varansi. This summer, during the RISE program, he was mentored by Dr. Tasnim Hassan. His research topic was "Low-cycle fatigue failure of elbow piping" and is part of a larger focus on understanding the behavior of piping components, which are critical elements of nuclear, chemical and industrial structures.

## CCEE's RISE program completes third year



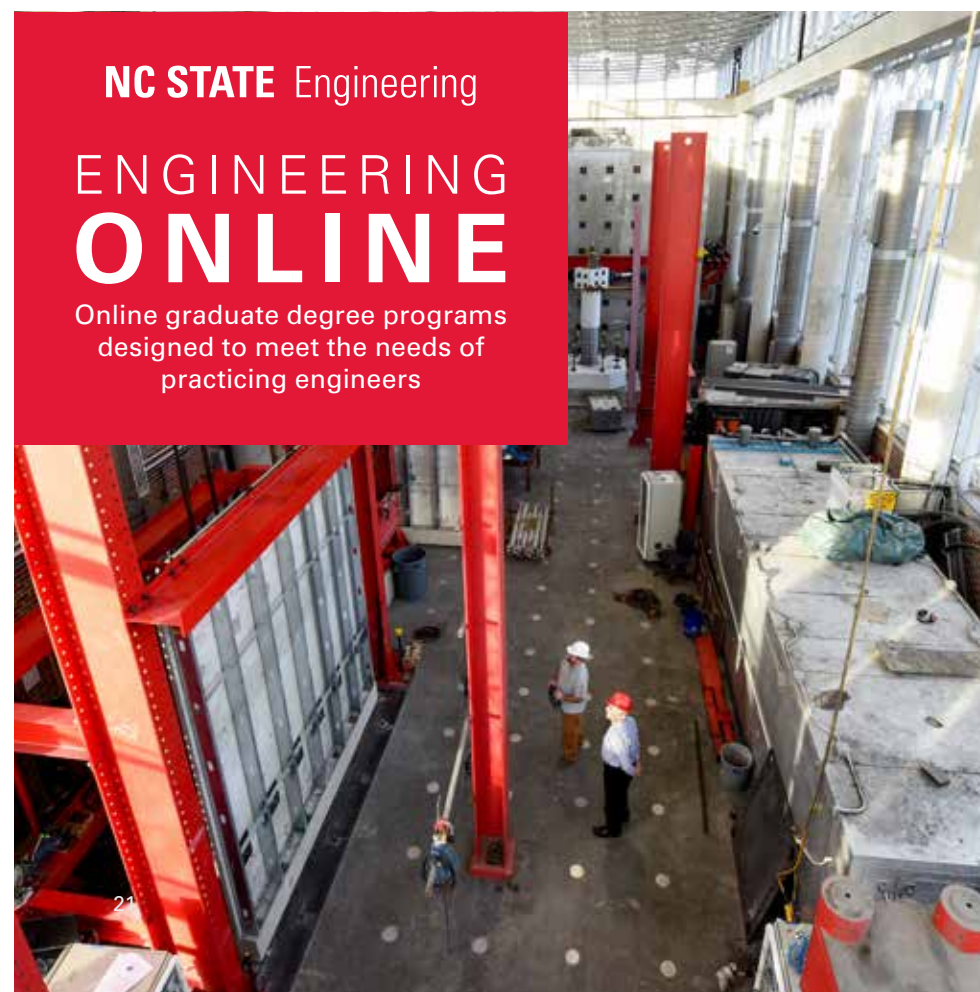
Anne Loeliger (right), mentored by CCEE graduate student Robyn Manhard, is shown here testing various types of Grade 80 steel to evaluate their performance in the plastic hinge region of a bridge column in an earthquake-prone area. Loeliger is a rising junior at Susquehanna University.

During June and July, 25 students from around the world participated in the third annual RISE program. RISE is the Research Internship Summer Experience and was started in 2016 by Dr. Ranji Ranjithan, director of graduate programs. "The RISE program provides us with a unique opportunity to identify talented prospects for recruitment as future master's and doctoral students," Ranjithan said. Participants get an in-depth experience in CCEE's graduate programs, and get to experience NC State's campus and the city of Raleigh. They receive a research stipend, travel expenses, and university housing. Mentored by CCEE faculty and graduate students, they conduct research and present their findings at the annual Summer Research Symposium. "It helps interested students make an informed choice about coming to graduate school at NC State. Two participants from the 2017 program are now in our graduate program," Ranjithan said. "We are looking forward to receiving graduate applications from eight participants this year who have expressed interest in studying at NC State." ■

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# STUDENT GROUPS

## AMERICAN CONCRETE INSTITUTE (ACI)

In March, members of the ACI chapter traveled to Salt Lake City, Utah, for the 2018 ACI Convention. Students participated in committee meetings and technical presentations and competed in the International Concrete Bowling Ball Competition, where they placed 23rd out of 53 teams from around the world.

The chapter was honored as an “ACI 2017 Outstanding University” for the fifth year in a row, in recognition of the high level of engagement of its students and faculty in ACI activities, and for its support of the Concrete Industry in NC and abroad.



Members of the ACI chapter competed in the Bowling Ball Competition. Left to right, Daniel Cisneros, Seth Shearon, Caleb Sawyer, Cody Harrison, Andy Jiang, Alexandra Farraher, Allison Womack

## AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

The ASCE Steel Bridge Team earned an invitation to participate in the ASCE National Competition, held in May 2018 at the University of Illinois at Urbana-Champaign. The team had a commanding first place win earlier in April at the Carolinas Conference. From a field of 230 teams that participated regionally, our team was one of only 42 invited to the national competition.

“We had a great group of dedicated people this year on the bridge team, which allowed us to stay on schedule and ultimately meet our goal of having the bridge ready in time to practice before the competitions,” said Steel Bridge Team captain Sanders Rohs (BSCE 2018). “The practice paid off and we got our build time down to under 10 minutes.” Notably, the team’s construction speed was less than half the time of the second-best team at the regional conference. In Illinois, at the national competition, the team completed the assembly of their 178-pound bridge in 8.57 minutes. This speed, along with a good ranking in the stiffness category -- the bridge had an aggregate deflection of 1.080 inches when fully loaded with 2,500 pounds -- earned the team an overall

ranking of 29th in the national competition. “That’s our best finish of the three consecutive years we’ve attended nationals,” said faculty advisor Steve Welton.



Members of the steel bridge team, left to right, Steven Welton (co-faculty advisor), Kadin White, David Zabel, Thomas Clunan, Caleb Sawyer, Sanders Rohs (senior bridge captain).

## COASTS, OCEANS, PORTS AND RIVERS INSTITUTE (COPRI)

In July, several members of NC State’s COPRI chapter attended the 36th International Conference on Coastal Engineering in Baltimore, Md. The conference, organized by ASCE COPRI, was attended by more than 750 individuals from 41 countries. Our students participated in pre-conference short courses, technical sessions, and social and networking opportunities, which included meeting several CCEE alumni.

Earlier this year, the chapter organized a field trip to the U.S. Army of Corps of Engineers office in Wilmington, NC. Students met with several local engineering professionals and were given a tour on an active dredge that was pumping sand from an inlet



Members of COPRI took a field trip to the coast of North Carolina in April. L to R Dhananjay Patel, Kevin Conner (USACE), Liliana Velasquez Montoya, Greg Williams (USACE), Mohammad Innab, Casey Dietrich (COPRI Faculty Advisor), Carter Rucker, Nelson Tull, Nikhil Rastogi, Alireza Gharagozlou, Parin Bodiwala, Faith Johnson, Aditya Gupta, Sheetal Patidar, Jay Patel

onto a nearby beach for a nourishment project. The trip included a tour of the Kure, Carolina, and Wrightsville Beaches led by Spencer Rogers of NC Sea Grant. Students from the coastal engineering undergraduate course also joined the beach tour.

“This field trip gave us a close-up view of some fascinating coastal engineering projects in North Carolina. Being able to step on an active dredge and learn about our coast from engineering professionals really contextualizes and supplements what we learn in our courses,” chapter president Nelson Tull said.

## EARTHQUAKE ENGINEERING RESEARCH INSTITUTE (EERI)

In June, four members of the undergraduate Seismic Design Competition team traveled to Los Angeles, California for the EERI Annual Meeting, which was held this year in conjunction with the 11th National Conference on Earthquake Engineering. The final stages of this demanding competition included 39 teams and represented the culmination of a yearlong process, including submitting a design proposal that determines admittance to the competition. The CCEE team presentation included architectural concepts, structural system analysis and design, and information on the construction process and material testing. The competition concluded with a “shake day,” in which each team subjected their balsa wood models to ground motion testing on a shake table.

Two students also made presentations during the conference. Zachary Krish (Ph.D. 2018) presented his research entitled “Rapid Repair of Reinforced Concrete Bridge Columns via Plastic Hinge Relocation Utilizing Conventional Material.” Graduate student Ishika Nawrin presented his topic “Assessment of the Influence of the Elastic Halfspace Assumption on Site Response Estimations.”



Left to right, Ariadne Palma, Zachary Krish (Ph.D. 2018), Victor Calderon, Dr. Mervyn Kowalsky, Ana Gabriela Haro (Ph.D. 2017), and Ishika Nawrin Chowdhury.



The EWB group that traveled to Caserio Panhux, Guatemala shows some Wolfpack Pride. Left to right, professional mentor Bruce Binney, Florian Vorleiter, Rachel Finkelstein, Erica Lisowe, Julia O’Brien, Sarah McConnell, Jeremy Lowe, Carter Rucker, Luke Shealy, and Wesley Hayes.

## ENGINEERS WITHOUT BORDERS (EWB)

NC State’s Engineers Without Borders chapter has students from across the College of Engineering. Our chapter was chosen by the NC State Sustainability Council as the 2018 recipient of a Green Brick Award in the student organization category. The Green Brick Awards have recognized sustainability achievements at NC State since 2004.

Currently, the chapter is working on two projects in Sierra Leone and one in Guatemala. In May 2018, a group of five students and a professional engineering mentor traveled to the Dele Village Learning Center in Lower Allentown, Sierra Leone. This was the final trip to complete a multi-year project in which they partnered with the community to complete a water system at the school. Water is now pumped, treated, stored, and distributed throughout the school to bathrooms, stand pipes, and hand washing stations in a system powered by a small solar array. In another project with the school, EWB students have designed a 7 kW solar photovoltaic system with battery storage and are planning to travel in December, 2018 to complete construction.

In August, one of our EWB teams spent 10 days in Guatemala. Nine team members and an engineering mentor traveled to Caserio Panhux, a small indigenous community. They built 14 household rainwater catchment systems. The chapter has been working since 2016 on designs, documentation, and funding for the rainwater catchment systems. Two more implementation trips are planned to this location. ■

## The Simpson Brothers: (Not) just a couple of average guys.

David Simpson (BSCE 1981) and his "baby" brother Michael Simpson (BSCE 1982) claim to be "average." They do not want to be put on any kind of pedestal, or have the spotlight turned on them. It's not their way. David Simpson is "just an average guy who was willing to work hard." Michael Simpson put it like this: "Some people are naturally gifted, but I considered myself average, so I had to go above and beyond. I hit the books hard, all the time."

Now, four decades into their civil engineering careers, both brothers have established and now lead their own engineering firms after years of experience with both government agencies and the private sector.

"I guess you could say that we've been following in each other's footsteps all our lives," David Simpson said. "Sometimes I was the leader, and then sometimes I found myself following my brother's lead. He

followed me to NC State and into civil engineering, but Mike's the one who first started his own business, and he urged me to do the same."

Michael Simpson established MMSA, Inc. (Michael M. Simpson + Associates) in 1999. His structural engineering firm, headquartered in Greenville, SC, employs 14 people and maintains a strong presence in Atlanta and Charlotte. "I do the vertical, and David does the horizontal," Michael Simpson explains, referring to the fact that his firm specializes in structural framing and foundations for buildings, while David's firm is known for its work on bridges.

David Simpson established SE&A, P.C. (Simpson Engineers & Associates, P.C.) in 2004. Headquartered in Cary, NC, the firm has grown to more than 45 employees and specializes in

transportation structure design, in-service bridge inspections, and transportation planning services throughout the state, as well as ongoing work with the NCDOT Rail Division.

The Simpson brothers are anything but "average." Their lives and accomplishments exemplify the power of having a strong work ethic and the importance of family support. Their story is rooted in North Carolina, where they grew up working in

tobacco fields well before they were teenagers. "We worked during the summers to earn money to help buy our school clothes," Michael Simpson explains. They also grew up watching their father work two jobs most days and pick up extra work on Saturdays.

"He didn't want my Mom to have to work too much, because he wanted her home for us. He wanted her to be able to take us to our extracurricular activities like marching band and sports. They both sacrificed and put family first. That's how we came up," Michael Simpson explains.



David Simpson (L) and Michael Simpson (R) standing in front of the dorm they lived in while at NC State.

### WHAT HAPPENS WHEN A COUPLE OF "AVERAGE GUYS" DO WELL, AND DECIDE TO GIVE BACK?

A few years ago, David Simpson decided he wanted a formal way to give back to NC State and to honor their parents. The David B. and Annie P. Simpson Endowment was established to honor the tireless efforts of their parents, who made it possible for the brothers to attend NC State, focus on their academics, and not incur student loan debt. The scholarship has some unusual parameters. "We specifically want this scholarship to support someone who is struggling with perhaps the same circumstances we had. Someone who may not have the highest grades, but who has the fortitude and discipline to persevere through the curriculum," David Simpson explains.

You know, just another "average" student. ■



Fitts-Woolard Hall construction site as of mid-August 2018.

## Our new home is under construction! Fitts-Woolard Hall to open doors in fall of 2020

Excitement is building as construction of Fitts-Woolard Hall progresses every day. The 225,000-gross-square-foot building will house the Department of Civil, Construction, and Environmental Engineering; the Edward P. Fitts Department of Industrial and Systems Engineering; and the College of Engineering administrative offices. The building will include new labs, modern classrooms and collaborative workspaces for students, and will make it possible to bring our faculty, students and laboratories together in one building.

Elevated concrete structural construction should be completed in mid-October and the level 1 slab on grade by mid-December. Steel erection is also expected to be completed in mid-December. Finally, the open space next to the Hunt Library is beginning to look like a building!

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 to be raised, more than \$47 million has been committed to date. However, the work is not complete. We still need to raise another \$13 million to meet our commitment. We continue to look 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 laboratories.

With much gratitude, we are pleased to have named the building Fitts-Woolard Hall in recognition of a \$25 million joint gift from Industrial and Systems Engineering alumni Edward P. Fitts, Jr. and Edgar S. Woolard, Jr. If you are interested in participating, please contact Lora Bremer (919.513.0983 or [lfbremer@ncsu.edu](mailto:lfbremer@ncsu.edu)). ■

### Milestones:

- Start date of construction project: 2-5-18
- Start of excavation: 2-8-18
- Start of concrete foundations: 4-30-18
- Start date for steel erection: 8-28-18
- Expected completion date for concrete structure: mid-October 2018
- Expected completion date for project: 7-12-20

*Live web cams are available to watch construction in real time at [go.ncsu.edu/fwh-camera](http://go.ncsu.edu/fwh-camera).*

# ALUMNI BRIEFS

**ALI ALMALKI** (Ph.D. 2018) is an assistant professor at Jazan University, Saudi Arabia. He is responsible for teaching Construction Management and Construction Engineering undergraduate courses. His current research focuses on infrastructure asset management, prediction of future asset condition rating, and maintenance plan processes. Ali lives in Jazan, Saudi Arabia, with his wife and four sons.

**LAURISSA HOYLE CUBBAGE** PE, PMP (BSENE 2003, MSCE 2006) recently accepted a position with HDR Engineering in Richmond, Va., where she leads the central-Virginia water business group. Laurissa manages wastewater projects in both Virginia and North Carolina. She is active within the Virginia Water Environment Association and was elected as the president-elect of the Virginia chapter for 2018-2019. She enjoys volunteering for the WEF Student Design competition and local STEM programs for teens interested in engineering.

**MICHAEL ELWARDANY** (Ph.D 2017) is a lead research engineer at the University of Wyoming Research Corporation, Western Research Institute. Michael has recently presented his research findings at several national and international meetings including the Transportation Research Board in Washington, D.C; the Federal Highway Administration Binder Expert Task Group meeting in Massachusetts, the Petersen Asphalt Research Conference in Wyoming, and the International Union of Laboratories and Experts in Construction Materials, Systems and Structures symposium in Germany.

**BAHAREH KARAMI** (MSENE 2012) ) is an engineer in training with Black & Veatch International Company. After beginning her career with Black & Veatch in their Charlotte, NC office, she is now

working in the Toronto office. She was recently promoted to civil engineer 3. Her responsibilities include preparing complex design deliverables in the design stage, and site inspection and contract administration during construction of wastewater-related projects. Bahareh is an active member of the Water Environment Association of Ontario (WEAO) in Toronto.

**ALAN M. MANESS**, PE (BSCE 1991, MSCE 1993) is the land development manager for VHB, with offices on the NC State Centennial Campus. Prior to its merger with VHB, Alan served as president of BBM Associates, Inc. from 1999 to 2016.

**BRANDON L. NEVERS**, PE (MSCE 2001) was recently selected to become Kittelson & Associates, Inc.'s president and CEO. He will begin serving in the president/CEO role in January 2020. He is currently serving as the firm's chief operating officer. Brandon has 20 years of experience in multimodal transportation planning and operations, congestion management, simulation, traffic design, parking, and applied research. Brandon has served as principal investigator and senior researcher for projects in the NCHRP, FHWA, and SHRP 2 research programs in the areas of travel time reliability and integrated modeling.

**PHIL LEWIS** (Ph.D., 2009), **SAEED ABOLHASANI** (MS, 2006), **SHIH-HAO PANG** (Ph.D., 2007), and **GURDAS SANDHU** (Ph.D., 2015) attended the CRC Onroad Vehicle Emissions Workshop in Garden Grove, Calif. in March 2018. Phil is an associate professor of construction science at Texas A&M University. Saeed is a certification engineering specialist at MTU America Inc. in South Carolina. Shih-hao is an air resources engineer at the California Air Resources Board. Gurdas is a fellow of the ORISE program at the U.S. Environmental Protection Agency in Ann Arbor, Mich. ■

## 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 recognition, as well as retirements. We also want to keep your contact info current so we can keep you up to date on events within the department.

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Announcements

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



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## How your support makes a difference

### ENDOWED FACULTY SUPPORT

Faculty are the heart and soul of the Civil, Construction, and Environmental Engineering Department, which is home to more than 50 dedicated scholars and educators. Endowments and named professorships are an essential part of our effort to recruit and retain the very best faculty and then provide them with opportunities to explore new research ideas with the involvement of graduate and undergraduate research assistants. Relative to our peer institutions, the department has a low number of endowed professorships.

### ENDOWED GRADUATE FELLOWSHIPS

We strive to attract the best and brightest graduate students from the U.S. and around the world. Departmental rankings, faculty recruitment, research success, and undergraduate education all depend on the presence of talented graduate students. Competition for the best graduate students is intense, and finances can be a deciding factor for students when choosing a graduate program. To recruit the best students, and to create a vibrant learning environment for undergraduate students, CCEE must be able to recruit students and provide competitive graduate fellowships.



Dr. Jason Patrick's research expertise is in fiber reinforced polymer composites that are used in automotive and aerospace structures



Your support enables student group activities.

### ENDOWED UNDERGRADUATE SCHOLARSHIPS

Undergraduate scholarships enable us to prepare tomorrow's leaders in civil, construction, and environmental engineering. Students are drawn to NC State and CCEE by our reputation for excellence. Cost is a major consideration for students and their families. Scholarships represent a mechanism to support and reward our top students.

### CCEE ENHANCEMENT FUND

An annual or endowed gift to the CCEE Enhancement Fund makes it possible to provide students with the best possible education and extracurricular experiences. The enhancement fund allows us to respond to emerging needs and exciting challenges. Your support enables recruitment and retention of the best and brightest faculty and students, support for our student organizations, field trips to complement classroom instruction, and opportunities for faculty and students to present at conferences in their fields of study. Our enhancement fund is critical to the department as we strive to continue to provide opportunities for students and faculty.

Our corporate sponsors provide support for specific research areas, enabling a faculty member to pursue a new research idea by funding a graduate research assistant. 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 22) are also dependent on external financial support.

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**RAMEY KEMP  
&  
ASSOCIATES**

## Investing in the Department

For more information contact:  
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**Phone: 919.515.7738**  
**Email: [lksmith4@ncsu.edu](mailto:lksmith4@ncsu.edu)**

## Department Advisory Board

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