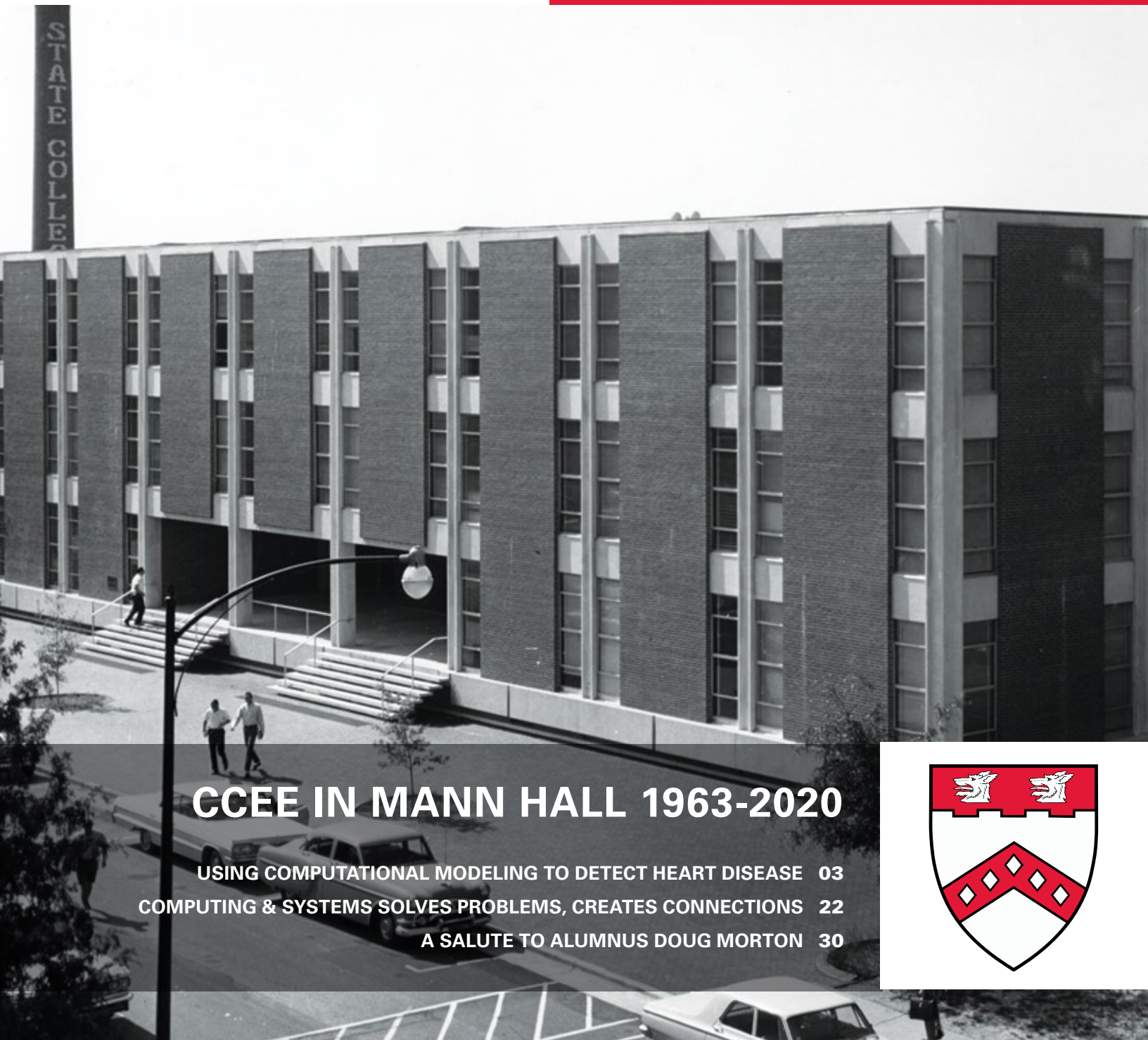


**NC STATE**

Engineering

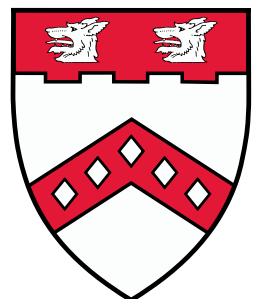
# CCEE NEWS

DEPARTMENT OF CIVIL, CONSTRUCTION,  
AND ENVIRONMENTAL ENGINEERING  
NC STATE UNIVERSITY | SPRING 2020



## CCEE IN MANN HALL 1963-2020

- USING COMPUTATIONAL MODELING TO DETECT HEART DISEASE 03
- COMPUTING & SYSTEMS SOLVES PROBLEMS, CREATES CONNECTIONS 22
- A SALUTE TO ALUMNUS DOUG MORTON 30



# IN THIS ISSUE

EDITOR

Julie Williams Dixon

CCEE PUBLICITY COMMITTEE

Morton Barlaz, Alex Albert (Student News), Doug Call (Awards), Francis de los Reyes (Student News), Joe DeCarolis (Research News), Casey Dietrich (Committee Chair), Ali Hajbabaie (Alumni Briefs), Tasnim Hassan (Research News), Jeremiah Johnson (New Projects), Lindsay Smith (Development), Shane Underwood (Research News).

OTHER CONTRIBUTORS TO THIS ISSUE

John Baugh, Emily Berglund, Downey Brill, Mohammed Gabr, Murthy Guddati, David Johnston, Mervyn Kowalsky, Jim Nau, Gnanamanikam Mahinthakumar, Ranji Ranjithan.

PRODUCTION STAFF

Darsee Heath, Candice Wallace.

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



## IN THE SPOTLIGHT

### 1963-2020 CCEE IN MANN HALL PAGE 12

When our department moved into Mann Hall in 1963, it was one of the only buildings on campus with air conditioning! In this issue we take a look back at Mann Hall as we prepare to move to our new home on Centennial Campus this summer.



## DEPARTMENT NEWS

- > RESEARCH UPDATES PAGE 02
- > NEW RESEARCH PAGE 06
- > NEW FACULTY PAGE 08
- > AWARDS AND HONORS PAGE 18



## STUDENT NEWS

- > GRAND CHALLENGES SCHOLARS PAGE 16
- > STUDENT GROUPS PAGE 26



## ALUMNI AND DEVELOPMENT NEWS

- > ALUMNI BRIEFS PAGE 29
- > ALUMNI FEATURE PAGE 30
- > CORPORATE SPONSORS PAGE 33
- > FITTS-WOOLARD HALL UPDATE PAGE 34

### ABOUT THE COVER

Pictured is a view of Mann Hall shortly after it opened in 1963. Mann Hall was named for Carroll Lamb Mann (1877-1961), who graduated from NC State in 1899 with a degree in civil engineering. He taught at NC State following graduation and was the head of the Department of Civil Engineering from 1916 until his retirement in 1948. (Photo courtesy of NC State Libraries Special Collections)



Dr. Morton Barlaz

## LETTER FROM THE DEPARTMENT HEAD MORTON A. BARLAZ

**Welcome to our spring 2020 newsletter.** It is a pleasure to update our friends on activities in the department. I am writing this letter just after our December graduation in which we recognized 49 B.S., 42 M.S., and 6 Ph.D. graduates. I always find graduation to be an uplifting reminder of our mission and our impact on civil engineering.

This is the last newsletter that will be issued with Mann Hall as our home. We are scheduled to occupy Fitts-Woolard Hall in time for the fall 2020 semester. Mann Hall has served us well and has been the home for students since its opening in 1963. The building has aged and we now struggle to meet our space, power, and heating and cooling needs.

Mann Hall is perhaps a symbol for much of the U.S. and its aging infrastructure. The UNC system alone estimates the need for \$4 billion in deferred repairs and renovations to meet the needs of our students and faculty, and this is a small piece of the overall U.S. need. I am excited by the technology that is being developed by NC State researchers as well as others around the world to improve the quality, cost-effectiveness, and sustainability of the built environment. There is much work to be done by civil, construction, and environmental engineers, and I look forward to making progress on our deferred infrastructure needs in both the U.S. and around the world.

I hope that you share my pride in the department's teaching, research, and extension activities. This newsletter features research briefs from several of our faculty, highlighting the department's contributions to the well-being of society. **Dr. Murthy Guddati** is working with researchers at the Mayo Clinic and Duke University to use ultrasound to detect the stiffening of arteries, an early indicator of cardiovascular disease. **Drs. Mo Gabr** and **Shamim Rahman** are working on methods to protect coastal infrastructure using Geotextile Sand Containers. **Dr. Mervyn Kowalsky** was recently named the Christopher W. Clark Distinguished Professor. His research includes developing techniques for the rapid repair of bridges after earthquakes, as well as rapidly constructing new structures for earthquake resilience. **Dr. Ali Hajbabaie** is planning for transportation operations in the evolving age of connected and automated vehicles.

I am pleased to welcome **Dr. Jonathan Miller** who joins us as a teaching assistant professor and **George Bonner** who will serve as Director of the N.C. Renewable Ocean Energy Program (NCROEP). George will be based at the Coastal Studies Institute on the Outer Banks. **Dr. Shamim Rahman** retired in December after 40 years in CCEE. Rahman's research has been in the area of modeling of problems in geotechnical engineering. He has developed models on the seismic response and instability of soil sites and earth structures, as well as offshore construction.

In closing, as state support for our mission continues to result in uncertain budgets, we have become ever more dependent on your financial support. Your support provides help with field trips and special projects for undergraduates, allows graduate students to make presentations at national conferences, and helps us 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. Our second annual Day of Giving is March 25<sup>th</sup> and more information is coming soon.

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.

Morton A. Barlaz

Distinguished University Professor and CCEE Department Head

## CCEE AT NC STATE SUSTAINABLE INFRASTRUCTURE FOR SOCIETY

- \$23 million in research expenditures
- 226 ongoing research projects
- 14 winners of CAREER and other NSF young faculty awards
- 53 faculty members
- 334 graduate students
- 756 undergraduate students





## RESEARCH UPDATES

GSCs installed to protect imminently threatened structures along the North Carolina coast. Note the remnants of previous sandbags that have sunk and ruptured. (Photo courtesy of NC Department of Environmental Quality, Division of Coastal Management)

### Can Geotextile Sand Containers protect North Carolina's coast?

When a hurricane moves over the North Carolina coast, it typically creates strong waves and currents that damage beaches and coastal properties. As a temporary solution to mitigate erosion and scour during storms, the state allows the use of soil-filled textile bags to protect coastal infrastructure. In a recent study, CCEE researchers explored the reasons why these bags may fail during a storm, and are now developing ways to improve their performance.

Geotextile sand containers (GSCs) can be shaped as bags or tubes, and they can be covered with sand to look like natural dunes. They are allowed as permanent installations in

some states, and they are proposed for use to mitigate scour at the foundation systems of offshore wind turbines, marine hydrokinetic devices, and associated infrastructure placed on the seabed.

However, GSCs often fail to perform as designed. **DRS. MOHAMMED GABR** and **SHAMIM RAHMAN**, along with Ph.D. student **AMIN RAFIEI**, are investigating the cause of these failures through a project from the NC Renewable Ocean Energy Program and funding from the Geosynthetics Sciences Institute. Using numerical modeling, the GSCs and seabed were subjected to cyclic wave loading. The results from the modeling explained the emergence of instantaneously liquified sand zones, similar to quick sand, undermining the stability of GSCs. The emergence of such zones under wave loading, even for a few seconds, causes the GSCs to sink into the seabed and ultimately rupture.

GSC rupture has been observed in many coastal communities including North Topsail Beach and Ocean Isle in North Carolina, and along beaches in Galveston, Texas. Now that this failure mode is understood, the researchers are developing new configurations and stabilization measures to improve GSC stability during extreme storm events. ■

### Computational modeling of blood vessels for early detection of heart disease

*““It is fascinating that the concepts used to study soil and pavement layers can be used to look for stiff arteries in patients!”*

**Dr. Thanela Macedo**  
*Vascular Radiologist, Mayo Clinic*

Cardiovascular disease (CVD) is the leading cause of death in the United States. A well-known early indicator of CVD is stiffening of the arteries resulting from collagen deposits and loss of elasticity in the arterial walls. CCEE researcher **DR. MURTHY GUDDATI** is collaborating with researchers at Mayo Clinic and Duke University to create a non-invasive way to measure arterial stiffness.

Most of us are familiar with the use of ultrasound waves for imaging in medical applications. “This technique we are working on uses ultrasound, but not in the traditional way,” Guddati explains. “We are not using it to just see something, but to apply force on an arterial wall, which generates waves that propagate along the arterial wall, and how they propagate is affected by the stiffness of the artery.”

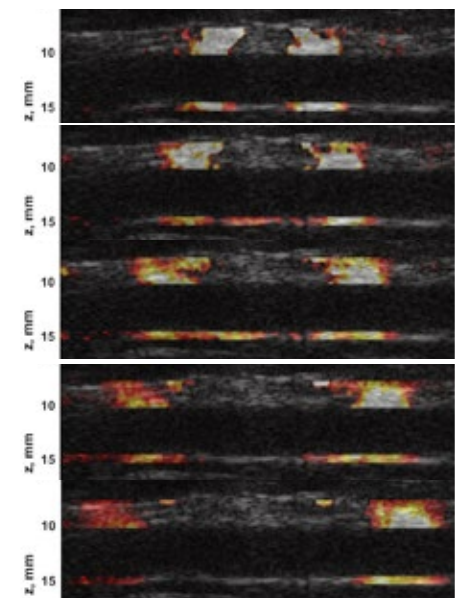
Over the past few years, Guddati and his students have developed wave-guide inversion models that are now being used to back calculate arterial stiffness. “We are essentially using physics to solve the problem, but the physics are represented by algorithms, which combine mathematics and computing,” he explains.

Guddati has spent his career using mathematics and computing to simulate and characterize various physical systems in civil engineering and beyond. In 2016, he developed a portable system based on sound waves for measuring the depth of embedded bridge pilings to help with maintenance of failing bridges.

In this staged scene, researchers are creating the environment and instrumentation that eventually will be used during pilot testing on humans.

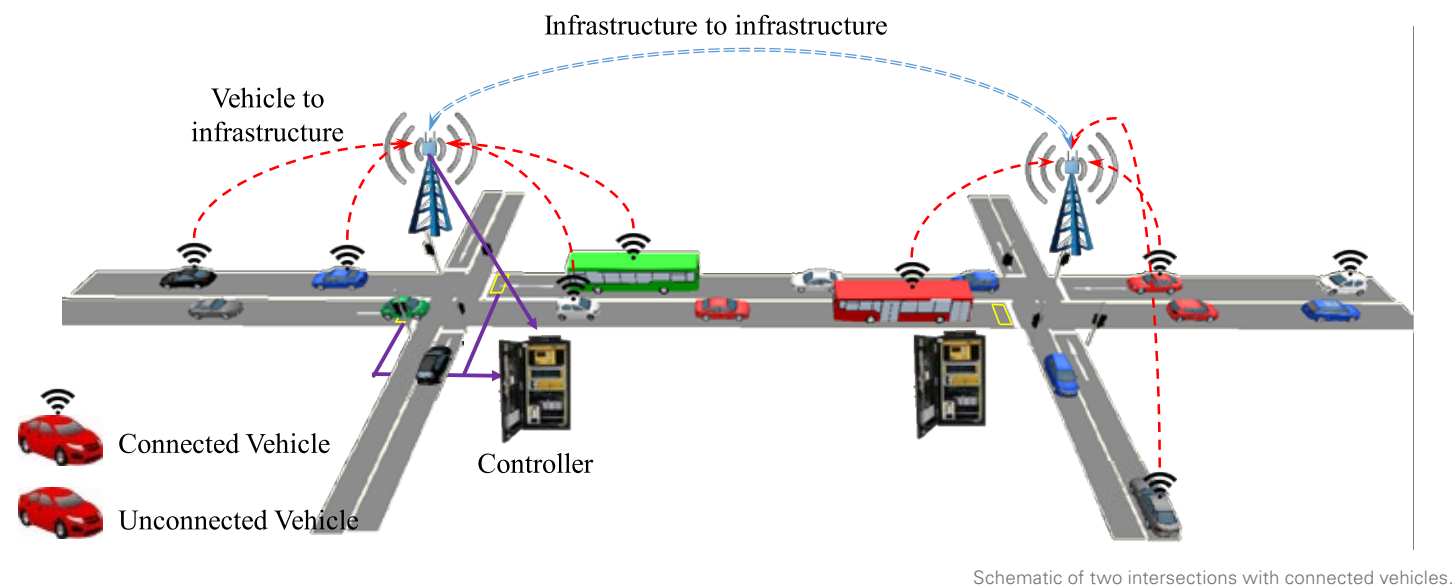
Past work funded by the National Science Foundation led to the development of a technique utilizing guided wave inversion to determine the properties of layered soil and pavements. “These techniques are applicable to civil engineering, geophysics, mechanical engineering, and now biomedical engineering,” Guddati said.

This four-year project is funded by the National Institutes of Health. After proving that the algorithm worked on the computer, the team began doing phantom experiments using rubber tubes. The next phase will include testing the technique using arteries from pigs, followed by pilot testing on humans. The ultimate goal will be the development of an inexpensive, non-invasive ultrasound technique which could be implemented on existing ultrasound scanners with minor modifications. ■



Ultrasound scans of propagating wave in arterial wall, resulting from excitation at the center (snapshots at different times). The propagating characteristics of this observed wave are used in the computational algorithm to estimate the stiffness of the artery, an early indicator of the cardiovascular health. (Photo courtesy of Dr. Matthew Urban, Mayo Clinic)





## How will traffic signal systems change in response to connected and automated vehicles?

Connected and automated vehicles, when fully functional and reliable, are expected to revolutionize how traffic systems are operated and controlled. Public transportation agencies that oversee traffic control are researching and preparing for both changing infrastructure needs, and traffic control systems and methodologies. For example, how will the flow of traffic be impacted by connected and automated cars? Will travel times change? Will speed limits be impacted? How can traffic signals be retimed to work more efficiently with connected and automated vehicles? How might intersection design change?

CCEE assistant professor **DR. ALI HAJBABAIE**, who joined our department in 2019, is interested in real-time optimization of large-scale complex engineering systems that are represented by models. His research is focused on traffic operations and control in the presence of connected (human-driven) and automated (self-driving) cars.

### IMPROVED TRAFFIC SIGNALING SYSTEMS COULD IMPROVE TRAVEL TIME AND SAFETY

Connected vehicles are equipped with wireless technology and can share their location, speed, and acceleration rate (among other data) with each other and with traffic signal controllers. Therefore, traffic signal controllers will have a lot more information to optimize the timing of traffic lights. Preliminary research shows that improved signaling due to connected vehicles will reduce travel delays, reduce the number of stops, and improve safety.

Hajbabaie and his team, including S. M. A. Bin Al Islam and Mehrdad Tajalli, both Ph.D. students in CCEE, developed a mathematical model that relies on communications between vehicles, pedestrians, and traffic controllers to determine the timing of signals at intersections. The model can predict traffic crashes that may happen in the near future and warn those who are at risk to take necessary action. This is done through an algorithm the team developed that predicts where each vehicle will be in the next 3–5 seconds.

Their research shows that the proposed traffic signal methodology reduced the number of near-crash events (defined as 1.5 seconds away from a crash if no action is taken) by 53–100 percent depending on the connected vehicle market penetration rate. Their research also reports significant improvement in traffic operations when connected vehicles are present in a traffic stream. Their results predicted that adoption of their model could reduce traffic delays by 7–20 percent in the absence of any connected vehicles and by over 50 percent if 40 percent of vehicles were to be connected. As expected, the results show that increasing connected vehicle market penetration rate improved both safety and operations.

This research is part of a project titled, “Preparing for Traffic Signal Operations in A Multi-Modal Connected and Autonomous Vehicle Environment,” and is funded by the Washington State Department of Transportation. ■



Dr. Mervyn Kowalsky, bottom right, is shown here with his research group.

## Kowalsky named distinguished professor

**DR. MERVYN KOWALSKY** was named the Christopher W. Clark Distinguished Professor of Structural Engineering in 2019. Kowalsky joined the faculty in 1998 after completing his Ph.D. and postdoctoral research at the University of California in San Diego.

***“I was surprised and honored to receive this endowed chair. It’s nice to know that your colleagues and your department head feel that what you’ve done is worthy of that sort of consideration. When I look at the accomplishments of the other professors in this department who have received a distinguished professorship, I’m humbled to be in that realm.”***

Kowalsky’s research is focused on earthquake engineering with an emphasis on developing new analysis and design methods for structural systems that allow for more accurate predictions of structural performance in an earthquake. “The goal of our work is to ultimately prevent loss of life in an earthquake, and to minimize the economic destruction caused by seismic events. It’s work that comes with a lot of responsibility,” Kowalsky said.

Much of his research is funded by the Alaska and California Departments of Transportation (DOT). “Both of these west coast DOTs are in areas with high seismic activity, and we are honored that they choose to support earthquake engineering research at NC State,” Kowalsky said. His research group is involved with developing techniques for the rapid repair of bridges after earthquakes, as well as rapidly constructing new structures for

earthquake resilience, and using high strength materials in new design. Much of his research is conducted at the Constructed Facilities Laboratory. Large scale experiments, including some conducted in an environmental chamber that allows physical tests in controlled temperatures down to negative 40 degrees Celsius (-40 F), are combined with computational modeling to develop methods that allow engineers to better characterize the performance of structures under seismic events.

Kowalsky says the biggest impact of receiving the Distinguished Professorship is that the funds will allow him to support the research of his graduate students more fully. “We will be able to obtain instrumentation that allows my students to expand their research capability, fund research assistant positions for projects, and pay for travel to more conferences,” Kowalsky said. Two of his Ph.D. students, Ariadne Palma and Jessica Thangjitham, have recently been chosen to present at special sessions during the 17<sup>th</sup> World Conference on Earthquake Engineering to be held in Japan in September of 2020. “This conference is like the Olympics of earthquake engineering. It’s only held every four years, and people come from all over the world. Very few students are able to participate in the special sessions, and we were fortunate to have two special session requests selected from among over 100 applications received,” Kowalsky adds. The Christopher W. Clark Distinguished Professorship will allow for their travel to this important event.

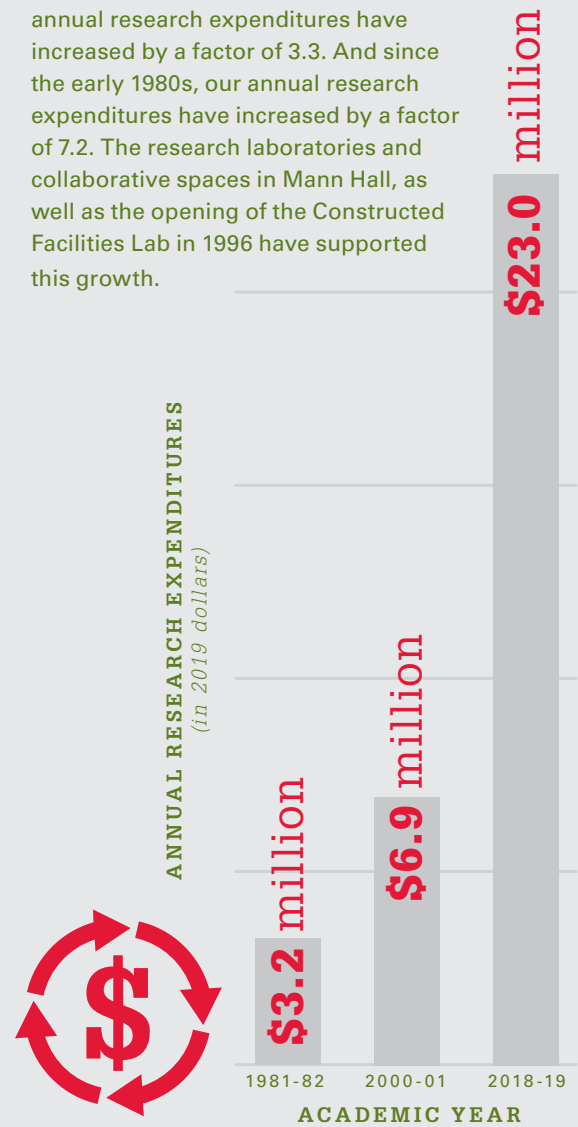
The department is proud of Dr. Mervyn Kowalsky, and grateful for this new endowed position made possible by Christopher Clark (BSCE 2017). ■

# NEW RESEARCH PROJECTS

During the latter half of 2019, CCEE launched numerous new research projects with funding from federal and state agencies, foundations, and industry sponsors. This support will enable CCEE faculty members, their research teams, and their collaborators to address problems facing infrastructure and the environment in North Carolina and around the world.

## Research Growth in Mann Hall

During the 55 years in which Mann Hall has been our home, the department’s research programs and expenditures have increased significantly. Detailed year-by-year numbers are not available for the early years of Mann Hall, but since 2001, our annual research expenditures have increased by a factor of 3.3. And since the early 1980s, our annual research expenditures have increased by a factor of 7.2. The research laboratories and collaborative spaces in Mann Hall, as well as the opening of the Constructed Facilities Lab in 1996 have supported this growth.



**DR. TASNIM HASSAN** will collaborate with Drs. Korukonda Murty and Jacob Eapen (Nuclear Engineering) through a Department of Energy grant to design and develop a novel miniature testing system to perform elevated temperature creep tests at multiple scales. To qualify new alloys for use in next generation reactors, it is essential to develop accelerated but accurate high temperature and irradiated material test data. The research will perform in-situ scanning electron microscopy to investigate failure mechanisms, and multiscale material modeling to predict long-term failure responses.

**DRS. JEREMIAH JOHNSON** and **FERNANDO GARCIA MENENDEZ**, in collaboration with Dr. Harrison Fell (Agricultural and Resource Economics) and Dr. Melinda Morrill (Economics), received funding from the U.S. National Science Foundation (NSF) to study the potential for grid-scale energy storage to be used to reduce human health impacts from air pollution. Energy storage devices, such as batteries or pumped storage hydropower, can shift the time and location of power plant emissions based on their charging and discharging strategies. This three-year project will couple expertise in power systems, air pollution, and economic damage modeling.

**DRS. KEVIN HAN** and **ABHINAV GUPTA** received support from the U.S. Department of Energy’s Advanced Research Projects Agency-Energy (ARPA-E) program to develop an innovative virtual environment to digitally manage the performance of nuclear power plant construction. This construction performance modeling and simulation environment will facilitate automated inspections of components and subsystems before shipping, which will reduce construction staffing levels, improve supply chain efficiency, and prevent delays due to quality and compatibility issues.

**DR. CASEY DIETRICH** received funding from the U.S. Coastal Research Program to develop methods to adapt beach and dune nourishment to improve resilience in a changing climate. He will work with NC coastal communities to identify the climate patterns that most often trigger the need to nourish beaches and dunes, the variability of the time interval between such nourishments, and the costs and sediment volumes necessary to maintain this coastal protection policy into the 21<sup>st</sup> century. Triggers like beach width, dune height, and community preferences will be used to identify how often communities will need to re-nourish, contingent on future climate and sea level rise scenarios.

**DR. DETLEF KNAPPE** is collaborating with Dr. Owen Duckworth (Crop and Soil Science) to study the interaction between per- and polyfluoroalkyl substances (PFASs) and soil, and PFAS uptake by plants, with funding by the U.S. Environmental Protection Agency and the North Carolina Policy Collaboratory. This project seeks to answer questions about the fate and transport of poorly understood PFAS in the subsurface and how these compounds are taken up by food that is grown, raised, or caught in PFAS-impacted areas. Postdoctoral research associate Dr. Cecile Zhi is beginning a greenhouse study and developing analytical approaches to determine PFAS levels in food. This research is being conducted in collaboration with researchers at the Colorado School of Mines, Michigan State University, Duke University, and NC State’s Center for Human Health and the Environment.

In a project funded by the Environmental Security Technology Certification Program (ESTCP) of the Department of Defense, **DR. DETLEF KNAPPE** and his team are studying factors controlling PFAS removal by activated carbon adsorption and ion exchange. Results from these studies are expected to provide the basis for models to predict treatment performance and conduct life cycle analyses. This research will provide guidance for drinking water providers and remediation engineers to select cost-effective treatment approaches for PFAS removal.

A multi-university research collaboration led by **DR. FRANCIS DE LOS REYES, III** was awarded an Engineering Research Center Planning Grant by NSF. The funding will allow the group, which includes faculty from the University of South Florida and NC A&T University, to conduct workshops to develop a proposal for an Engineering Research Center on Sanitation and Water Infrastructure of the Future for Marginalized Communities (SWIFT-MC). The vision for SWIFT-MC is to develop and use advanced engineering analysis, technologies, models, and solutions to re-engineer water and sanitation / wastewater systems in underserved areas — both those lacking sufficient infrastructure and those lacking the resources to maintain existing infrastructure.

**DR. MORTON BARLAZ**, in collaboration with **DR. FLORENTINO DE LA CRUZ**, a research assistant professor in the department, has received a grant to study the anaerobic biodegradability of several types of cotton under simulated landfill conditions. Biodegradability is one metric that is used to evaluate the environmental impact of products that are often disposed in landfills at the end of their useful life. The project is funded by Cotton Incorporated.

**DRS. DOUGLAS CALL** and **FRANCIS DE LOS REYES, III**, with funding from the Environmental Research and Education Foundation and in collaboration with researchers at the University of North Carolina at Chapel Hill, will research a new approach to treating food waste. Their goal is to develop a hybrid bio-electrochemical technology that can generate and recover high-value chemicals from mixtures of food waste while simultaneously degrading the waste.

**DR. FRANCIS DE LOS REYES, III** received funding from the Bill and Melinda Gates Foundation to continue work on the Flexcrevator technology for emptying pit latrines in low and medium-income countries. The focus during this part of the project will be to coordinate work with potential commercial partners and contractors to design, build, and test Design Validation (DV) trash excluders. Work will be conducted in Rwanda, Madagascar, and Ghana, to collect performance and commercialization data, including business model data (supply chain, marketing, financing, sales plan).

**DRS. WILLIAM RASDORF** and **DANIEL FINDLEY** were awarded a grant from the North Carolina Department of Transportation to recommend processes for constructability reviews (CRs). CRs are meetings that are held early in the design-build process to identify and eliminate problems before construction begins. Constructability reviews bring construction knowledge into the design process. The primary objective of this research is to provide a formal process to conduct successful CR meetings and attain relevant benefits to improve the overall efficiency of the construction process.

**DR. ELIZABETH SCIAUDONE**, in collaboration with researchers at the U.S. Naval Academy and Dewberry, will investigate inlet processes driving erosion of the sound-side shoreline at a North Carolina barrier island. The project, which is funded by the North Carolina Department of Transportation, includes field measurements of tidal currents, wind-driven waves, sand properties, and marsh erosion. The field data will be used to improve a numerical model of sand and water movement and subsequently design potential alternatives to slow erosion. ■



# NEW FACULTY



Dr. Jonathan Miller

## Miller brings teaching expertise to undergraduate program

### DR. JONATHAN MILLER

joined the department as a teaching assistant professor in January. Miller will teach the department's senior design course, CE 450, which integrates transportation systems, geotechnical engineering and water resources as applied to the development of sustainable horizontal infrastructure. He will also

Ph.D. (2019) in civil engineering at NC State. While pursuing his Ph.D., Miller participated in the Preparing the Professoriate program and taught CE 383 Hydrology and Urban Water Systems. He also traveled as a mentor with the student chapter of Engineers without Borders, accompanying them on their initial trip to a village in Guatemala, where they worked with the community to design and build water catchment systems.

In his Ph.D. research, Miller used statistical modeling to provide policymakers with effective alternatives for the management of aquatic ecosystems. His work has included modeling fish and invertebrate presence in Gulf of Mexico estuaries as well as modeling the biological health and water quality of NC Piedmont streams. As a postdoctoral researcher, also at NC State, he developed a watershed nutrient loading model for Jordan and Falls Lakes and quantified the sources of nutrient loading to the reservoirs from 1994-2017. This work was commissioned by the NC legislature, and will be used to assist the NC Department of Environmental Quality with the development of policies to protect the Jordan Lake watershed.

Miller enjoys the outdoors, especially bicycling with his family on local trails. He also enjoys music and plays guitar, piano, and viola. ■

teach CE 301 Geomatics and Surveying and other undergraduate courses, and assist in the undergraduate programs office.

Miller grew up in Cary, NC, and says several outstanding high school teachers inspired him to pursue a teaching career. After graduating from UNC-Chapel Hill with a B.S. in mathematics and religious studies (1997), he was a teaching missionary for five years in Guatemala, where he observed the importance of both education and civil infrastructure in developing countries. When he returned to the U.S., he taught high school in Biscoe and High Point, NC, before returning to earn his M.S. (2014) and



Dr. Meagan Kittle Autry

## Kittle Autry brings expertise in engineering communication

### DR. MEAGAN KITTLE AUTRY

joined the department in August 2019 as a teaching assistant professor and director of graduate professional development. Kittle Autry will develop new programming to complement the technical preparation students receive in CCEE and to ensure that graduates are career-ready. Her hiring is part of CCEE's ongoing focus on enhancing

Kittle Autry earned a Ph.D. in communication, rhetoric, and digital media from NC State in 2013 with a focus on the rhetoric of science and technology. She also holds a M.S. in rhetoric and composition from NC State and a B.A. with honors from Catawba College. Her dissertation examined the evolution of the scientific research article and the ways academic culture influences how researchers write. Her work with Dr. Bill Kinsella (NC State) and Dr. Ashley Mehlenbacher (University of Waterloo, Ontario) on public participation in local nuclear energy discourse won an international award.

Kittle Autry teaches CE 610 Advanced Communication for Engineering Research. This course provides in-depth instruction into key genres in the academy, including research articles, grant proposals, and research posters. She is also developing a new course, CE 590 Professional Engineering Communication, designed for master's students. It will be offered in Summer

student success by teaching strong communication skills including technical writing and oral presentation.

2020 for the first time through Engineering Online. In addition to these classes, she is holding regular workshops for students on topics related to professional development and meeting with students in the senior design classes. Kittle Autry has a decade of experience teaching engineers how to be better communicators and is committed to teaching excellence.

Prior to joining CCEE, Kittle Autry served as the assistant dean of academic affairs at William Peace University in Raleigh,

NC. In this role, she built high impact student programming, designed and developed innovative learning spaces for students, and managed faculty hiring and promotion.

Kittle Autry is originally from Ottawa, Ontario, Canada. She enjoys living in the "Oak City," especially for its proximity to the beach and mountains. She is an avid swimmer and a voracious book reader and consumer of podcasts. ■



George Bonner, P.E.

## Bonner brings diverse civil and coastal engineering expertise

**GEORGE BONNER** joined the department as Director of the NC Renewable Ocean Energy Program (NCROEP) in August 2019. Following a 30-year career as an engineer and commissioned officer in the U.S. Coast Guard, Captain Bonner returned home to North Carolina to lead NCROEP's multi-institutional research effort between East Carolina University's Coastal Studies Institute (CSI), NC State University, the University of North Carolina-Charlotte, and North Carolina Agricultural and Technical State University. The position is based at the CSI on Roanoke Island located on the Outer Banks.

Bonner grew up in the Outer Banks. While working in construction during high school, he became interested in engineering and sustainability, watching firsthand the unprecedented growth and rapid changes to North Carolina's coast. Following graduation from Manteo High in 1984, he attended NC State University in civil engineering for one year prior to accepting an appointment to the U.S. Coast Guard

Academy, where he earned a civil engineering degree and was commissioned in 1989. He also holds a M.S. in civil engineering (1994) from the University of Illinois Urbana-Champaign, and earned a graduate certificate in coastal engineering from Old Dominion University in 2007.

Captain Bonner served in Coast Guard civil engineering assignments in Alaska, California, Puerto Rico, and Virginia. Throughout his career, he has led efforts to enhance infrastructure resiliency and sustainability while adapting to a changing climate. He served on the Hampton Roads, VA, Steering Committee for the White House Inter-Governmental Pilot to develop a model for communities addressing sea level challenges.

Bonner is a registered Professional Engineer and Certified Floodplain Manager. He is a past president of the Society of American Military Engineers (SAME) Hampton Roads Post and was selected as a SAME National Fellow in 2015.

The NCROEP was initiated with funds from the State of North Carolina and is designed to support research and education to explore and stimulate the development of energy from ocean currents and waves. In recent months, Bonner has led development of a new strategic plan for NCROEP focused on leveraging research resources to advance technologies and building partnerships to support responsible ocean energy solutions and economic prosperity. He is excited about ocean energy solutions to power blue economy maritime activities including transportation, aquaculture, fisheries, and ocean observation. The new strategic plan also includes expanded use of Jennette's Pier in Nags Head as an Ocean Energy Research Platform.

Bonner enjoys boating, sailing, and volunteering with the Boy Scouts, and he is a lifetime Wolfpack fan. He tries to maintain his racquetball game and is always looking for a match when in Raleigh. He has three children including a son majoring in civil engineering at the U.S. Coast Guard Academy. ■





Crews clean the face of Bertha, the SR 99 tunneling machine, a few days after the five-story-tall machine completed its 9,270-foot journey beneath Seattle. (Photo courtesy of WADOT)

## Safety concerns before, during, and after designing and constructing one of the world's longest underground tunnels

### 18<sup>TH</sup> ANNUAL ZIA LECTURE

The annual Zia lecture always provides insights into a challenging civil infrastructure project. This year's topic was the design and construction of the SR99 tunnel under Seattle, which opened to traffic in February of 2019 after years of planning and construction.

The tunnel has two levels of traffic. (Graphic courtesy of Yang Jiang)



### DIGGING DEEP, DIGGING SMART

Imagine boring a tunnel more than two miles long underneath a large city. The tunnel will pass under more than 150 existing buildings, as well as under sewer and water lines, monorail foundation piles, on and off ramp foundations, a railroad tunnel and an existing seawall. Deep in the ground, along the tunnel corridor where you bore, are existing utility lines. Above, more than 100,000 cars a day travel on streets including a deteriorating two-story viaduct. "This is what kept me awake at night during the construction phase," Dr. Mike Wongkaew, P.E., S.E., told the audience at the 18<sup>th</sup> Paul Zia Distinguished Lecture in September, 2019. As has been noted about Seattle's new tunnel, "digging deep isn't always enough — you've got to dig smart, too," (*wired.com*, June 2019).

The new double-decker tunnel, with four lanes of traffic, runs for two miles and replaces the Alaskan Way Viaduct, which opened to traffic in 1953. The two-story viaduct severed the waterfront from the rest of downtown, and there have been

calls to replace it for decades, even before it was damaged by the 2001 Nisqually earthquake. "It was not very beautiful anymore, and besides being an eyesore, it was seismically vulnerable," said Dr. Yang Jiang, P.E., S.E., another of the three speakers who presented at the lecture.

Linea Laird, P.E., opened the Zia Lecture and provided an overview of the project, which included years of evaluating potential solutions before the city finally agreed on a deep bore tunnel. Laird introduced the audience to Bertha, the name given to the massive tunnel boring machine that was used on the project. It was named after Bertha Knight Landes who was elected as mayor of Seattle in 1926.

Sept. 2019



Oct. 2019



The Alaskan Way viaduct severed the waterfront from the rest of the city. In the photo on the left you see the remaining pieces of it during demolition. (Photos courtesy of WADOT)

### QUICK FACTS ABOUT BERTHA

- When built, it was the **world's largest diameter tunneling machine**
- **350** feet long, weighs **8,000** tons
- Cutterhead alone has **800** cutting tools, and weighs **944** tons
- By the end of tunneling, the cutterhead had rotated **2,300** miles
- Bertha had to stop tunneling in December 2013 after only **1,000** feet
- **Two-year delay** while Bertha was lifted from the ground and repaired

### SAFER INSIDE A TUNNEL AND A REFERENCE TO PAUL ZIA'S WORK

Seattle is in a high seismic activity area, and Jiang spoke about the differences in seismic responses between tunnels and bridges, explaining that ground movement is generally significantly smaller than the movement of bridge columns during an earthquake. He told the audience he would much rather be inside a tunnel during an earthquake, than on a bridge.

As his team began the seismic analysis of the tunnel, they found an article by **DR. PAUL ZIA**, as well as CCEE professor emeritus **DR. SAMI RIZKALLAH**. The article helped them go beyond the minimum reinforcement requirements, and instead consider the important seismic components. "The article said that as long as you make sure that the summation of the strains from the initial static state, shrinkage, and creep is less than the yield strain of the reinforcement, you will be fine," Jiang told the audience. "That's what we did."

*"The commercial value of this finding is hard to evaluate, but I would easily put it in \$4 million range. Thank you, Dr. Zia and others for your contribution."*

**DR. YANG JIANG**

### LIGHT AT THE END OF THE TUNNEL: SAFETY FEATURES OF THE FINISHED TUNNEL

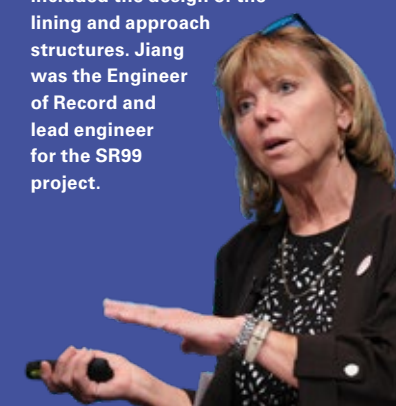
From start to finish, safety has been a central tenet of the replacement of the Alaskan Way Viaduct and completion of the SR99 tunnel. The tunnel is divided into over 100 safety zones that allow targeted response to safety issues.

#### **Safety features of the completed tunnel include:**

- Tunnel is visually monitored 24/7
- Heat and smoke detectors
- Eight miles of fiber optic heat sensors line the tunnel ceiling
- Water-based fire suppression system
- Ventilation system including emergency fans at each end and in ceiling
- Emergency egress includes pressurized corridor to keep smoke out
- Emergency communication features
- Structural fire protection
- Lighting system includes added light near the end of tunnel to help driver's eyes adjust as they leave the tunnel. ■



**DR. YANG JIANG, P.E., S.E.**, is a principal engineer with HNTB Corporation in Bellevue, Washington. HNTB was one of several firms that were part of the design team for the tunnel. Their specific responsibilities included the design of the lining and approach structures. Jiang was the Engineer of Record and lead engineer for the SR99 project.



**LINEA LAIRD, P.E.**, was the director of design-build and program administrator for the Alaska Way Viaduct Replacement Program in her previous role as chief engineer with Washington State Department of Transportation (WADOT). She has since joined the Seattle office of WSP USA as a strategic advisor working on transportation projects.



**DR. MIKE WONGKAEW, P.E., S.E.**, is an associate vice president for HNTB. He works for the company's national tunnel practice with a focus on the Pacific Northwest. He served as technical advisor on the SR99 tunnel project, which included review of the design submittals and some of the construction submittals.





# 1963 to 2020

## CCEE in Mann Hall

Mann Hall is one of several former homes to the department on Main Campus. We can trace our roots back to 1889, when the North Carolina College of Agriculture and Mechanic Arts enrolled its first students into curricula that included the fundamentals of civil engineering. The department shared buildings until 1928, when we moved into the newly-completed Civil Engineering Building (later renamed to be the first Mann Hall). However, by the late 1950s, the department had outgrown that space. Larger enrollments, expansion of nationwide infrastructure, and initiation of the Interstate highway program created the need for a modern facility for education and research.

Construction started April 24, 1962, with final acceptance on

December 19, 1963. Designed and built with careful attention to cost, the 78,266 gross ft<sup>2</sup> facility cost \$990,223, including design fees and furnishings, or \$12.50/ft<sup>2</sup> in 1962 dollars. Classes were first offered in the new Mann Hall for the spring 1964 semester.

*“During my first three undergraduate semesters, I observed the new Mann Hall under construction,” said Dr. David Johnston (BSCE 1966). “My visits to old Mann Hall (now the east wing of Daniels) were mainly for advising, but it was crowded and, designed in a classical Federal architectural style, it seemed older than it actually was. The new Mann Hall was modern inside and out and was air conditioned, **one of only a few air conditioned buildings on campus at that time.** The lobby and porch were unusual features and great social spaces for students. The lab spaces were far better than typically found in most CE programs.”*

Occupied exclusively by the department, the fall 1964 student enrollment was 547 undergraduates and 54 graduate students with a faculty of 23. The functional design spread offices, classrooms and computer labs, and design labs on the upper three floors with a ground level main entrance at the front of the building. Experimental labs were located in the basement floor with ground level access at the rear of the building.

Along with the excitement of the impending move to Fitts-Woolard Hall, our brand-new home on Centennial Campus, the farewell to our longtime residence in Mann Hall is cause for reflection. Mann Hall is old, needs work, and no longer accommodates our growing family. Still, it’s been a good home for 57 years, and it deserves a proper goodbye. In addition to dozens of professors who have taught and done research within these walls, there are thousands of civil, construction, and environmental engineers who called Mann Hall home during their college career.

The CCEE Department has been in Mann Hall since it was constructed in 1963. We have added students and faculty, repurposed space to meet our teaching and research needs, and expanded into additional buildings on Main and Centennial Campus. But during that time, everything had a connection to Mann Hall.

*“**Mann Hall has been home** for me these past few years and I think I speak for many others in saying that they feel the same way,” said Ashton Stuart (BSCE 2019), the CCEE valedictorian for Fall 2019. “We have taken classes, studied, worked on what seemed like impossible homework, eaten, hung out with friends, and maybe even slept in Mann Hall, and we will have memories that we will reflect on years down the road.”*



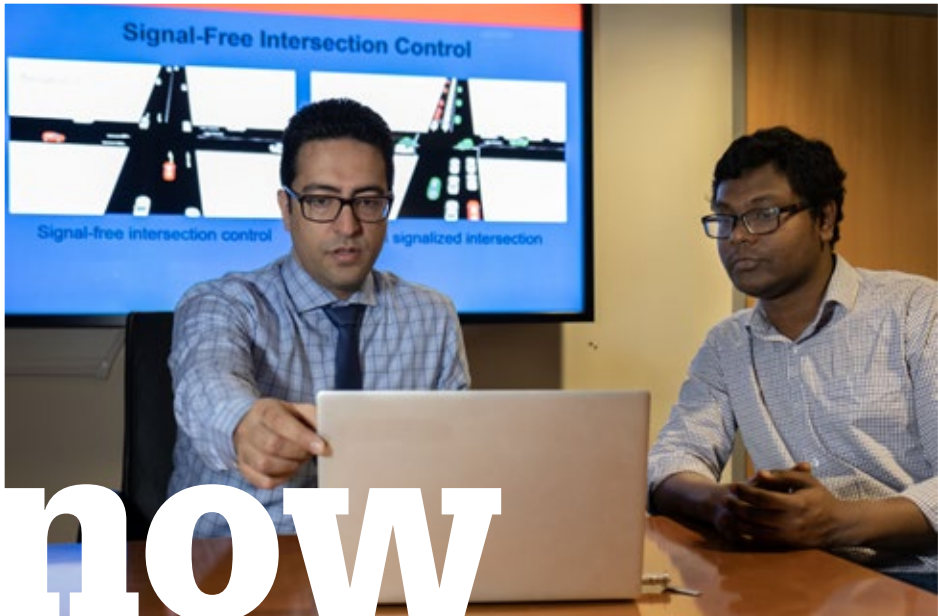
Top left: Scenes of Mann Hall under construction during 1962. Top right: Our new home, Fitts-Woolard Hall in early stages of construction during 2018.

Civil engineering graduate student Mohamed Talat Mostafa, left, and Dr. Paul Zia, making casting segments in the basement lab of Mann Hall in 1978. By 1996, large scale experiments like this were moved to the Constructed Facilities Lab on Centennial Campus.





then



Dr. Ali Hajbabaie, left, and graduate student S.M.A. Bin Al Islam use computational modeling to research the effect of autonomous and connected vehicles on traffic systems.

now

Top photo: Dr. Willard F. Babcock, right, with an engineering student conducting highway research. (Photo courtesy of NC State University Libraries Special Collections)

Today, with a fall 2019 undergraduate enrollment of 730, graduate enrollment of 342, and a faculty of 55, Mann Hall is well beyond its original occupancy level. To meet space needs over the years since the mid-1970s, there have been a series of moves in and out of temporary spaces in adjacent buildings plus the relocation of some research activities to the Constructed Facilities Laboratory, as well

as, to Broughton, Burlington and Daniels Halls, and to the Institute for Transportation Research and Education.

The department looks forward to a new facility, moving into Fitts-Woolard Hall during Summer 2020. But for many of our alumni, the memories of Mann Hall will live forever.

*“I remember many a chilly fall day walking up Stinson Drive to Mann Hall and walking by Broughton Hall and Burlington Labs and seeing Riddick and Daniels and thinking, ‘This is the heart of NC State Engineering,’”* said Gregory L. Williams (BSCE 1987). *“In my mind, those buildings will always be NC State Engineering.”*

*“During my last semester, I was attending a class in Mann Hall when the earthquake hit outside of Richmond, Virginia,”* said Edward William Woodley, III (BSCE 2011). *“The desk was shaking and the projector screen looked like it was going to fall off of the wall. I remember Dr. Borden, one of our soils professors, coming in to say not to worry, ‘They must be mixing concrete in the basement or something.’ About five minutes later, he rushed back into the room, interrupting class again, exclaiming ‘That wasn’t the basement that was an earthquake!’ We just felt an earthquake!’ To this day, I still remember his excitement.”*

# THE ORIGINAL CCEE NEWSLETTER

## VOLUME 01, ISSUE 01



NEWS FOR ALUMNI AND FRIENDS OF THE DEPARTMENT OF CIVIL ENGINEERING NORTH CAROLINA STATE UNIVERSITY.

SPRING 83

### A MESSAGE FROM THE DEPARTMENT HEAD

I am pleased to introduce this inaugural issue of Mann Hall News which fulfills a long-standing need felt strongly by the Department to develop and maintain a closer contact with our alumni and friends. Our plan is to publish this newsletter once every semester which will bring to you items of interest occurring in the Department and news about our alumni, faculty, and students.

In the face of the national engineering education crisis, our Department is in a stronger position now than ever before. Through the 70's, the Department enjoyed a phenomenal growth largely brought about by the shift in the national focus from the space effort to energy and environmental concerns. Our undergraduate enrollment more than doubled from 497 to 1,089, but our state appropriated operating budget (excluding faculty and staff salaries) increased by only 49% from \$36 per student in 1970 to \$53.50 per student in 1980 (after adjustments for inflation). By setting admission limits and raising the admission standards, in concert with the University policy, we have now managed to stabilize the undergraduate enrollment at about 800 students. This would permit us to maintain a high quality undergraduate program and to further expand our graduate program.

The latter has experienced a steady growth rate in recent years. There are now 125 students seeking advanced degrees in civil engineering. To fulfill our mission as the research institution in the state university system, our goal is to reach a graduate enrollment of about 200 students with a quality research doctoral program.

In 1982, the total average annual budget for sponsored programs increased by 39% from \$842,000 to \$1,172,000, exceeding the one million dollar mark for the first time. The total funding for sponsored projects under contract was \$1.8 million, representing a 53% increase from the previous year.

During the past three years, we have been blessed with a series of successes in our faculty recruitment. Twelve new faculty members with exceptional qualifications have joined us, making our total faculty strength at 34 regular full-time members, three part-time emeritus professors, two full-time visiting instructors, three part-time adjunct faculty, and one full-time visiting extension specialist. Members of our faculty are active in pro-

fessional organizations, and they continue to excel in teaching and research. Many have been recognized nationally for their achievements.

In 1982, we granted 125 BSCE, 74 BSCEC, 2 CE, 15 MS, 22 MCE, and 7 PhD degrees, a record high in the history of the Department. Many of the students were honored for their accomplishments.

In a recent national study of the quality of the research doctoral programs in the United States, conducted by the Conference Board of Associated Research Councils and published by the National Academy Press, we were among the 74 leading departments selected for the rating. Our program ranked 23rd in scholarly quality of faculty and was one of only two in the southeast placed among the top 25 in the nation.

We are excited, but not complacent, about the high standing of the Department. With the support of our administration, concerned alumni and friends, we are optimistic that this Department is well poised for further advancement in quality and reputation.

We hope that the items reported in this newsletter are of interest to you and we welcome your comments. Please let us hear from you and provide us with interesting news items.

Finally, we join you in congratulating the "Cardiac Pack" and coach "V" on winning the 1983 NCAA Basketball championship.

*Paul Zia*  
Paul Zia

### INTRODUCING . . .


With the accompanying photographs, we are pleased to introduce our faculty and staff. Perhaps never before has the CE faculty changed so much as in the past three years. Retirements, deaths, and resignations brought about a period of intensive faculty recruiting, and despite the severe national competition, we were successful in bringing to our faculty 12 new members of excep-




Front Row (left to right): C. C. Tung, P. Zia, R. F. DeBruin, K. S. Hayner, N. P. Khosla, M. E. Uyank, A. C. Chao, W. F. Babcock. Second Row: S. W. Nurnally, W. S. Galtier, M. Amrein, C. Smallwood, R. A. Douglas, C. L. Heimbach, M. F. Overton, H. R. Malcolm, V. C. Mattern. Third Row: M. S. Rahman, J. M. Plecnik, H. E. Wabnis, S. H. Ahmad, Y. Horie, T. R. Hepler, D. W. Johnson. Fourth Row: G. H. Blessis, A. K. Gupta, J. S. Fisher, J. W. Horn, P. D. Gibbins, P. C. Lambie, J. M. Nau, E. D. Gurley. Top Row: R. E. Fodum, R. H. Borden, W. T. Heartz, R. H. McDonald, J. R. Stone, J. C. Smith. Absent are W. L. Bingham, J. F. Ely, L. J. Langfelder, W. J. Rindorf, and J. Tucker.




# Seven CCEE students chosen as Grand Challenges Scholars




**SILVANA ALFIERI**  
Senior  
Environmental Engineering  
Grand Challenge: provide access to clean water




**BRENNA COPELAND**  
Junior  
Environmental Engineering  
Grand Challenge: make solar energy economical



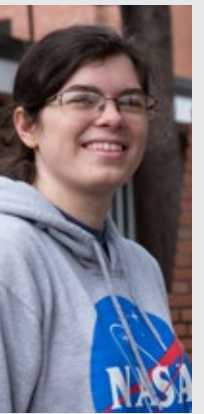
**KEVIN DUKE**  
Junior  
Civil Engineering  
Grand Challenge: provide access to clean water




**SARAH NAGY**  
Sophomore  
Civil Engineering  
Grand Challenge: restore urban infrastructure



**SERENA SAUERS**  
Junior  
Civil Engineering  
Grand Challenge: restore urban infrastructure



**LEANNA YOST**  
Senior  
Civil Engineering  
Grand Challenge: restore urban infrastructure



**KENDALL ZORN**  
Junior  
Environmental Engineering  
Grand Challenge: provide access to clean water

## 5 Core Competencies for Grand Challenges Scholars Program:

- 1. TALENT COMPETENCY:** mentored research creative experience on a Grand Challenge-like topic
- 2. MULTIDISCIPLINARY COMPETENCY:** understanding multidisciplinary of engineering systems developed through personal engagement
- 3. VIABLE BUSINESS / ENTREPRENEURSHIP COMPETENCY:** understanding, preferably developed through experience, of the necessity of a viable business model for solution implementation
- 4. MULTICULTURAL COMPETENCY:** understanding different cultures, preferably through multicultural experiences, to ensure cultural acceptance of proposed engineering solutions
- 5. SOCIAL CONSCIOUSNESS COMPETENCY:** understanding that engineering solutions should primarily serve people and society reflecting social consciousness

**BRENNA COPELAND**, a sophomore studying environmental engineering, was recently accepted to the GCSP, and said she applied because it offered a focus that would help her structure her time. “Working toward a grand challenge makes my extra-curriculars feel more meaningful,” Copeland said. Her Grand Challenge is making solar power more accessible. In addition to structuring her coursework around her interest, she is completing undergraduate research using data analysis to study solar energy use. Copeland is also participating in an ASB called Solar Spring Break during which a student group will travel to Los Angeles to help install solar panels in low income communities.

**KEVIN DUKE** is a junior majoring in civil engineering. Beyond his curriculum choices, he is fulfilling his five competency requirements by mentoring at the local YMCA, participating in the Naval ROTC program, and is part of a four-person student team that recently won second place in the NAE Global Grand Challenges summit business plan competition held in London last September. CCEE senior **SILVANA ALFIERI**, who is majoring in environmental engineering with a minor in environmental policy and another minor in Spanish, was also part of that team.

The department is proud to have so many students who are diligently preparing themselves to meet the global challenges facing society. ■

**LEANNA FREI YOST** is a senior in civil engineering. When she first got to NC State, she wanted to do everything, and ultimately overcommitted herself academically and socially. “I joined every club I could, was working toward a minor in addition to my major, and even completed two semesters of a co-op that ultimately didn’t align with my interests,” Yost said. Now she is one of seven CCEE students chosen to be part of the Grand Challenges Scholars Program (GCSP) and says the program inspired her to “take more control” over her degree.

The GCSP was established soon after the National Academy of Engineers (NAE) published the 14 Grand Challenges of Engineering in 2009. The Grand Challenges were meant to make NAE’s global vision for engineering clear and accessible. The vision was as follows:

*Continuation of life on the planet, making our world more sustainable, secure, healthy, and joyful.*

These fifteen words are intended to direct the course of engineering over the next century, and the ensuing 14 Grand Challenges, sparked a global movement. Engineering schools readily adopted the NAE Grand Challenges as a framework for inspiring study, research, and projects for students. The GCSP was a natural extension, and the NC State College of Engineering

(COE) joined more than 100 universities around the nation who have adopted the program. About 80 students selected across all COE departments are participating. Admission is competitive and requires that a student complete requirements for five core competencies. Each student declares one of the 14 Grand Challenges as their area of interest, and chooses a mentor to guide them. The competencies can be met by curricular or extra-curricular activities including coursework, undergraduate research, study abroad, club activities, internships, or service work.

Yost has recommitted to her minor in nonprofit studies, and is applying to NC State’s Institute for Nonprofit’s Social Innovation Fellows program to meet her entrepreneurship competency. She is also working as a teaching assistant in Engineering 102 during spring semester, and completing an Alternative Service Break (ASB) in the spring that is part of NC State’s ‘Lead and Engage’ program. The ASB she will complete is held in partnership with the Interfaith Center of Greater Philadelphia and will include service work, development of leadership skills, and dialogue with members of diverse faith traditions.

*“The program is a godsend. Once I committed to being a Grand Challenges Scholar, all the things I’m doing seemed to be more manageable because I’ve got a goal. It’s even led me to a new interest in urban design and urban planning since I chose ‘restoring urban infrastructure’ as my grand challenge focus. Now I have direction and have let go of the things that don’t drive me toward that.”*

LEANNA FREI YOST



Front row, from left: Silvana Alfieri, Serena Sauers, Brenna Copeland. Back row, from left: Leanna Frei Yost, Kendall Zorn, Kevin Duke. Not pictured here — Sarah Nagy.



# AWARDS & HONORS



Dr. Ashly Cabas

**DR. ASHLY CABAS**, assistant professor of geotechnical engineering, was selected as a Fellow for the National Science Foundation (NSF)-funded Enabling the Next Generation of Hazards and Disasters Researchers Fellowship Program. The Enabling Program is an initiative aimed at developing junior faculty to become excellent scholars in their individual disciplines, as well as in the

broader hazards and disasters research community. The program recognizes researchers with a career-long commitment to research on hazards, risk, and disasters who will contribute to the nation's future research capacity and infrastructure in these areas. Cabas will receive the award in San Juan, Puerto Rico, in June 2020 during the NSF Enabling Program workshop.



Dr. Lisa Castellano

**DR. LISA CASTELLANO**, who is the manager of the CCEE Environmental Laboratory recently received an NC State Health and Safety Award for her leadership displayed towards the development and maintenance of a strong safety culture. The award was given on behalf of the Eastman Chemical Company and NC State.

**DR. NAGUI ROUPHAIL**, Professor of Transportation Systems, received the Jay Quinn, Jr. Technical Excellence Award from the North Carolina Section of the Institute for Transportation Engineers (NCSITE). This award is given annually to a nominee who possess excellent technical knowledge that the nominee shares with NCSITE through presentations at sponsored meetings or training sessions, or through active participation in

councils or committees, task forces, or work groups. Roup hail received the award at the NCSITE Annual meeting in Raleigh, NC in November, 2019.



Dr. Joel Ducoste



Dr. Francis de los Reyes, III



Dr. Rudi Seracino

The CCEE department had three faculty inducted in the inaugural class of the new Academy of Excellence in Global Engagement at NC State. **DRS. JOEL DUCOSTE, FRANCIS DE LOS REYES, III, and RUDI SERACINO** were recognized for their achievements and as faculty and staff who have made outstanding contributions to international research, education, and service at NC State University.



Sadia Afrin

Environmental engineering Ph.D. student **SADIA AFRIN** was awarded a prestigious Graduate Research Innovation (GRIN) award from the U.S. Joint Fire Science Program (JFSP). The award funds student-authored proposals for original research that augments their dissertation work and enhances its policy relevance. The funds will support Afrin's effort to compare the costs of an operational prescribed burning program to those

of unplanned wildfires in collaboration with the NC Department of Parks and Recreation. She is advised by **DR. FERNANDO GARCIA MENENDEZ**.



Ishtiak Ahmed

Transportation systems Ph.D. student **ISHTIAK AHMED** received the Bowman Kelly Memorial Scholarship awarded by the North Carolina Section of Institute of Transportation Engineers (NCSITE). Each year, only eight students studying transportation engineering from all universities across the State of North Carolina are selected for this scholarship. Participants are evaluated based on their academic performance, research

and publications related to transportation engineering, and extra-curricular activities. Ahmed received the award during the NCSITE Annual Meeting held in November in Raleigh, NC. He is advised by **DRS. NAGUI ROUPHAIL** and **BILLY WILLIAMS**.



James East

Environmental engineering Ph.D. student **JAMES EAST** was awarded a 2019 Sustainability Research and Study Scholarship from the Air and Waste Management Association in recognition of his academic excellence and professionalism. This designation is given to acknowledge exceptional work in air quality research. East is advised by **DR. FERNANDO GARCIA MENENDEZ**.



Francisco Jativa



Elvin Hossen

**FRANCISCO JATIVA**, who received second place overall and is mentored by **DR. MOHAMMAD POUR-GHAZ**, is researching the potential to use seawater instead of freshwater in concrete and the long-term implications of the practice. Ph.D. student **ELVIN HOSSEN**, mentored by **DR. DOUGLAS CALL**, is researching an emerging technology called capacitive deionization, or CDI, which has the potential to generate drinking water from saltwater using less energy than other processes, and without the cost of expensive membranes.



Amin Rafiei

Ph.D. student **AMIN RAFIEI** was awarded a GSI Fellowship Grant from the Geosynthetic Sciences Institute. The award was based on his research proposal entitled, "Evaluation of Residual Pore Pressure and Deformation of Seabed beneath Geotextile Sand Containers due to Nonlinear Waves: Coupled Hydromechanical Finite Element Analysis." In his research, Rafiei is investigating the applicability of geotextile tubes filled with soil slurry to mitigate the effect of wave loading during extreme storms. Rafiei is advised by **DRS. MOHAMMED GABR** and **SHAMIM RAHMAN**.



Sierra Schupp

**SIERRA SCHUPP**, a graduate student in environmental engineering, was named the Carl J. Apicella Scholar by the Environmental Research and Education Foundation (EREF). The award recognizes graduate students pursuing excellence in solid waste management research and education. The scholarship is in honor of Carl Apicella, a leader in the solid waste and landfill industry for the past 30 years. Schupp is advised by **DR. MORTON BARLAZ**.



Michael Dunn

CCEE undergraduate researcher **MICHAEL DUNN** won the Student Poster Award at the American Shore and Beach Preservation Association's (ASBPA) National Coastal Conference in October, 2019 in Myrtle Beach, SC. The ASBPA Student Poster Award recognizes both compelling research and excellent presentation skills.

Dunn's poster was titled, "Estuarine shoreline erosion driven by flood channel proximity at Pea Island, NC." His work quantified rates of estuarine shoreline erosion and tidal channel migration using digital aerial photographs from 2003 to 2019, investigated wave and water level conditions for that time period, and showed that channel migration was the primary driver of the erosion. He is advised by **DR. BETH SCIAUDONE**.



Gracie Marie Hornsby

Undergraduate civil engineering student **GRACIE MARIE HORNSBY**, was selected as the 2019 College of Engineering Faculty Senior Scholar. This award recognizes one engineering student who exemplifies academic

excellence, intellectual breadth and depth of character. Hornsby's goal since coming to NC State is to serve communities that lack water resources. She plans to study water resources in graduate school and is planning a career in the global water, sanitation and hygiene area to combat the social and systemic issues that restrict over 2.3 billion people's access to basic sanitation and clean drinking water. She is advised by **DR. ANGELA HARRIS**, with whom she has conducted undergraduate research. ■



# CCEE inducts three new members to the Alumni Hall of Fame

In early November, the department held its third annual induction ceremony for the CCEE Alumni Hall of Fame in the James B. Hunt, Jr. Library on Centennial Campus. The three inductees were **Emily Brown Blount**, **Herbert P. McKim**, and **J.W. Willie York**.



From the room where the ceremony was held, there was a clear and wide view of the construction of Fitts-Woolard Hall. When department head Dr. Morton Barlaz began his remarks, he joked, “Holding the attention of a group of engineers while there is a great construction project out the window, is not easy. This time next year, we will be housed in that building.” It was a fitting backdrop for honoring the three new inductees.

Sadly, **EMILY BROWN BLOUNT** was unable to attend due to a recent injury, but the audience enjoyed the acceptance speech of **HERBERT MCKIM**, and from Smedes York, who accepted the posthumous award for his father, **J.W. WILLIE YORK**.

McKim addressed the audience briefly, extending deep thanks to his family, and to his business partner, Mike Creed. Creed was in the audience and was one of the inaugural inductees in 2017. McKim recounted growing up in Wilmington, NC, the son of an architect with a degree from NC State Design School. As a young child, Herbert McKim told his father he wanted to do exactly what his father did, but his father dissuaded him from architecture and encouraged him to pursue structural engineering. McKim is a founding partner of McKim and Creed, a civil engineering consulting firm that now employs hundreds of engineers across the country. He recounted the early years and some of the hurdles the company faced as they grew.



From left, Herbert McKim, Dr. Morton Barlaz holds the award for Emily Brown Blount, and Smedes York accepting for his father J.W. Willie York.



Smedes York

Smedes York also asked the audience to travel back in time and imagine Raleigh in 1933 when his father Willie York graduated with a construction option. “It was not exactly the height of the business cycle,” Smedes York reminded the audience. He also talked about the risk his father took in the late 1940s when he built Cameron Village, a shopping center with surrounding residential neighborhoods — one of the first developments of its kind in the country. Willie York was instrumental in many other iconic Raleigh sites such as the Velvet Cloak Inn and the original Farmer’s Market.

The stories were interesting, humorous, and thought provoking, and were enjoyed by family, friends, and colleagues in the audience. The department extends deep congratulations along with a sense of pride in honoring our outstanding alumni. The breadth of their accomplishments and service is inspirational.

Emily Brown Blount was the first female graduate of the department, receiving her B.S. in civil engineering in 1953 and a professional degree in civil engineering with a concentration in transportation in 1955. Following graduation, Blount began a career at the North Carolina Department of Transportation, starting as the Associate Traffic Engineer in the State



Emily Brown Blount

*The CCEE Alumni Hall of Fame was established in 2017 with 19 inaugural inductees. In 2018, and again this year, we inducted 3 more outstanding individuals. Note that nominations for 2020 will be accepted through June 15, 2020. You can find out more at [www.ccee.ncsu.edu/hall-of-fame](http://www.ccee.ncsu.edu/hall-of-fame).*

Highway Department. Five years after graduating, she became the first North Carolina woman registered as a professional engineer and as a professional land surveyor. Blount went on to have a 40-year career at the North Carolina Department of Transportation before retiring so that she could “travel to see the world.” She has been recognized for her outstanding achievements over the years with numerous awards including the 1978 Raleigh Engineers Club Outstanding Engineering Award, the 1997 R.V. Moss Lifetime Service Award from the NC Section of the Institute for Transportation Engineers, and in 2006, she was inducted into the NC Transportation Hall of Fame. Blount remains dedicated to her profession and still maintains her P.E. license by regularly attending engineering conferences such as the department’s annual Paul Zia Distinguished Lecture and by speaking with high school science majors and young women who may be interested in engineering. Additionally, Blount remains connected to our department through alumni engagement activities and by regularly contributing to the department’s enhancement fund.



Herbert P. McKim, Jr.

Herbert McKim earned a B.S. in civil engineering in 1973 and his M.S. in civil engineering in 1975 from NC State. He went on to earn an MBA from the University of North Carolina at Wilmington in 1985, where he was named Most Outstanding Student of the Cameron School of Business. During his undergraduate years, McKim played on the varsity tennis team, where he lettered all four years. Despite the difficulty of being a student athlete in a very rigorous program, McKim was inducted into Chi Epsilon, the National Honorary Civil Engineering Fraternity, and also pledged Sigma Phi Epsilon Fraternity as an undergraduate. Following graduation, McKim and fellow NC State classmate Michael Creed moved to Wilmington, NC and started their own engineering firm. McKim & Creed Engineers, PA, was founded on June 1, 1978. In the early 1980s, as the firm began to grow and diversify, McKim re-focused his time from project management to the business side of the engineering firm, using his organizational skills and entrepreneurial spirit to propel the company into the *Engineering News-Record* (ENR) Top 500 Companies by 1992. Today, McKim & Creed has more than 20

## INDUCTION CRITERIA INCLUDE:

- Service to the profession including advances to the technology or fundamental principles of the nominee’s chosen field or career
- Service to the local, national, or global community
- Service to the University
- Service to the welfare of society

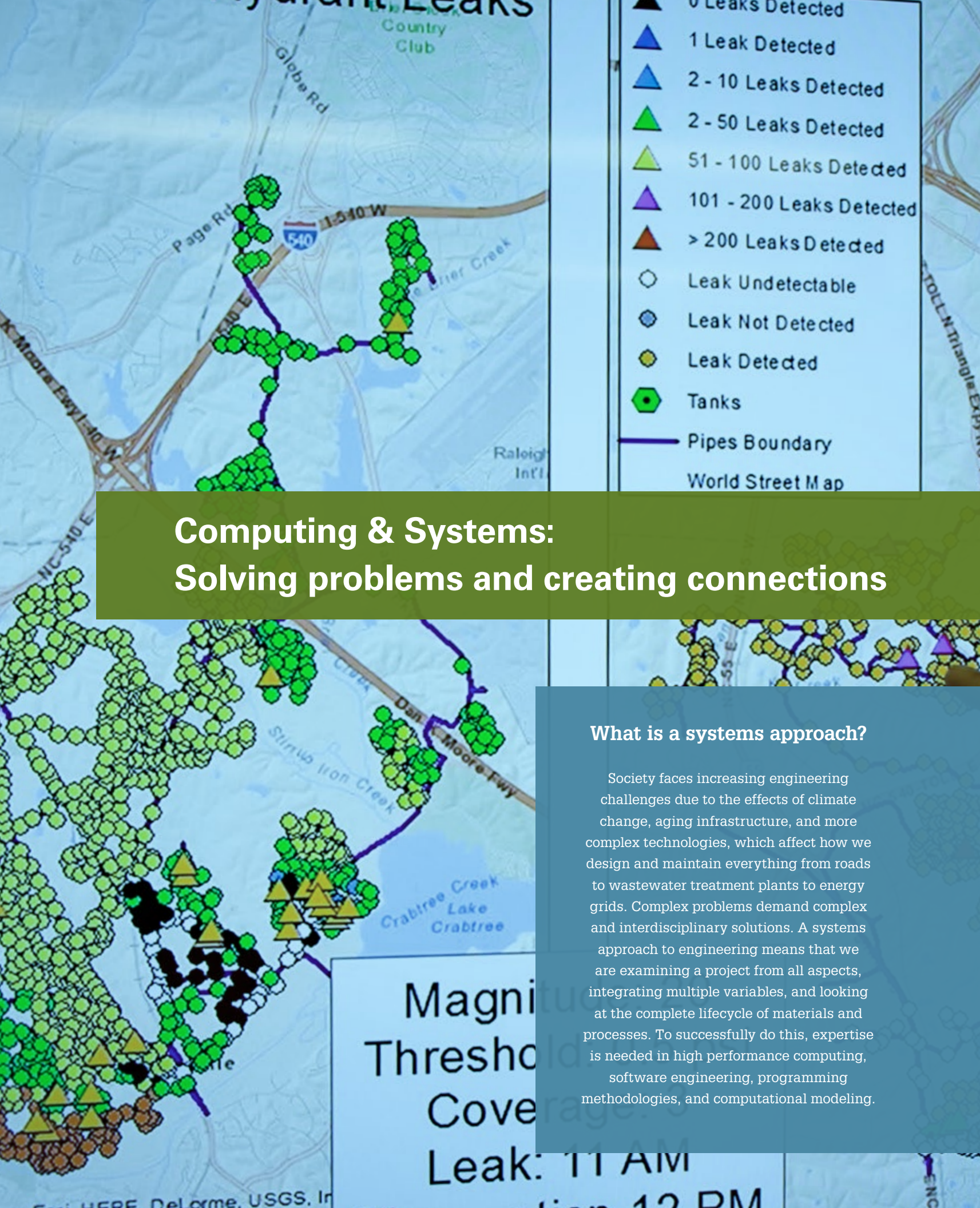
offices across the country with their headquarters proudly located on Centennial Campus. McKim has been recognized for his accomplishments with numerous awards including the ACEC / NC Community Service Award, the Distinguished Service Award from PENC, and the PENC Outstanding Technical Achievement Award. He is a Life Member of the Alumni Association and former Alumni Association Board of Directors member who continues to stay connected to the University through alumni engagement activities in addition to being a longtime supporter of the University.



J.W. Willie York

J.W. Willie York received his B.S. in civil engineering with a construction option in 1933. Following graduation, York worked at C.V. York Construction Co. until 1941 when he left Raleigh to work on construction at the Marine Corps base in Cherry Point, NC. Following World War II, he established his business (J. W. York and Co., now known as York Properties) in Raleigh, which built post-war housing. In 1949, York branched into commercial real estate development, building Cameron Village — one of the first suburban shopping centers in the country — surrounded by 561 apartments and 100 homes. The project won the National Association of Homebuilders’ award for best neighborhood development and is still in use and evolving today. In addition to his business acumen, York was a leader in the community, serving the state as Chairman of the Board of Conservation and Development from 1964 to 1968 under Governor Dan Moore and on the Raleigh school board. York put forth the motion to desegregate the Wake County school system in 1960 and the school board honored his leadership by naming a Raleigh elementary school after him. York remained connected to the University through both philanthropy and volunteerism until his passing. ■





## Computing & Systems: Solving problems and creating connections

### What is a systems approach?

Society faces increasing engineering challenges due to the effects of climate change, aging infrastructure, and more complex technologies, which affect how we design and maintain everything from roads to wastewater treatment plants to energy grids. Complex problems demand complex and interdisciplinary solutions. A systems approach to engineering means that we are examining a project from all aspects, integrating multiple variables, and looking at the complete lifecycle of materials and processes. To successfully do this, expertise is needed in high performance computing, software engineering, programming methodologies, and computational modeling.



Dr. Ranji Ranjithan, left, and Ph.D. student Hana Chmielewski.

**DR. SANKAR ARUMUGAM** saw a problem — water and energy utilities are vulnerable to climate variability, but they consider this variability over only a few days or weeks. For instance, a system of dams and reservoirs depends on monthly to seasonal precipitation as it can hold many months of inflow, but a dam operator typically considers only the 10-day inflow forecast for power generation. If there was a way to consider variability on longer time scales, then it would improve the sustainability of both water and energy systems. To research a solution to this problem, Arumugam needed to assemble a team — in addition to his expertise in hydroclimatology, he needed experts in water and energy systems, electrical power, and computer science. He found this expertise through our Computing & Systems (C&S) group.

*"We are lucky to have several faculty in our department who consider integrated systems, so it was easy to pull together a great team. I had worked already with Dr. Kumar Mahinthakumar on water systems optimization, I'd seen Dr. Joe DeCarolus work on energy systems, and Dr. Anderson de Quieroz has worked on planning of water and power systems. We also connected with Dr. Ning Lu (Electrical and Computer Engineering) on electrical power and Dr. Sreerama Sreepathi in computer science for the combined operation of water and power systems using monthly-to-seasonal streamflow and power demand forecasts."*

**DR. SANKAR ARUMUGAM**

Their collaborative proposal led to a \$1.2 million grant from the National Science Foundation, in which the team developed a framework and tested it with the State Climate Office of NC and two national laboratories. As part of the project, the team worked with three graduate students and two post-docs to improve operation of the Tennessee Valley

Authority's 28 reservoirs and power systems. This project is just one example of how our C&S group can connect faculty and students to address large, interdisciplinary problems.

### CONNECTING FACULTY ACROSS DISCIPLINES

Many engineering departments have faculty who apply systems engineering techniques in their specific disciplines. But our C&S group is unique because it encourages faculty to connect across disciplines. This encouragement has been formalized over a generation of faculty. When **DR. DOWNEY BRILL** was hired as department head in 1988, he brought a background in systems engineering from his previous position at the University of Illinois at Urbana-Champaign. "When I arrived, the department already had expertise in systems, modeling, and computing within the sub-disciplinary areas," Brill said. "I realized that these capabilities would be more and more important over time, so I worked with the faculty to strengthen that area."

The first steps were to hire faculty into the C&S group. Brill's first hire was **DR. JOHN BAUGH**, who focuses on formal methods for reliable engineering and scientific software. Baugh's research has addressed problems in hurricane storm surge simulation, active control of building structures for seismic protection, civil site development, vehicle routing and scheduling, and air quality management, as well as cyber-physical systems, which integrate computer components and physical infrastructure. The department also hired **DR. RANJI RANJITHAN**, whose focus is to integrate systems analytic methods with computational approaches to develop prototypes of engineering decision support tools. "Ranji was one of the first faculty members in all of engineering, and certainly in civil engineering, to do sophisticated research with heuristic, computationally intensive methods," Brill explains. Ranjithan's research ranges from systems for drinking water to solid waste to bridge girders. Another core member is



**DR. KUMAR MAHINTHAKUMAR** (Dr. Kumar), who focuses on parallel and distributed computing algorithms and tools for large-scale civil engineering applications. Kumar’s current focus is on modeling and optimization of systems for water distribution and groundwater flow and transport.

*“An engineering degree is a problem-solving degree. Having departmental expertise in C&S allows us to teach our students to use computing within the context of science and engineering. A systems approach is useful and informative in every traditional civil, construction, or environmental domain. We have pushed back against the trend that says civil engineers don’t need computing.”*

**DR. JOHN BAUGH**



Dr. Emily Berglund, left, combines behavior models with infrastructure simulation to create computational models.

The C&S group has grown as faculty with interests in systems engineering have been hired into specific sub-disciplines.

**DR. EMILY BERGLUND** is a member of both the C&S and the Environmental, Water Resources, and Coastal Engineering (EWC) groups. Berglund’s research uses modeling techniques that come from social science and artificial intelligence to help predict how people will behave. She combines behavior models with infrastructure simulation to create sophisticated computational models to predict, for example, water use during drought restrictions, or least cost approaches to managing reservoirs with demands from diverse stakeholders. In collaboration with other NC State faculty members, Berglund has worked on projects that use sophisticated computational methods and hardware to address topics including water shortages, water infrastructure design, and stormwater control. “I characterize our department as a computing and systems powerhouse,” Berglund said.

The C&S group now has 14 faculty members. Many of our most recent hires, regardless of domain, use sophisticated computing and systems approaches. **DR. ALI HAJBABAIE** uses computational modeling to visualize and design traffic operations and control systems and is looking to a future where automated and connected vehicles become part of the traffic stream. **DR. KEVIN HAN** uses computer vision and machine learning analytics for construction

project controls, with a focus on safety and hazard recognition. **DR. FERNANDO GARCIA MENENDEZ** uses computational modeling and data analysis to explore interdisciplinary questions related to air pollution, climate change, and environmental policy. “All these terms that have become commonplace, like artificial intelligence and neural networks, are things that our researchers have been involved in for a long time,” Brill said.

### CONNECTING STUDENTS IN THE CLASSROOM

Another focus of the C&S group has been developing courses in systems engineering. At the undergraduate level, CE 339 (Civil Engineering Systems) and CE 437 (Civil Engineering Computing) are opportunities for students to specialize. But more broadly, the goal is to integrate these techniques across a wide range of coursework. Students now learn Python in an introductory course from the Department of Computer Science, and they are then expected to use Python in junior and senior level courses in CCEE. Baugh holds informal seminars for CCEE faculty who wish to further their knowledge of Python for their research, or for mentoring their students who are using the programming language in their research. “We work closely with professors to help them introduce students to modern computing practices in the classroom,” Baugh said.

At the graduate level, there are many courses related to computing and systems, and these courses draw students from across the department and beyond. “One of the first things John (Baugh) did when he arrived was to develop a computer methods course to serve all students, whether they already had a background or specific interest in computing, or whether they needed an introduction to how it could enhance their research.” Brill said. “It’s hard to make it work for both, but John has done an outstanding job. He knows how to present the material in an engineering context and has kept it state-of-the-art.”

Kumar teaches several graduate level courses within the C&S group, including an introduction to numerical methods course designed for graduate students across CCEE, and more advanced courses including high-performance computing and inverse modeling. While similar courses are taught within NC State’s computer science department, space is limited, and they do not offer the direct connection to engineering.

*“To my knowledge, we are unique in offering such an in-depth set of computing and systems courses designed for students in all areas of civil engineering. In my high-performance computing course, I often have mechanical engineering and nuclear engineering students in addition to those from our department, because we teach parallel programming concepts with a focus on engineering problem solving.”*

**DR. KUMAR MAHINTHAKUMAR**

### CONNECTING INTO PRACTICE

The C&S group includes graduate students who pursue research in every sub-discipline of civil, construction, and environmental engineering, but who apply techniques from computing and system engineering.

*“One of the biggest benefits of the C&S group, beyond promoting interdisciplinary research within our department, is recruiting graduate students. It’s a niche area that not every civil engineering graduate student is interested in, but for the ones who are, we offer a definite edge.”*

**DR. RANJI RANJITHAN**

*“My interest in interdisciplinary research at the intersection of high-performance computing and domain sciences led me to the C&S program at NC State. The collaborative nature of the projects and the mentoring by faculty during my graduate studies defined my perspective and trajectory as a researcher. I currently co-lead the Performance Group for the Department of Energy’s climate model, and contribute to the Exascale Computing Project applications in nuclear fusion and climate science.”*

**DR. SARAT SREEPATHI, C&S ALUMNUS**

### LOOKING AHEAD

Evidence of the continuing evolution of our C&S group is a new course offered for the first time this spring called Cyber-Physical Systems. “It’s a course for which there is no precedent in civil engineering,” Baugh said. “We developed it to help students understand, appreciate, and work with emerging computer technologies that are shaping modern civil engineering infrastructure systems. Basically, it is about enhancing physical systems by augmenting them with computer systems.”

Cyber-physical systems have applications to smart cities and infrastructure, such as energy efficient systems with predictive control. In the transportation domain, examples include ‘self-driving cars’ and communication-based train control for urban rail systems. There are also applications in energy systems, building design, environmental quality, and many other areas. The new course focuses on the modeling and analysis of such systems, and is offered to both undergrad and graduate students.

Whether it is the operation of a single dam or an entire smart city, our C&S group will continue to prepare students, and facilitate researchers, to utilize state-of-the-art computational methods to design, build and operate civil engineering infrastructure. ■

### Expertise in computing and systems has led many of our graduates to successful careers in fields not traditionally associated with civil engineering. A few examples include:

- **DR. HARPREET CHADHA** (Ph.D., 1993), *Head of Network Capacity Planning, Google*
- **DR. GOPAL KAKIVAYA** (Ph.D., 1996), *Corporate Vice President, Microsoft*
- **SHOMA CHAKRAVARTY** (MSCE, 1998), *Vice President of Enterprise Architecture, Verizon*
- **DR. ERIC SOLANO** (Ph.D., 1999), *Internet of Things Data Scientist, Continental*
- **AMEY PARANDEKAR** (MSCE, 1999), *Head of Products for Microsoft Teams*
- **KISHAN CHETAN** (MSCE, 2000), *Vice President of Product Management, Salesforce*
- **PRASHANT PAI** (MSCE, 2001), *Vice President of Cyber Solutions, Verisk Analytics, Inc.*
- **CAN KUTERDEM** (MSCE, 2001), *Vice President of Strategy and Program Delivery for the EU Region, Phillip Morris International*
- **ARAVIND SRINIVASAN** (MSCE, 2001), *Head of Product-Mobility Platforms, Uber*
- **ALPER SAVAS** (MSCE, 2002), *Global Account Director, Spirent Communications*
- **ANDREW BERGLUND** (MSCE, 2013), *Principal Software Engineer, Red Hat*
- **DR. SARAT SREEPTHI** (Ph.D., 2012), *Senior Computer Scientist, Oak Ridge National Laboratory*
- **SHU LIU** (MSCE, 2015), *Machine Learning Engineer, Facebook*



# 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.



From left, CCEE students Renzo Cieza Morro and Amy Butler along with Faculty advisor Roberto Nunez.

## AMERICAN CONCRETE INSTITUTE (ACI)

The NC State ACI student chapter recently was awarded second place for their participation in the 2019 Fiber-Reinforced Polymer Composites student competition. The competition was held at the Concrete Convention and Exposition in Cincinnati, where more than 47 teams from around the world competed. As part of the competition, students were challenged with designing, constructing, and testing concrete beam specimens in accordance with specific design specifications. The NC State student team, which included **AMY BUTLER, RENZO CIEZA MORRO, DANIELLE CURRI, AARON NORTON, WILLIAM HINKLE**, and **TIM FORD**, designed the beam and calculated the predicted load capacity and the expected deflection. Once the design was finalized, they ensured that the designed beam met both the strength requirements and the cost constraints. They then prepared the concrete mix and cast the concrete specimen in preparation for the testing. Ph.D. student **FRANCISCO JATIVA** provided valuable technical support and faculty member **ROBERTO NUNEZ** served as the team advisor. The ACI Student chapter also assisted in administering ten exam sessions, which allowed 15 NC State students and 150 industry technicians to earn ACI Grade I Concrete Technicians International Certifications.

## CONSTRUCTION ALLIANCE

Students in the Construction Alliance participated in the annual Associated School of Construction (ASC) Region 2 competition held in Peachtree City, Georgia. The students participated in the Risk and Finance category and as part of the Shadow Team.



Construction Alliance Student members at the ASC Region 2 competition.



Katherine Boumenot of Balfour Beatty offering a info-session of Virtual Design in Construction.

Shadow teams are made up of students who are attending the conference for the first time and hope to participate in the main competition in the future. They are grouped into teams that include students from multiple universities. This year they were tasked with estimating the cost of a proposed structure and developing a construction schedule. **SHINJAN SIKDAR**, a student of the construction engineering program, won first place in the shadow competition along with his team members. “The experience in the competition helped me see some of the practical challenges in the construction industry and has been useful as I have begun interviewing for industry positions,” Sikdar said.

The Construction Alliance along with Lithko Contracting and Clancy and Theys Construction Company organized a site visit to a student-housing complex construction project on Hillsborough street. In addition to touring the site, students were introduced to software packages used in the management of residential and commercial projects.

The Alliance also hosted an info-session on Virtual Design in Construction (VDC) provided by Katherine Boumenot, a Project Engineer at Balfour Beatty and alumna of our construction program. Students were introduced to a number of disruptive

technologies that are changing how construction projects are planned and executed.

Finally, a group of 12 students from the construction engineering program attended the annual Construction Management Association of America (CMAA) NC Chapter symposium. Here, students were introduced to current work practices and the future of the construction industry. Conner Gwyn Schenck PLLC graciously sponsored the student attendees. “Attending the symposium was a wonderful learning experience and provided a nice opportunity to meet and network with professionals in the construction industry,” Siddharth Banerjee, a member of the Construction Alliance said.



EERI Officers, Arjun Jayaprakash, Jessi Thangjitham, and Mike Lin show Dr. Erica Fischer some of the large-scale test specimens at the Constructed Facilities Lab.



Graduate student Diego Sosa explains the concept of torsion under seismic loads utilizing a shake table.



From left, EERI officers and faculty on the panel: Victor Calderon, Raj Thangappa, Taylor Brodbeck, Dr. Jason Patrick, Dr. Giorgio Proestos, Jessi Thangjitham, Arjun Jayaprakash, Diego Sosa, and Dr. Ashly Cabas.

## EARTHQUAKE ENGINEERING RESEARCH INSTITUTE (EERI)

EERI hosted a special guest lecture in November by Dr. Erica Fischer, who is an assistant professor at Oregon State University. She plays an active role in the EERI national chapter as one of the founders and co-chairs of the EERI Virtual Earthquake Reconnaissance Team (VERT), and a member of the EERI Learning from Earthquake Executive Committee and Board of Directors. Fischer’s lecture highlighted her research on fire performance of mass timber for high-rise building construction.

In October, the EERI student chapter hosted an Undergraduate Research Event where students learned about research opportunities in the department. The highlight of the event was a shake table demonstration and a Q&A panel of CCEE faculty and students. The panel included **DRS. ASHLY CABAS, JASON PATRICK, GIORGIO PROESTOS**, along with Ph.D. student **FRANCISCO JATIVA**, and undergraduate **JESSICA GORSKI**.



From left, Mazine Lowe, Dr. Johanna Mathieu, Martina Gonzales Bertello (Vice President of Student Energy Club), Dr. Emily Grubert, and Kateri Callahan.

## STUDENT ENERGY CLUB

The Student Energy Club hosted a Women in Energy Panel titled: “Power Shift: The Future of Energy and the Women Shaping It.” The panel included Mazine Lowe, executive director of the Center for Energy Education; Dr. Johanna Mathieu, Professor of Electrical Engineering and Computer Science at the University of Michigan; Dr. Emily Grubert, Professor of Civil and Environmental Engineering at the Georgia Institute of Technology; and Kateri Callahan, principal of Dynamic Energy Strategies. This diverse group of leaders with expertise in energy education, technology and policy discussed the challenges faced by the energy system today, and pathways being used to mitigate them. The panel also focused on the role of women in energy leadership in academia, the corporate sector, as well as government, and discussed strategies to navigate challenges that women experience in STEM fields.





Members of the PENC helping a Girl Scout group test their water filtration design.

## PROFESSIONAL ENGINEERS OF NORTH CAROLINA (PENC)

The student chapter of PENC co-hosted an Engineering Licensing Panel event with Chi Epsilon where students asked a panel of seven local professionals about the licensing process and their individual experiences. In addition, the student chapter collaborated with the Triangle Chapter of PENC to organize a recurring mentorship program. This program provides the opportunity for students to be mentored one-on-one by a local practicing engineer (E.I. or P.E.) for a semester.

The student chapter also volunteered at the TechnoQuest 2019 event at Meredith College. This event is a STEM exploration day run by the Girl Scouts North Carolina and is intended to provide broad insight into STEM fields for girls in 6<sup>th</sup> through 12<sup>th</sup>



Danielle Curri

grades. Representatives from the student chapter organized hands-on activities including a water-filtration column experiment and a spectral-sensor activity, while also providing brief presentations on water quality and solar energy.

## NEW STUDENT CHAPTER OF WOMEN'S TRANSPORTATION SEMINAR

CCEE's **DR. ELENI BARDAKA**, along with senior **DANIELLE CURRI**, were instrumental in

establishing a new student chapter of Women's Transportation Seminar (WTS). WTS is an international organization began in 1977 and dedicated to building the future of transportation through the global advancement of women. There are 79 local chapters including one dedicated to the Triangle region of North Carolina. "Currently, we have about 20 students from NC State in the new student group, and we are working on outreach initiatives to gain students from surrounding universities," said Bardaka, whose research focuses on transportation planning and economics, including the socioeconomic impacts of urban rail.

"I am so excited to help found this club and to get it started before graduation," said Curri, who will graduate in May and has already accepted a job as a transportation engineer. "One of the most exciting events we have had so far was a project life cycle event this past November. We had professionals from multiple civil engineering sub-disciplines come share their role in a large infrastructure project. Students rotated around the classroom and got to speak to professionals one on one about their role in the project. Students had the opportunity to speak with traffic engineers, structural (bridge) engineers, transportation and environmental planners, and hydraulic engineers," Curri shared.



Global WASH is a new student organization formed last year.

## NEW GLOBAL WASH CLUB

The new Global WASH Student Chapter held their first official chapter meeting in January. "The goal of this new club is to foster an interdisciplinary, creative community where students can refine their interests in Global WASH, discuss pressing global issues, and be connected to career opportunities for the future.," said vice president **GRACIE HORNSBY**, a senior in civil engineering. "We are looking forward to our first 'WASH Wednesday' discussion about student roles in combating the global water crisis." The group was formed last year by graduate students **PRADNYA LATKAR**, who serves as president, **POORVA MOKASHI**, **MYAT AUNG**, and Hornsby. ■

**THOMAS M. HARRIS**, P.E. (BSCE 1987, MCE 1993), is the bridge design manager for the Raleigh, NC, office of WSP U.S.A., Inc., where he is responsible for managing and overseeing design efforts and providing quality control reviews. Currently, he is structure design lead for the I-40 / I-77 Interchange Improvements Design-Build project in Statesville, North Carolina. This project includes a 2,300-foot pre-stressed concrete girder ramp bridge and a 487-foot, two span curved steel plate girder bridge. Harris has been with WSP since 2017.

**DR. GABRIELA HARO**, (Ph.D. 2017), who completed her doctorate with a focus on structural engineering, was named Head of the Department of Earth Sciences and Construction at Universidad de las Fuerzas Armadas ESPE in Sangolquí, Ecuador. Haro studied the seismic behavior of structural walls while at NC State. At ESPE, she is in charge of a department of 52 faculty and 760 students. The program offers specializations in civil engineering, and geographical and environmental engineering. Haro is planning on returning to NC State for a short sabbatical in Fall 2020.

**BRANDON NEVERS**, P.E. (MSCE 2000), was recently selected to become the president and CEO of Kittelson & Associates, Inc. Prior to beginning that role in January 2020, Nevers served as the firm's chief operating officer. Kittelson & Associates, Inc., is a transportation engineering and planning firm with 24 offices around the U.S. Nevers, who worked with Dr. Nagui Roupail during his time at NC State, has 20 years of experience in multimodal transportation planning and operations, congestion management, simulation, traffic design, parking, and applied research.

**CASEY D. SHANAHAN**, P.E. (BSCE 2014, MSCE 2016), joined Hayward Baker, Inc., as a design engineer. Shanahan works on projects

related to design of excavation support systems, ground improvement technologies, and deep foundation systems throughout the Southeast. Prior to accepting this position, Shanahan practiced in geotechnical consulting, managing large subsurface investigations for transportation projects and performing design of various geotechnical / geostructural systems.

**DR. DANNY SMYL**, (Ph.D. 2017), is a lecturer and assistant professor in the Department of Civil and Structural Engineering at the University of Sheffield in the United Kingdom. His research is centered around structural health monitoring, deep learning, inverse problems, and their interfaces. Concurrently, he is serving as a member of the Engineering and Physical Science Research Council Early Career Forum.

**WAYNE STOCKS**, (BSCE 1986), became the president of Thornton Tomasetti in January 2020. Stocks, based in Washington, DC, is the co-lead for the firm's business units. Stocks has more than 25 years of experience in structural design, construction and project management for new buildings and historic structures. He has collaborated with private-sector and government clients on a diverse portfolio of education, hospitality, healthcare, entertainment, office and mixed-use projects.

**DR. HAIBO ZHAI**, (Ph.D. 2008), is now an associate research professor of Engineering and Public Policy at Carnegie Mellon University. Zhai conducts systems research in low-carbon energy and environmental sustainability. He was recently cited in the international journal *Science of the Total Environment* as being one of the top 10 most productive scholars worldwide in research on carbon capture and storage between 1997 and 2017. Zhai studied with Dr. Chris Frey and Dr. Nagui Roupail during his time in our department. ■

*We mourn the passing of **BAHAREH KARAMI**, (MSEE 2012), who died when the plane she was on was shot down in Tehran on January 8<sup>th</sup>, 2020.. After graduation, she worked as a civil engineer at Black & Veatch in Toronto for five years, then took a job as a design technologist with the Regional Municipality of York. In her spare time, Karami volunteered with a children's charity. She was visiting family in Iran at the time of her death. To read more about her time at NC State, visit [news.ncsu.edu/2020/01/mideast-tragedy-claims-alumna](https://news.ncsu.edu/2020/01/mideast-tragedy-claims-alumna).*





## Around the world and back home again: a salute to alumnus **Doug Morton**

**DOUG MORTON** (BSCE 1983), has a unique perspective. As the Associate Vice Chancellor for Facilities at NC State, he is leading the teams responsible for design and construction of Fitts-Woolard Hall, our new home on Centennial Campus where the department will move in July 2020. He simultaneously is responsible for the re-design, rehabilitation, and re-purposing of Mann Hall when the civil engineering faculty and students leave the building.

On any one day Doug Morton may interact with tradesmen or traffic engineers, or meet with department heads or deans. He moves seamlessly between talking with architects or construction foremen, to those in charge of finances or those in charge of maintenance. “It’s all roads and commodes, whether it’s a Navy base or a college campus,” Morton said.

As the Associate Vice Chancellor for Facilities since Fall 2016, Morton oversees NC State’s 20,000 acres on campus, which includes: 1,189 buildings; 65 miles of roads or pedestrian paths; 484 miles of utility lines including energy, water, sewer and telecommunications; a stormwater management system that includes four watersheds and three dams; and five central utility plants. It’s a lot to manage, but when you know that during part of his tenure in the Navy he had oversight of a military construction organization comprised of 16,000 people in 33 units employed worldwide in wartime operations, you realize that it’s all relative. Morton’s humility belies his rise through the ranks since his graduation from our CCEE department 36 years ago.

Morton earned a civil engineering degree with a construction option. When he graduated in 1983, he immediately joined the Navy Civil Engineer Corps, where he spent the next 33 years. He retired as a Rear Admiral, and his many leadership positions have taken him around the world, including one stint as Deputy for Security Cooperation in the U.S. Embassy in Pakistan. As Commander of the Naval Facilities Engineering Command Atlantic, he oversaw base and facility planning, design engineering, construction, base operating services and maintenance, environmental planning and compliance, utilities, transportation, acquisition and real estate services to the Navy and Marine Corps in the United States, Europe, Africa, and Southwest Asia. Morton also served as Chief of Staff in the FIRST Naval Construction Division, the Seabees.

### ***Retiring the Dress Blues for Wolfpack Red***

When reflecting on differences between his life in the Navy as compared to civilian life, Morton did not hesitate to admit that he missed the uniform in some ways. “The formal ranking system clearly displayed by the uniform helped you understand the level of experience the person in front of you had,” Morton said. “Plus, just having to pick out what to wear to work every day can be a challenge,” he joked. Morton pointed out that both the Navy and the University each have a clear mission. “We know what our mission here at NC State is as a research-based,

land grant university. We are educating people to solve the grand challenges of our society. We’re all working toward that mission, and I certainly feel professional pressure to succeed.”

### ***Fitts-Woolard Hall Completion***

“One of the most gratifying things for me right now is working with the lead team responsible for the design and construction of Fitts-Woolard Hall. I have to mention four people, three of whom are also alumni of our department,” Morton said. He names his core team as Cameron Smith and Jake Terrell from NC State’s Facilities Division, along with Mary Beth Russo, the project manager for the architectural and engineering design firm Clark Nexsen, and Mark Collins, executive project manager with the lead construction company, Skanska. “There is such a level of dedication with this group, three of them have a connection with Mann Hall and are so excited about being involved in the new home for CCEE. I think there might be a little extra giddy-up in all our steps since we have that connection to Mann Hall and civil engineering.”

### ***“A Place That is Part of You.”***

It’s no secret that Mann Hall is showing its age, as it is currently surrounded by scaffolding placed as a safety precaution against the deteriorating frame. It needs an external facelift, as well as

updates to the electrical, mechanical and plumbing components. But Doug Morton is adamant that there will be no wrecking ball. “We have hired a designer to help us figure out a way to hold onto Mann Hall. We can’t just discard the built environment,” Morton said. He says that the price per square foot to bring Mann Hall up to date is still much less than new construction costs. “We think we can significantly improve the energy efficiency of the building, and by removing some internal walls, create a more collaborative and flexible environment.” He’s working closely with the Provost to determine who might call Mann Hall home next. “If you are a civil engineer from NC State, then Mann Hall is a ‘place’ that is part of you. The building itself was the place where students received the foundation for their careers. I’m sure it’s different for each individual, but I have strong memories of the professors that influenced me including Roy Borden and George Blesis.”

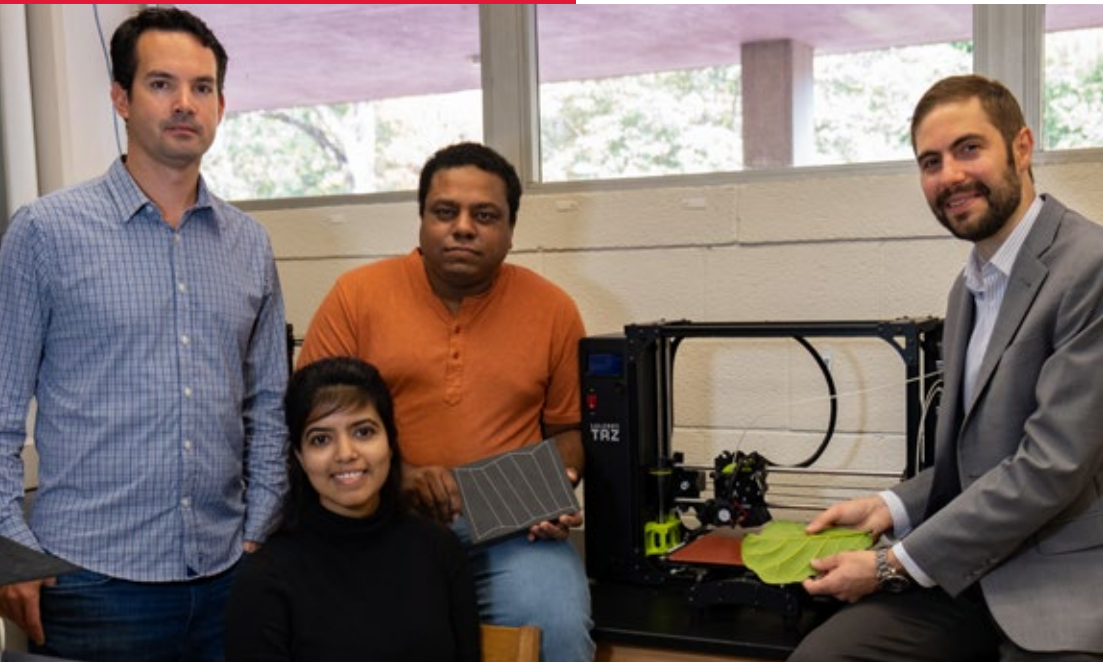
### ***On Top of His Game***

Doug Morton moved 21 times in the 33 years he was in the Navy. While he and his wife are looking forward to putting down some roots in Raleigh, he doesn’t plan on becoming complacent. “Moving so much in the military means that you have to keep starting fresh. You are forced to stay current. I guess you could say it keeps you on top of your game” Morton said.

We salute Doug Morton and are excited to have him back on campus, and feel certain he’s still on top of his game. ■



# How Your Support Makes A Difference



From left: NC State Ph.D. students William Martin, Urmi Devi, and Sherif Aboubakr, with Dr. Jason Patrick. The research team is focused on advancing lightweight fiber-reinforced composites.

**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.

**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 gift to the CCEE Enhancement Fund makes it possible to provide students the best possible education and extracurricular experiences. The enhancement fund allows us to respond to emerging needs and exciting challenges. For example, last year we deployed teams of students to the field for data collection as soon as it was safe after Hurricane Florence hit North Carolina. 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. Our enhancement fund is critical to the department as we strive to continue to provide opportunities for students and faculty.

**RECOGNIZING OUR CORPORATE SPONSORS**  
Our corporate sponsors may opt to provide support for specific research areas, enabling faculty to pursue a new research idea. Sponsorships are also available for this newsletter, the welcome back ice cream each fall and our graduate symposia. The 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 26*) are also dependent on external financial support.  
The **Firm of the Month** program recognizes corporate partners who have made an ongoing commitment to the



The department has a wide variety of programs that are made possible by private financial support. For more information on opportunities to help, please contact **Lindsay Smith**, our Director of Development at [lksmith4@ncsu.edu](mailto:lksmith4@ncsu.edu) or **919.515.7738**.

## 2019 Corporate Donors

The firms listed here have provided endowments or made contributions from mid August 2019 through the end of December 2019. Many on the list have supported multiple activities in the department. We would like to extend our sincere appreciation.

ACI Carolinas Chapter	Dewberry	Kimley-Horn & Associates, Inc.	SEPI Engineering & Construction
American Society of Civil Engineers Eastern Branch	Eagle Rock Concrete, LLC	Kisinger Campo and Associates	Stewart Engineering
Beam Construction Company, Inc.	Ellinwood + Machado, LLC	LHC Structural Engineers	Terracon Consultants, Inc.
Benesch	FDH Engineering, Inc.	Murphy & Coates, LLC	Tindall Corporation
Brasfield and Gorrie	Greasecycle, LLC	Omega Liquid Waste Solutions	Vanasse Hangen Brustlin, Inc.
CFMA Triangle Chapter	Holder Construction Company	Scalene Design	WSP/Parsons Brinckerhoff, Inc.

## SHARE YOUR NEWS

There are thousands of alumni of the Civil, Construction, and Environmental Engineering department working throughout the nation, and around the globe. We invite you to provide us with updates about career accomplishments, awards or recognition, as well as retirements. We aspire to create a community of alumni that remain connected to the department and to each other. We also want to keep your contact info current so we can keep you up to date on department events. Send your information to Julie Dixon at [jwdixon2@ncsu.edu](mailto:jwdixon2@ncsu.edu).

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





# Fitts-Woolard Hall: Supported and constructed by alums for the next generation

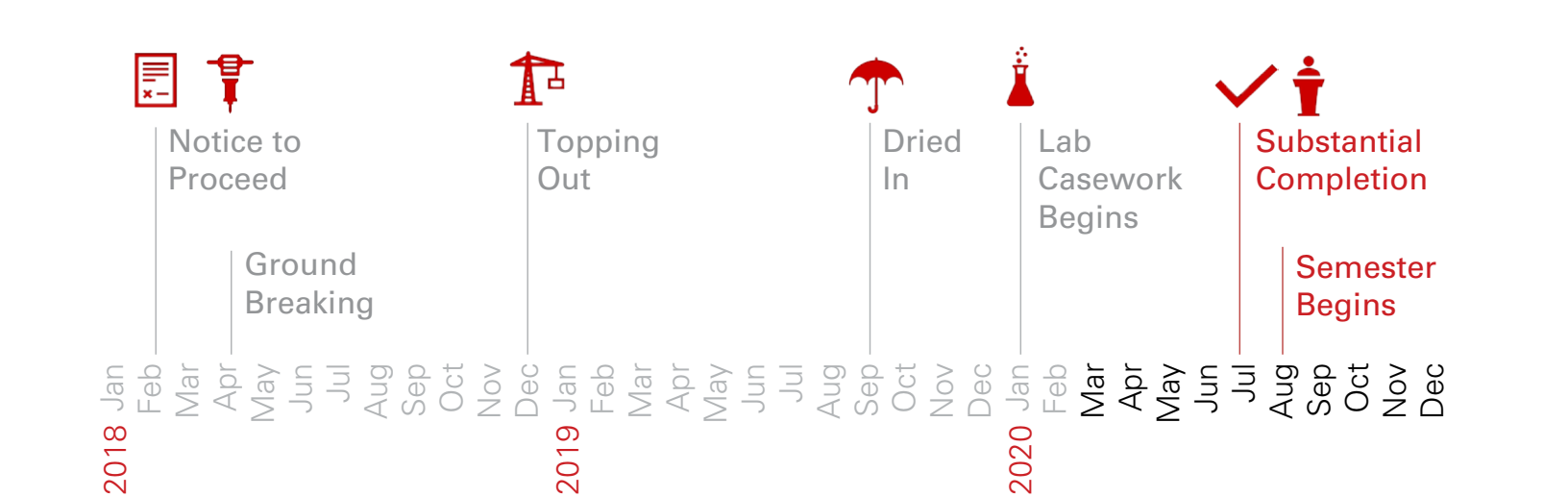
- Aggregate Processing Lab
- Air Quality Lab
- Asphalt Mixing Lab
- Asphalt Multi-Scale Testing Lab
- Materials Conditioning Lab
- Cementitious Materials Research Lab
- Civil Computer Software Teaching Lab
- Civil Engineering Systems Lab
- Coastal Engineering Lab
- Concrete Technology Lab
- Construction Engineering Lab
- Construction Computing Lab
- CCEE Student Projects Lab
- Driving Simulator Room
- Incubator Research Lab
- Hydraulics Teaching Lab
- Hydraulics Research and Flume Lab
- Soils Lab
- Structural Composites Lab
- Structural Behavior Measurements
- Structural Testing Lab
- Transportation Control and Sensors Lab
- Environmental Analytical Instrumentation
- Environmental Engineering Teaching Lab
- Environmental Engineering Pilor Lab
- Molecular Biology Lab
- Global Sanitation Lab
- Electrochemistry Lab

*“Construction is on schedule and we expect to start moving in mid-July. The excitement is building as we work through last minute construction details. Grad students and faculty are starting to pack labs and offices while commercial movers and rigging contractors are being engaged for the big transition. The objective is to have teaching labs ready for fall semester and research labs functional soon after. **This new building will serve generations of engineers for many decades.**”*

**Dr. David W. Johnston, P.E.,**  
Edward I. Weisiger Distinguished Professor Emeritus



There are naming opportunities still available, including many of the Laboratories listed here. Contact Erica Fuller with the NC State Engineering Foundation at [eacinder@ncsu.edu](mailto:eacinder@ncsu.edu) or 919.515.9958.



## Department Advisory Board

The following distinguished alumni and friends of the department currently serve on the board:

<b>Jennifer Brandenburg</b> BSCEC 1986	<b>John Lucey</b> McKim & Creed	<b>Stacey Smith</b> <i>Past Chair</i> BSCEC 1992, MCE 2004 Smith Gardner, Inc.
<b>Glenda Gibson</b> BSCE 1987 Mott McDonald	<b>Mark McIntire</b> BSENE 1995, MSCE 1997 Duke Energy Corporation	<b>Sandra Stepney</b> BSCE 1983 Simpson Engineers & Associates
<b>Christine Herrick</b> BSCE 2011 Kimley-Horn & Associates	<b>Tonya Mills</b> BSCE/BSENE 1994 Tri Properties Inc.	<b>Gray Talley</b> <i>Secretary</i> BSCEC 1998 Shelco Inc.
<b>Joe Hines</b> BSCE 1991 Timmons Engineers	<b>Mike Munn</b> BSCEC 1995 McAdams	<b>Steve Thomas</b> BSCE 1984, MSCE 1986 Sepi Engineering
<b>Tyler Highfill</b> <i>Vice Chair / Nominating Chair</i> BSCE 1992, MSCE 1994 Highfill Infrastructure Engineering, P.C.	<b>Dan Pleasant</b> BSCE 1972, MCE 1973 Dewberry	<b>Mike Wayts</b> Freese and Nichols, Inc.
<b>Jonathan Holtvedt</b> BSCE 2015, MCE 2017 Lennar	<b>Bill Pope</b> <i>Chair</i> BSCEC 1983 Pope Custom Homes	
<b>Will Letchworth</b> BSCE 2002, MSCE 2004 WSP U.S.A.		

## Investing in the Department

We invite you to invest in the future of the department. Your gift will help us take CCEE to a new level of excellence.

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**  
**Campus Box 7901**  
**Raleigh, NC 27695-7901**

Please indicate on the check, or with a note, the purpose of your gift and that it is directed to CCEE.

If you prefer to make your donation online, you can use your credit card with our online feature at [www.engr.ncsu.edu/alumni-and-giving/ways-to-give](http://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 Fitts-Woolard Hall Building Project Fund.

For more information contact:  
**Lindsay Smith**, CCEE Director of Development  
Phone: 919.515.7738  
Email: [lksmith4@ncsu.edu](mailto:lksmith4@ncsu.edu)



# MEET OUR FACULTY

- ALEX ALBERT**  
Construction, *Assistant Professor*
- SANKAR ARUMUGAM**  
Water Resources / Computing and Systems,  
*Professor and University Faculty Scholar*
- TAREK AZIZ**  
Environmental, *Assistant Professor and Coordinator of Undergraduate Advising*
- ELENI BARDAKA**  
Transportation Systems, *Assistant Professor*
- MORTON BARLAZ**  
Environmental, *Distinguished University Professor and Department Head*
- JOHN BAUGH**  
Computing and Systems / Transportation Systems,  
*Professor*
- EMILY BERGLUND**  
Water Resources / Computing and Systems,  
*Associate Professor*
- ASHLY CABAS MIJARES**  
Geotechnical, *Assistant Professor*
- DOUGLAS CALL**  
Environmental, *Assistant Professor*
- CASSIE CASTORENA**  
Transportation Materials, *Associate Professor*
- FRANCIS DE LOS REYES**  
Environmental, *Professor and University Faculty Scholar*
- JOSEPH DECAROLIS**  
Environmental / Computing and Systems, *Associate Professor and University Faculty Scholar*
- CASEY DIETRICH**  
Coastal / Computing and Systems, *Associate Professor*
- JOEL DUCOSTE**  
Environmental, *Professor and Assistant Dean of Graduate Student Advancement*
- CHRIS FREY**  
Environmental, *Glenn E. Futrell Distinguished University Professor*
- MOHAMMED GABR**  
Geotechnical, *Distinguished Professor of Civil Engineering and Construction*
- FERNANDO GARCIA MENENDEZ**  
Environmental / Computing and Systems, *Assistant Professor*

- ANDREW GRIESHOP**  
Environmental, *Associate Professor*
- MURTHY GUDDATI**  
Structures / Computing and Systems/Materials,  
*Professor*
- ABHINAV GUPTA**  
Structures, *Professor*
- ALI HAJBABAIE**  
Transportation Systems / Computing and Systems,  
*Assistant Professor*
- KEVIN HAN**  
Construction / Computing and Systems, *Assistant Professor*
- ANGELA HARRIS**  
Environmental, *Assistant Professor*
- TASNIM HASSAN**  
Structures / Materials, *Professor*
- MARC HOIT**  
Structures, *Vice Chancellor for Information Technology*
- EDWARD JASELSKIS**  
Construction, *E.I. Clancy Distinguished Professor*
- JEREMIAH JOHNSON**  
Environmental, *Associate Professor*
- JOSHUA KEARNS**  
Environmental, *Assistant Professor*
- RICHARD KIM**  
Transportation Materials, *Jimmy D. Clark Distinguished University Professor*
- MEAGAN KITTLE AUTRY**  
Teaching Assistant Professor and Director of Graduate Professional Development
- DETLEF KNAPPE**  
Environmental, *S. James Ellen Distinguished Professor*
- MERVYN KOWALSKY**  
Structures, *Christopher W. Clark Distinguished Professor*
- JAMES LEVIS**  
Environmental, *Research Assistant Professor*
- GEORGE LIST**  
Transportation Systems, *Professor*
- MIN LIU**  
Construction / Computing and Systems, *Associated Professor, Edward I. Weisiger Distinguished Scholar*

- GREGORY LUCIER**  
Structures, *Research Assistant Professor and Constructed Facilities Laboratory Manager*
- KUMAR MAHINTHAKUMAR**  
Computing and Systems, *Professor*
- BRINA MONTOYA**  
Geotechnical / Materials, *Associate Professor*
- JIM NAU**  
Structures, *Professor*
- ROBERTO NUNEZ, CONSTRUCTION**  
*Lecturer and Senior Construction Extension Specialist*
- DAN OBENOUR**  
Water Resources / Computing and Systems,  
*Assistant Professor*
- MARGERY OVERTON**  
Coastal, *Professor and Vice Provost for Academic Strategy*
- JASON PATRICK**  
Structures / Materials, *Assistant Professor*
- MOHAMMAD POUR-GHAZ**  
Structures / Materials, *Associate Professor*
- GIORGIO PROESTOS**  
Structures, *Assistant Professor*
- RANJI RANJITHAN**  
Environmental / Computing and Systems, *Professor and Associate Head for Graduate Programs*
- WILLIAM RASDORF**  
Construction, *Professor*
- NAGUI ROUPHAIL**  
Transportation Systems, *Distinguished University Professor*
- ELIZABETH SCIAUDONE**  
Coastal, *Research Assistant Professor*
- RUDOLF SERACINO**  
Structures, *Professor and Associate Head for Undergraduate Programs*
- AKHTAR TAYEBALI**  
Transportation Materials, *Professor*
- SHANE UNDERWOOD**  
Transportation Materials, *Associate Professor*
- STEVEN WELTON**  
Structures, *Senior Lecturer*
- BILLY WILLIAMS**  
Transportation Systems, *Professor and Director of ITRE*

# ENGINEERING ONLINE

*Join the hundreds of professional engineers who have advanced their career by taking graduate courses online. Take just a few courses to support your area of interest, or commit to earning an online Master's Degree.*

**We offer great opportunities for development.**

NC State has been offering distance education in engineering for more than four decades, and is consistently ranked among the top online engineering programs in the country. Our CCEE Department offers two degrees, Master of Civil Engineering (MCE), and Master of Environmental Engineering (MENE). In 2018 rankings by Best College reviews our online Environmental Engineering degree was ranked #1 in the country, and our Civil Engineering degree earned the #2 spot! With numerous courses available each semester, our online students are able to customize their degrees to support their area of professional interest. The online degree requires the completion of 10 courses, which some students complete in as little as two years, though three to four years is more typical given their other responsibilities.

**Go to the Engineering Online Registration Portal at**  
**[www.engineeringonline.ncsu.edu/apply-and-enroll/enroll](http://www.engineeringonline.ncsu.edu/apply-and-enroll/enroll).**



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

Non-Profit Org.  
US Postage  
**PAID**  
Raleigh, NC  
Permit #2353

# CHECK OUT CCEE AT NC STATE

[www.ccee.ncsu.edu](http://www.ccee.ncsu.edu)

[facebook.com/ccee.ncsu](https://facebook.com/ccee.ncsu)



[@NCStateCCEE](https://twitter.com/NCStateCCEE)



nc state civil construction and  
environmental engineering



700 copies of this document were printed at a cost of \$2,745.57.

