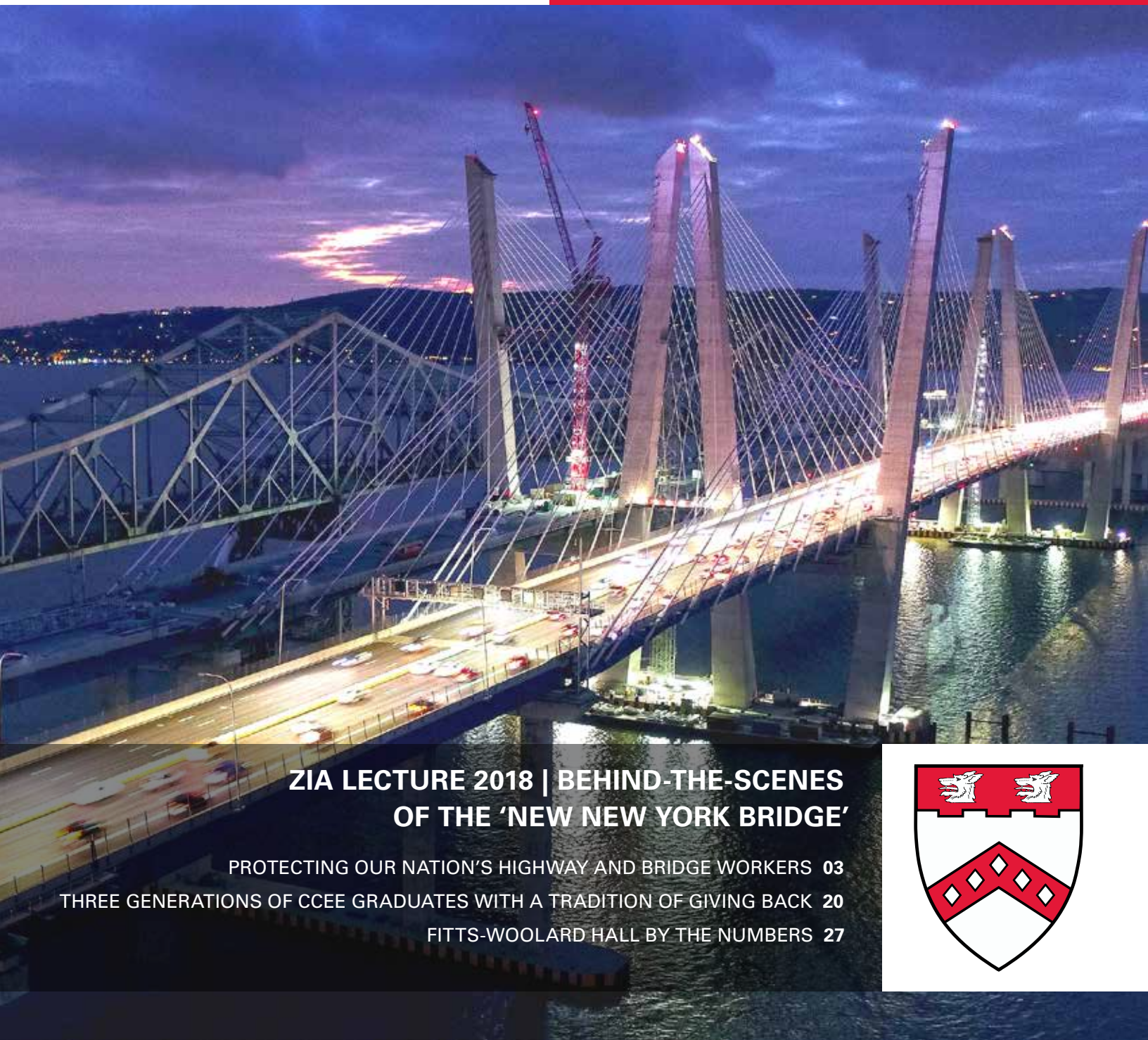


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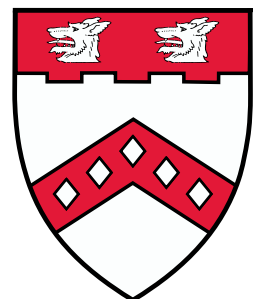
CCEE NEWS

**DEPARTMENT OF CIVIL, CONSTRUCTION,
AND ENVIRONMENTAL ENGINEERING**
NC STATE UNIVERSITY | SPRING 2019



ZIA LECTURE 2018 | BEHIND-THE-SCENES OF THE 'NEW NEW YORK BRIDGE'

PROTECTING OUR NATION'S HIGHWAY AND BRIDGE WORKERS 03
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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.



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IN THE SPOTLIGHT

CCEE RECEIVES NSF AWARDS AND FELLOWSHIPS TO SUPPORT DEPARTMENTAL RESEARCH PAGE 09

Ph.D. student Sonja Pape is improving the understanding of how recycled asphalt materials behave in asphalt mixtures. Pape is one of five current CCEE students to receive an NSF graduate fellowship.



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ABOUT THE COVER

Traffic crosses the “new New York” bridge on the first span, while construction continues on the second span. Part of the old bridge, which has since been completely demolished, can still be seen in this photo from 2018. The bridge was featured at the 2018 Paul Zia Distinguished Lecture Series, including the work of CCEE Alumnus Brian Keaney. Photo courtesy of the New York State Thruway Authority.

LETTER FROM THE DEPARTMENT HEAD MORTON A. BARLAZ



Dr. Morton Barlaz

Welcome to the Spring 2019 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 69 B.S., 50 Masters, and 7 Ph.D. graduates. I always find graduation to be an uplifting reminder of our mission and impact on the profession and civil infrastructure.

I am pleased to welcome Dr. **Giorgio Proestos** to our faculty. Giorgio joins us after completing his Ph.D. at the University of Toronto. His research focuses on the behavior of reinforced and prestressed concrete structures and includes large-scale experimental testing of concrete structures. We also note the retirement of Dr. **E. Downey Brill**, who served as the Department’s Head from 1988 to 2005 and as Interim Director of the Institute for Transportation Research and Education from 2016 to 2018. We wish Downey all the best, including success with a proposal that he submitted just a few days after his retirement in December. Downey has displayed selfless dedication to the department’s mission throughout his career.

I am pleased to share that Dr. **Youngsoo Richard Kim**, Jimmy D. Clark Distinguished University Professor and Alumni Association Distinguished Graduate Professor, is the thirty-fourth recipient of the RJ Reynolds Tobacco Company Award for Excellence in Teaching, Research and Extension. This is the highest award offered by the NC State College of Engineering and recognizes Richard’s contributions related to asphalt materials and pavement. I am also happy to share that Dr. **Fernando Garcia Menendez** was awarded an NSF CAREER award in 2018 for his research on air quality and work to reduce the impact to human health of air pollution from smoke associated with the natural fire cycle (see article, page 9).

This newsletter features research briefs from several of our faculty, highlighting the Department’s contributions to many aspects of civil infrastructure. Dr. **Alex Albert** is working to improve safety for the workers who maintain the approximately 600,000 bridges in the U.S. Dr. **Josh Kearns** is working to provide safe drinking water to people without access to a centralized source of treated water. In the article on page 4, learn how he has involved his class in a project to evaluate field test kits to measure arsenic concentrations in drinking water. Drs. **Joe DeCarolis** and **Jeremiah Johnson** prepared a report for the state legislature to evaluate the costs and benefits of electric grid scale energy storage. Large-scale energy storage has the potential to reduce both costs and emissions while helping to integrate renewable energy into the state’s energy grid. As all of you are aware, there are many challenges to civil infrastructure (unbearable traffic, flooding, drought, aging bridges and buildings, or water of questionable safety), and our contributions to solutions are often taken for granted. Our faculty members continue to educate students on their role in the design, construction and operation of sustainable infrastructure.

We continue to make progress on our new home on Centennial campus. As I write this letter, construction is on schedule and we are choosing office furniture!

In closing, I hope you share my pride in the Department’s teaching, research, extension, and contributions to civil infrastructure. 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 help as we strive for excellence in all that we do. Please consider committing to a recurring monthly or annual gift.

I 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

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





Left: Solar array. Right: Rows of battery racks. Photo from Portland General Electric, shared under a Creative Commons license.

How will new energy storage technologies impact consumers?

Grid-scale energy storage has the potential to drive down costs of electricity, reduce emissions, and help integrate renewables such as wind and solar power, which only produce electricity when the wind blows and the sun shines.

In December of 2018, a team of experts from NC State and NC Central University released a report detailing the costs, benefits, and obstacles to deploying energy storage to benefit North Carolina's grid. The study was mandated by the NC General Assembly. The NC Policy Collaboratory, established by the state legislature to utilize and disseminate environmental research from researchers in the University of North Carolina system, selected the team led by NC State to conduct the required research.

CCEE Associate Professor **JOSEPH DECAROLIS** brought together researchers spanning CCEE, Electrical and Computer Engineering, Public Administration, Agricultural and Resource Economics, the FREEDM Center, the NC Clean Tech Center, and the NC Central School of Business. The interdisciplinary team drew on a wide range of research and solicited stakeholder input to assess the benefits and costs associated with a range of energy storage technologies — from lithium-ion batteries to pumped hydro storage.

The study found there is considerable potential for the deployment of cost-effective energy storage today and, with decreasing battery costs, much more potential in the coming decade. "For example, in the moderate range of capacity, like the 300 megawatts of energy storage capacity Duke Energy has proposed to build over the next 15 years, energy storage could offset the construction of a gas power plant," says **JEREMIAH JOHNSON**, CCEE Associate Professor. "At the high end, more than a gigawatt, you offset the need for multiple power plants — and potentially provide the infrastructure necessary to expand the development of renewable power sources, such as wind or solar."

"Energy storage has value beyond its relevance to renewable energy," says DeCarolis. "For example, power utilities have to balance electricity generation and consumer demand. Energy storage gives utilities a potentially more efficient way to do this, driving down costs."

The full study, available at go.ncsu.edu/energy_storage, will be used to inform the NC General Assembly as they explore new energy policy options in the coming term. ■

Protecting our nation's highway and bridge workers

There are over 4 million miles of roads and 600,000 bridges in the U.S. The services of workers who maintain and operate them are fundamental to sustaining the nation's infrastructure and for the safety of more than 200 million daily commuters. However, the workers themselves are highly susceptible to being injured on the job. Unfortunately, more than 26,000 serious injuries are reported among these workers every year.

Apart from being struck by vehicular traffic, these workers suffer a disproportionate number of falls — particularly when working at heights on bridges. When working on the deck, they rely on existing guardrails for their protection against falls, but most bridge guardrails do not offer a sufficient barrier height as required by regulatory bodies. This issue has resulted in an unacceptable number of falls from bridge decks and is a nationwide safety issue.

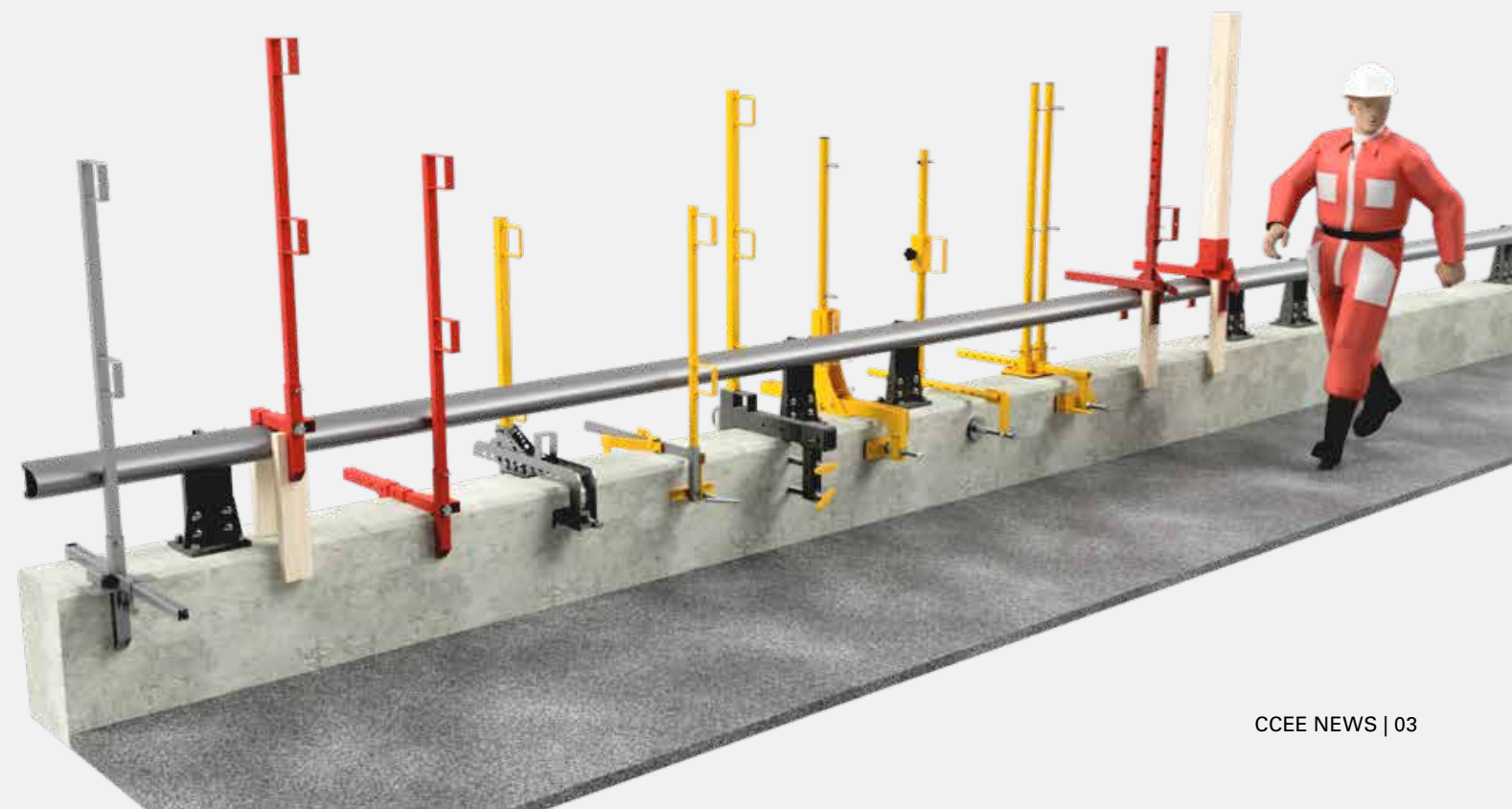
To prevent such falls, some transportation departments have begun adopting fall protection devices, which can be installed over bridge guardrails to temporarily increase the barrier height. However, many of the available devices are not compatible with or do not firmly attach onto every bridge guardrail. Therefore, transportation agencies have to assess compatibility of these devices with existing bridge guardrails. This assessment has been performed using an inefficient trial-and-error based approach, in which the devices are purchased, transported, and

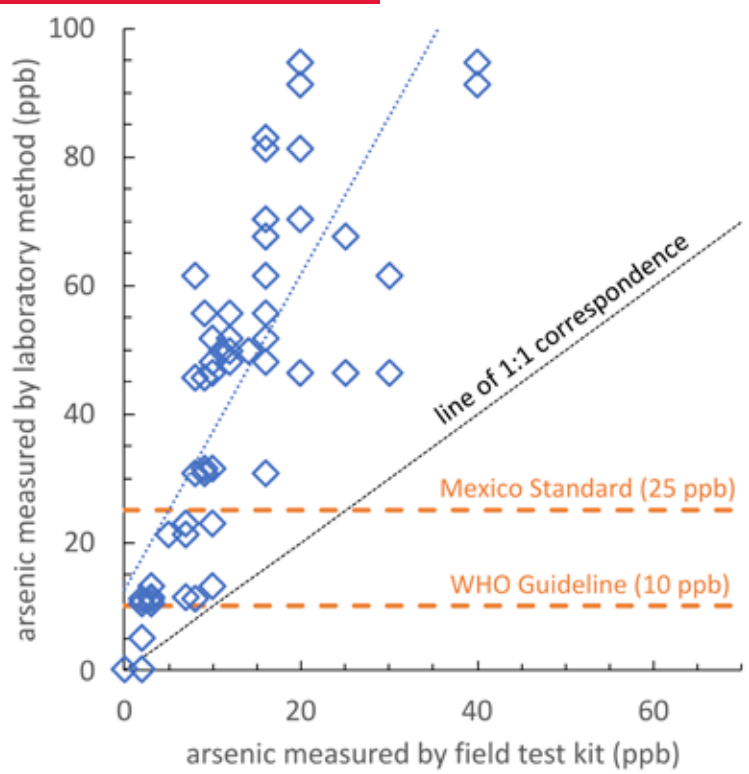
iteratively tested on a number of guardrails. Apart from being expensive, the approach also exposes workers to unnecessary safety risk.

To address this issue, Dr. **ALEX ALBERT** along with Ph.D. student **CARLOS ZULUAGA** developed a safe, cost-effective, and efficient approach to assess the compatibility of protective devices with existing bridge guardrails. The approach leveraged the strength of 3D virtual modeling to assess compatibility using computer visualizations. Their approach involved extracting design features of bridge guardrails from various sources including design drawings and performing a market analysis of available fall protection devices. Using the design feature data, 3D visual models of existing guardrails and commercially available fall protection devices were built, and compatibility was assessed by bringing both elements into the same virtual environment.

Using the proposed method, suitable fall protection devices were identified for more than 22,000 bridge guardrails in North Carolina. The research team sees excellent potential for the approach to protect bridge worker across the United States and beyond. ■

Assessing compatibility between fall protection devices and NC bridge guardrails using 3D virtual models





Evaluation of arsenic field test kits as a learning exercise for engineering students in global water and sanitation

Correspondence between arsenic concentration in drinking water measured by field test kits (x-axis) and accurate concentration measured by laboratory method (ICP-MS) at RTI International (y-axis). If the field kits were accurate and precise, data points would fall on the line of 1:1 correspondence.

An estimated 150 million people in more than 70 countries around the world are exposed to elevated levels of naturally occurring arsenic in groundwater used for drinking and cooking. Inexpensive field test kits are readily commercially available and have been promoted for classifying the safety of water sources. In Spring 2018, Dr. **JOSH KEARNS** had his class conduct an exercise to evaluate the accuracy and reliability of the test kits. The results raise questions about the kits.

Working with Caminos de Agua, a nonprofit water and health development organization in central Mexico, and RTI International, a research institute in North Carolina, students in the class evaluated water samples collected by Kearns from community wells in rural villages in Guanajuato state and urban taps in San Miguel de Allende, Mexico. These water samples were spiked with known quantities of arsenic and analyzed using field test kits by Caminos de Agua technical staff in their field laboratory, as well as by students in the Water and Sanitation in the Developing World class. Arsenic concentrations measured using the field test kits were compared to concentrations measured by accurate laboratory methods using inductively coupled plasma mass spectrometry at RTI.

The class found that the field test kits registered arsenic concentrations that were 3 to 4 times lower than the laboratory method. The class determined that field test kits could not be used to classify waters as “safe” relative to the World Health Organization Guideline Value of 10 ppb to a 95% level of confidence.

The findings were a critical alert to Caminos de Agua, who had been tasked by the regional government to test water sources and provide water quality reports to water committees of 30 villages and municipalities. Using the field kits, all arsenic data were below the Mexican Standard and most were below the WHO Guideline Value. Subsequent laboratory analyses revealed all water sources to be above the 10 ppb WHO Guideline, and about 30% of samples even exceeded the 25 ppb Mexican Standard. Armed with the results of the classroom exercise, Caminos de Agua is now following up with communities regarding their water quality. Dr. Kearns’ research group is working with Caminos de Agua to develop low cost community and household water treatment systems using granular ferric hydroxide sorbent to remove arsenic. ■

In the latter part of 2018, CCEE faculty members contributed to efforts that resulted in more than **\$3.3 million** of new research support from federal, state, and private agencies and foundations. This support will enable faculty, their teams of graduate, undergraduate and postdoctoral researchers, and their collaborators to address a diverse range of problems in support of sustainable infrastructure and the environment in North Carolina and throughout the world.

Dr. **CASEY DIETRICH** will investigate the erosion of Hatteras Island during storms, with support from the U.S. Army Corps of Engineers. A model will be developed to simulate the breaching of the island during Hurricane Isabel (2003), which was selected due to the extensive observations of erosion during that storm, with the goal of predicting the size and location of the breach and its effects on waves and flooding. This model will lead to better predictions for future storms.

With support from the U.S. Department of Energy, Drs. **KEVIN HAN** and **ABHINAV GUPTA** will investigate ways to integrate design, construction, and testing processes to ensure the successful implementation and deployment of a new nuclear test reactor at a national laboratory. Their integrated approach will allow all stakeholders to identify and minimize risk together during design, construction, operation, and maintenance phases.

Dr. **DETLEF KNAPPE** will develop new materials for the selective removal of fluorochemicals from water. Knappe is working in collaboration with Dr. **WEI GAO** (NC State, College of Textiles) and Dr. **KEVIN O’SHEA** (Florida International University, Chemistry) on this NSF-funded project. At present, more than 6 million U.S. residents are estimated to consume drinking water that exceeds the EPA’s health advisory level of 70 ng/L for the summed concentration of just two fluorochemicals (perfluorooctanoic acid and perfluorooctane sulfonate), and improved methods for the treatment of contaminated water are needed.

Drs. **SANKAR ARUMUGAM** and **JOSEPH DECAROLIS** will investigate the intersection of food-water-energy systems and their implications for the regional/global economy. Their study is investigating the impacts of uncertain climate and development scenarios on two economically vibrant regions: the Southeast U.S. and the North China Plain. This project is a collaborative effort between the U.S. (NC State, University of Central Florida,

International Food Policy Research Institute) and China (Peking University, China Institute of Hydropower and Water Resources), with funding from the National Science Foundation in the U.S. and China.

Dr. **RANJI RANJITHAN** has received funding from the NSF to develop a new resilience modeling and analysis methodology to aid in making decisions about water infrastructure asset management, in consideration of both normal and emergency operations. Ranjithan’s research team will apply and test their newly developed method on a major water utility. Water infrastructure system resilience improvement decisions must be considered as part of an ongoing cycle of preparation, adaptation and recovery.



Dr. Eleni Bardaka gives a presentation regarding transit-induced gentrification.

Dr. **ELENI BARDAKA** will investigate how access to transit, transit ridership, and traffic congestion will be impacted by shifts in demographics and the introduction of new mobility services. With support from the Southeastern Transportation Research, Innovation, Development and Education Center (STRIDE), a university transportation center funded by the U.S. Department of Transportation, Bardaka will study access

to public transportation in consideration of suburbanization of poverty, transportation network companies, healthcare access, and vulnerable populations. Bardaka will collaborate with faculty from Georgia Tech, UNC Chapel Hill, and the University of Florida.

The research projects in this section were all awarded by the North Carolina Department of Transportation (NCDOT).

Dr. **ALEX ALBERT** will examine worker compensation claims data to identify causal factors associated with a disproportionate number of injuries. Using these findings, feasible interventions and policy changes will be developed and implemented. The research will contribute toward improving the safety and wellbeing of the state's employees.

Drs. **GEORGE LIST, BILLY WILLIAMS,** and **DANIEL FINDLEY** were awarded a project to study the freight needs of rural North Carolina. Rural areas have special demands that are driven by the prevailing economic activity. The project will examine current economic activity and how it is expected to change in the future, and use this information to identify the associated transport and related infrastructure needs. The research will result in suggestions to NCDOT about how transport and infrastructure needs might be met through capital investments, as well as partnerships with other state agencies and nearby states.

Drs. **MIN LIU** and **WILLIAM RASDORF** will conduct research to develop recommendations on how North Carolina's street-aid allocations should be adjusted to address the impacts of seasonal population shifts and a large military presence on local roads. The current distribution of funds does not account for these high-impact, part-year traffic loads. The findings will help NCDOT improve decision making to enhance the equitable distribution of maintenance funds.

Drs. **ELENI BARDAKA, GEORGE LIST, NAGUI ROUPHAIL, BILLY WILLIAMS,** and **CHRIS FREY** were awarded a project to study the transportation, economic, land-use, and environmental impacts of autonomous vehicle (AV) technology in North Carolina. The study will provide recommendations to NCDOT regarding changes in policies and regulations, future test infrastructure, and research priorities in the area of AV technology. The NC State faculty will collaborate with Dr. Missy Cummings, Director of the Humans and Laboratory Lab at Duke University.

Drs. **ELENI BARDAKA** and **DANIEL FINDLEY** will study the contribution of different vehicle classes to the deterioration, as

well as the financing, of highway infrastructure. The research will examine whether the current tax and fee structure is equitable, and evaluate alternative infrastructure funding mechanisms based on revenue potential, financial sustainability, ease of implementation, and public perception.

Drs. **SHANE UNDERWOOD** and **CASSIE CASTORENA** will investigate whether the material factors currently used for pavement design are representative of modern paving materials. Currently NCDOT uses structural layer coefficient values that are based on a test road constructed and evaluated in one climate zone and with one set of materials. More recent material selection and design have resulted in substantial changes in asphalt concrete and aggregate base since the values were originally set. Improving these material factors could result in substantial cost savings by reducing the required pavement thickness and/or leading to pavements that require less frequent rehabilitation and reconstruction.

Dr. **CASSIE CASTORENA** will investigate asphalt mixtures containing reclaimed asphalt pavement and reclaimed asphalt shingles. The use of recycled materials in pavements has increased in recent years. However, there is uncertainty in the extent to which recycled binders melt and blend with virgin binders, making it difficult to select materials and develop asphalt mix designs. This project will enable improved practices, which could result in pavements that consume less virgin materials and last longer.

Dr. **RICHARD KIM** will work with NCDOT and the Geosynthetic Materials Association to develop a plan for the use of an improved geosynthetic pavement interlayer material in road design. This project will develop recommendations on how to choose appropriate geosynthetic pavement interlayer products for a specific application based on performance data.

Dr. **NAGUI ROUPHAIL** will develop a statistical model to predict lane change intensity in urban interchange influence areas in North Carolina. The overall objective is to remedy the excessive levels of discretionary lane changes occurring in urban locations. The research will predict how driver lane changing behavior is impacted by local traffic density and by the site geometric conditions. A second objective is to ascertain whether changes in signing, markings, or other traveler information can induce fewer discretionary lane changes through better lane pre-positioning of exiting vehicles thus mitigating the unnecessary traffic turbulence near interchanges. Currently NCDOT has no access to road sensors that can track lane changing behavior. ■

NEW FACULTY

Giorgio Proestos brings expertise in reinforced and prestressed concrete structures



Dr. Giorgio Proestos

conduct his experimental work at the department's Constructed Facilities Laboratory.

Proestos earned his Ph.D. (2018) from the University of Toronto and conducted some of his dissertation research at the Istituto Universitario di Studi Superiori di Pavia, Italy. His

Dr. **Giorgio Proestos** joined the department as an assistant professor in January 2019. His research focuses on developing tools and models for engineers to predict the behavior of reinforced and prestressed concrete structures subjected to extreme loads. His research also includes large-scale experimental testing of concrete structures using complex control methods. He will

doctoral research focused on the shear and torsion response of concrete structures and included an extensive experimental program. Proestos also holds an M.A.Sc. (2014) and a B.A.Sc. in Engineering Science (2012) from the University of Toronto. In recent years, Proestos has provided expertise to engineers in several specialized situations including the forensic investigation of structures and dispute resolutions.

Proestos will teach an undergraduate course on reinforced concrete structures (CE327) this spring and a graduate course on prestressed concrete structures (CE522) in the fall. As a part of these courses, he will teach students the fundamentals of how concrete structures behave and how to design them safely. He will also show real examples to demonstrate the relationship between the classroom and engineering practice.

Originally from Toronto, Proestos is excited to explore the mountains and forests of North Carolina. He is also looking forward to exploring the world-famous golf courses in the area. ■

Three CCEE faculty receive Distinguished Professor Recognition in 2018

In 2018, the College of Engineering bestowed three of our CCEE faculty with the title of Distinguished Professor.



Dr. Mohammed Gabr

"Throughout my career, I have had the unwavering support of my family, the guidance of my mentors, excellent collaborations with my colleagues, and the invigorating challenges offered by our amazing students. Whenever I have endeavored to empower the process of discovery in the classroom, I have felt the most professional and personal fulfillment."

-Mohammed Gabr

Dr. **Mohammed Gabr** was named Distinguished Professor of Civil Engineering and Construction. Gabr joined our department in 1998.

His research focuses on innovative soft soils evaluation and improvement techniques, and the development of innovative measures for rehabilitation and improving the functionality of flood defense earth structures under extreme storms. He has

also worked on the recovery of energy from the ocean, having provided innovative contributions in the area of anchoring and stability of marine hydrokinetic energy devices and the development of offshore compressed air energy storage systems. "Recovery of energy from the ocean has the potential to make significant and far-reaching impacts on our society, the environment, and the economy," Gabr said. "It is exciting to be able to generate new knowledge in such impactful areas."

Gabr has served as interim director of the NC Renewable Ocean Energy Program for the past three years. He also serves as the Editor-in-Chief of the American Society of Civil Engineers Journal of Geotechnical and Geoenvironmental Engineering.

Gabr is a Fellow of the American Society of Civil Engineers and was inducted as a Diplomat of the Geo-Institute Academy



Detlef Knappe

joined our department in 1996 after completing his PhD at the University of Illinois. He has conducted research on water quality and treatment for 25 years and is a recognized leader in the field. He is interested in drinking water quality and treatment, water reuse, the development of processes to remove organic micro pollutants from drinking water and the fate of organic pollutants in solid waste landfills. In recent years, Knappe has led efforts in North Carolina and nationally to identify contaminants of emerging concern in drinking water, and to develop and evaluate technologies for their removal. His research resulted in the identification of a contaminant known as GenX in the drinking water supply affecting more than 200,000 residents in the

“It was certainly a very happy moment, when I learned about being named the S. James Ellen Distinguished Professor of CCEE. I feel very thankful for Mr. Ellen’s support of our Department and the opportunities that the Distinguished Professorship provides for my research group. His generosity is contributing to our ability to improve drinking water quality in NC and beyond.”

-Detlef Knappe

Dr. **Detlef Knappe** was named the S. James Ellen, Jr. Distinguished Professor of Civil, Construction, and Environmental Engineering. Knappe

of Geo-Professionals in 2015. Among his many honors, he was selected to receive the ASCE Edmund Friedman Professional Recognition Award, received an NC State Alumni Outstanding Teacher award, and was elected to the NC State Academy of Outstanding Teachers in 2008. ■

Wilmington area. His efforts contributed to regulatory changes that stopped the contaminant from being discharged into the Cape Fear River.

In 2018, Detlef was selected to serve on the Science Advisory Board of the NC Departments of Environmental Quality and Health and Human Services. He also serves as Trustee for the Water Science and Research Division of the American Water Works Association.

Knappe is a recipient of the NC State Outstanding Teacher Award, the Kimley-Horn Faculty Award for excellence in graduate and undergraduate teaching, and the Young Civil Engineer Achievement Award from the University of Illinois. In 2018, he was also honored with a Green Tie Award by the NC League of Conservation Voters and with a Pelican Award from the NC Coastal Federation.



Nagui Roupail

and Environmental Engineering. He has been a member of our faculty since 1994, and also served as director of the Institute for Transportation Research and Education (ITRE) at NC State from 2002-2017. During his tenure as Director, ITRE gained national prominence as a top research institute in transportation operations. Indicative of this success was an increase of 90% in ITRE’s research expenditures and the annual engagement of dozens of graduate students into ITRE research and development projects.

Roupail’s research interests are in the analysis and optimization of traffic operations and vehicle systems. He has developed national standards for the analysis and design of

“I am delighted to receive this recognition from the university where I have spent over 25 years of my academic career. I give the most credit to the dedicated and hard-working graduate students who make us look good in the process of building their own academic pedigree. I am excited by where transportation mobility research is headed and am confident that our NC State group will meaningfully contribute in shaping its future.”

-Nagui Roupail

Dr. **Nagui Roupail** was named a Distinguished University Professor in the Department of Civil, Construction,

freeway facilities with consideration of non-recurring congestion effects, including incidents, special events and weather. This material has been published in the National Academy of Sciences Highway Capacity Manual and has been implemented nationwide since 2015.

Roupail has received 13 best paper awards along with his graduate students as co-authors. He also received the Grant Mickle National Best Paper Award in the areas of Transportation Operations, Management and Safety in 2010 given by the Transportation Research Board of the National Academy of Science. After stepping down as ITRE Director, Roupail was among a select number of faculty from across the University of North Carolina system to be named and awarded an RTI University Scholar grant. ■

Department roster of National Science Foundation Awards gets another boost in 2018

Every year the NSF receives about 50,000 research proposals from scientists and engineers in almost every discipline. Of those submitted, only about 12,000 will be selected for funding. Funding from this federal agency, which was established in 1950 to keep the United States at the leading edge of discovery, is highly selective and potentially career-changing. In this article, we describe the NSF CAREER award research of one faculty member as well as the work of five graduate students who are supported on prestigious NSF Graduate Research Fellowships. In total, 14 of our faculty have received early career awards from the NSF. This is one of the highest honors given to young faculty in science and engineering. In addition, 27% of the Department’s research is supported by NSF.



Dr. Fernando Garcia Menendez



“In addition to funding research in the traditional academic areas, the agency also supports ‘high-risk, high pay-off’ ideas, novel collaborations and numerous projects that may seem like science fiction today, but which the public will take for granted tomorrow. And in every case, we ensure that research is fully integrated with education so that today’s revolutionary work will also be training tomorrow’s top scientists and engineers.”

- NSF “WHAT WE DO”

CAREER AWARD - DR. FERNANDO GARCIA MENENDEZ

Dr. **Fernando Garcia Menendez**, an assistant professor in CCEE, received a Faculty Early Career Development award, known as the CAREER Award, in 2018. NSF awarded \$500,000 over five years to support his project, “Modeling and Educational Framework to Support Air Quality Management in a Smoky Atmosphere.”

The overarching objective of Garcia Menendez’s research is to describe interactions and relationships between environmental and human systems as they relate to air quality. He is developing computational tools to help U.S. land managers lessen the impact of air pollution from smoke to

human health, while at the same time restoring the natural fire cycle to improve ecosystem health. His research integrates land management and air quality to jointly consider wildfire risk, air quality, and public health impacts.

In partnership with the North Carolina State Division of Parks and Recreation (NC State Parks), he will also seek to change misguided perceptions of fire and smoke among the scientific and broader communities. Under his guidance, NC State students will work with environmental education and interpretation specialists within NC State Parks to design and carry out informational campaigns at locations where prescribed fire commonly occurs. These campaigns will include printed materials, signage, digital resources, surveys, and science presentations within parks and neighboring communities. In addition to a focus on preparing undergraduate and graduate students in effective science communication, Garcia Menendez will engage high school students with environmental research and encourage the participation of students from underrepresented groups in engineering. In the summer of 2018, Garcia Menendez started the “Future Ingenieros @ NC State” program and mentored 8 Latino high school students from throughout North Carolina as they worked on a week-long research project.

Garcia Menendez also has a focus on air quality modeling in Latin America and has established working relationships with Universidad de La Salle and the Universidad de los Andes in Colombia. His research has many policy implications. For example, in the area of wildland fires, his work helps to guide fire-related decision-making by integrating the externalities associated with different land treatments into land management strategies that minimize public health impacts under a sustainable wildland fire regime.

In addition to Garcia Menendez’s CAREER award, we also have 5 PhD students who have been supported by the prestigious NSF Graduate Research Fellowships.



Monica Camacho

MONICA CAMACHO: NSF GRADUATE FELLOWSHIP AWARDED IN 2018

Growing up in Key Largo, Florida, **Monica Camacho** witnessed the importance of maintaining good surface-water quality for the benefit of humans and the environment, inspiring her from a young age to protect our water resources. She is a first-year graduate student working with Dr. Tarek Aziz on research on the formation of harmful algal blooms in drinking water reservoirs. Camacho is developing an agent-based model to better predict the abundance of potentially toxin-producing phytoplankton present in a bloom under various engineered and natural conditions. Her goal is to have her model serve as a tool to better engineer our drinking water reservoirs, remediate impaired water bodies and forecast bloom formation as the climate changes.



Morgan DiCarlo

MORGAN DICARLO: NSF GRADUATE FELLOWSHIP AWARDED IN 2018

Morgan DiCarlo is a first-year Ph.D. student in the Computing and Systems area, who has always been passionate about water resources. In her dissertation research, under the guidance of Dr. Emily Berglund, she is studying how information spreads over social media during water-related crises, including hurricanes and drought, and how information diffusion affects water management strategies. DiCarlo is also part of a rapid response research team that collected data about how people used social media to seek help and rescue during Hurricanes Florence and Michael in 2018. Her research will report on the ways that communities use platforms such as Twitter and Facebook during flooding and drought, and the data she collects will be used to build models to support engineering design and management decisions.



Jacob Monroe

JACOB MONROE: NSF GRADUATE FELLOWSHIP AWARDED IN 2016

Jacob Monroe, a third-year Ph.D. student in the Computing and Systems area, has been fascinated with civil infrastructure since an internship with a wastewater utility as an undergraduate. In his dissertation research, he is exploring the dynamics

between distributed energy technology adoption and energy infrastructure. Under the guidance of Dr. Emily Berglund, he is developing a set of agent-based models to simulate how electric grids are changing with the adoption of distributed energy technology. For example, as households generate electricity through solar photovoltaic technology (i.e., solar panels) there are issues of excess electricity generation, electric grid stability, and perhaps the potential for homes with excess electricity generation to trade with neighbors. His research aims to develop new insights about the infrastructure challenges associated with uncontrolled rooftop solar technology adoption, assess alternative electricity market structures, and develop new operational standards for smart grids.



Liz Ramsey

LIZ RAMSEY: NSF GRADUATE RESEARCH FELLOWSHIP AWARDED IN 2015

Liz Ramsey, a Ph.D. student specializing in Water Resources, is passionate about water’s role in international development

and security. Under the guidance of Dr. Emily Berglund, Liz explored how consumers make water use decisions in Jaipur, India, by conducting surveys and developing new water resources models. In her Ph.D. studies, she is developing models to explore the connections among drought, rural to urban migration, and social unrest in Syria. She is simulating the loss of household income in rural areas due to the depletion of groundwater resources, and predicting how households will make decisions about migrating and joining protests. This research will develop new insights on the impacts of climate change and water resources on the security of nations.



Sonja Pape

SONJA PAPE: NSF GRADUATE FELLOWSHIP AWARDED IN 2015

Sonja Pape is a Ph.D. student who says she never planned on researching asphalt pavements, but found herself fascinated after a summer research opportunity as an undergraduate. In her dissertation research, under the direction of Dr. Cassie Castorena, she is improving understanding of how recycled asphalt materials behave in asphalt mixtures. At present, Pape is developing a procedure to fabricate asphalt specimens with a tracer additive to allow differentiation between the old and new asphalt using X-ray spectroscopy. She will use the procedure to evaluate how different laboratory sample fabrication procedures affect the interaction of new and recycled asphalt in an asphalt mixture. Ideally, her work will determine the most appropriate laboratory sample fabrication procedure to match what occurs in an asphalt plant, allowing for better quality laboratory research. ■

Zia Lecture features the ‘new New York bridge’

A riveting behind-the-scenes look at the design-build approach for one of the largest infrastructure projects ever completed in the U.S.

A FEW FACTS ABOUT THE BRIDGE

- Built to replace the existing Tappan Zee bridge over the Hudson River
- Traffic on the old bridge was exceeding capacity by 40%
- Estimates to maintain the old bridge were \$750 million/year
- The new bridge cost \$3.98 billion to design and construct
- 3.1 mile two-span bridge with four lanes of traffic on each span
- 330,000 cubic yards of concrete poured during construction
- More than 1,000 piles driven into the Hudson riverbed
- 192 cables on the bridge; 700 miles of strand in the cables
- New bridge can handle 140,000 vehicles a day

“The Zia Lecture has reached the point of, ‘Of course, we are going to see another miracle this afternoon.’”

– Donald Kline, retired P.E. (BCE 1953)
Member of first Zia Lecture Committee

The “new New York bridge”, officially named the Governor Mario M. Cuomo Bridge, replaced the Governor Malcolm Wilson Tappan Zee bridge. For many the bridge will always be referred to as simply the Tappan Zee. At one point the New York Times referred to it as the ‘Bridge of Grand Ambition.’ Whatever you choose to call it, most agree it’s an engineering and construction feat.

The 2018 Paul Zia Distinguished Lecture, attended by 600 engineers, faculty and students featured the iconic bridge.

Presenters included CCEE alumnus Mr. **Brian Keaney**, P.E. (BSCE 1993, MSCE 2000) Geotechnical Section Manager with HDR; Mr. **Gang Jiao**, P.E., Director of Design Engineering with Fluor; and Mr. **Ken Wright**, P.E., Northeast Area Principal Bridge Engineer with HDR.

By the time New York Governor Andrew Cuomo pushed through legislation in late 2011 to begin construction of the first design-build bridge in the state, the project had been in

Waterproofing membrane being applied to the eastbound span.
Photo from June 2018.

discussion for more than a decade, and over 150 concepts had been considered. However, once the request for proposals, which required a 100-year service life for the new bridge, was released in March 2012, things moved along remarkably fast. The contract was awarded in July of the same year, to Tappan Zee Constructors, LLC a consortium of design, engineering, and construction firms.



Ken Wright, Design Manager.

Pre-fabricated, repetitive elements to meet performance.

Ken Wright served as design manager for the bridge project. He reminded the audience that part of the structural design included making sure that as much of the work as possible could be done off the water, for both safety considerations and cost efficiency.

The project made extensive use of pre-fabricated and repetitive elements, which were constructed off-site and brought to the construction site by barge.

The substructure consisted of precast pile caps that were infilled with concrete batched on-site. The superstructure consists of an aesthetically pleasing 5 span steel girder assembly with the iconic main span being a twin-cable stay.



Workers help guide the placement of precast road panels.

The difference between low-price and low-cost.

Gang Jiao, PE, served as Tappan Zee Constructors’ Design Engineering Manager from early in the proposal phase, shaping the winning design-build strategy, and executing the design and construction. He began his talk defining the difference between “low-price and low-cost”. “Low price means you do the same work, but you bid low and we all know that is not sustainable,” Jiao said. “Low cost means you need to be creative and innovate to be competitive, versus simply underbidding.”



Gang Jiao, PE, was instrumental in shaping the winning design-build strategy.

The construction approach included off-site fabrication and modular assembly. Utilizing a large crane that had been built previously for a bridge project in Oakland Bay, and was owned by two companies who were part of the Tappan Zee consortium, led to the ability to lift larger spans and heavier sections creating an advantage in construction speed and cost savings. The modular approach to construction also minimized the need for dredging, which led to decreased costs, and lessened environmental impacts.

You can see more photos from the Zia Lecture and reception, as well as a few more photographs of the bridge on our Facebook page. All photographs of the bridge are used with permission by the New York State Thruway Authority. ■



A mobile batch plant supplied concrete to the project daily.

“My best work is underground.”

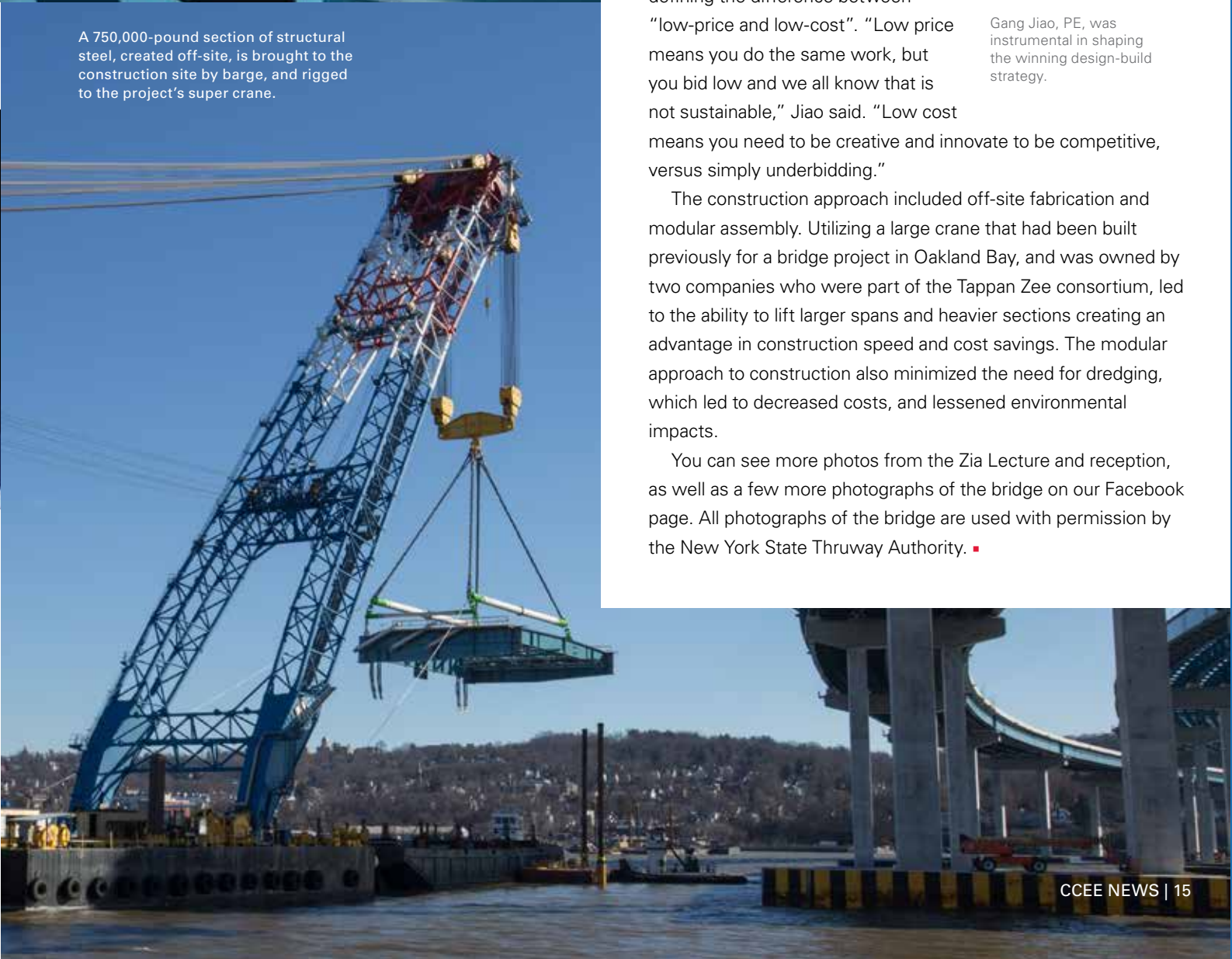
CCEE Alumnus Brian Keaney (BSCE 1993, MSCE 2000) served as deputy lead foundation engineer. He described the geotechnical challenges of building the bridge across the Hudson River, and while he provided numerous engaging photographs of the construction and finished phase, he joked with the audience that his best work was underground.

Numerous soil samples were required to characterize the subgrade and topology. Terrain types included river bottom, glacial till/bedrock, organic soils, sand, silt and clay.

A variety of foundation elements including H-piles, micro-piles, friction piles, end bearing piles, drilled shafts, and spread footings were used. Aggregate piers and earthquake drains were employed for areas susceptible to liquefaction. Roughly 80,000 tons of steel were employed, and the piles would be 50 miles long if stretched end- to-end.



CCEE Alumnus Brian Keaney at the 2018 Paul Zia Lecture.



A 750,000-pound section of structural steel, created off-site, is brought to the construction site by barge, and rigged to the project's super crane.

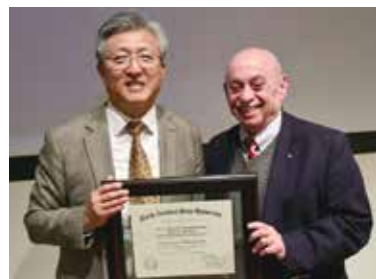
AWARDS & HONORS



Dr. Edward Jaselskis

Dr. **EDWARD JASELSKIS**, E.I. Clancy Distinguished Professor, received an Editor's Choice recognition for his publication entitled "Metrics That Matter: Core Predictive and Diagnostic Metrics for Improved Project Controls and Analytics." The paper, published in the *Journal of Construction Engineering and Management*,

provides a standardized approach for the selection and use of project control metrics for better assessment of project progress and performance, which is critically important to the successful delivery of capital facility projects. Core predictive and diagnostic metrics are identified that can help provide actionable insights into a project's actual progress, performance, and forecast at completion. This research is significant as it will help companies collect data on fewer metrics and know that the ones they use will provide the greatest insight on project progress, assessment, and forecasting.



Left to Right: Dr. Richard Kim and Dr. Louis-Martin Vega, Dean of the College of Engineering.

Dr. **YOUNGSOO RICHARD KIM**, Jimmy D. Clark Distinguished University Professor and Alumni Association Distinguished Graduate Professor, is the thirty-fourth recipient of the RJ Reynolds Tobacco Company Award for

Excellence in Teaching, Research and Extension. Kim gave his award lecture, titled "From Theory to Engineering Practice:

A 30-Year Journey," on November 12, 2018. The award was established in 1981 and honors a College of Engineering faculty member who has demonstrated superiority in areas that relate to the NC State's three-fold mission of teaching, research and extension. Kim's research is in the area of asphalt materials and pavements, and he is an international leader in the characterization of asphalt materials and pavements, pavement preservation and rehabilitation, and pavement performance modeling.



Right: Ashley Bittner

ASHLEY BITTNER, a Ph.D. student in Environmental Engineering, was awarded the Jacobs Network of Engineering, Technology, and Science (JNETS) Graduate Research Scholarship. Bittner is one of two local

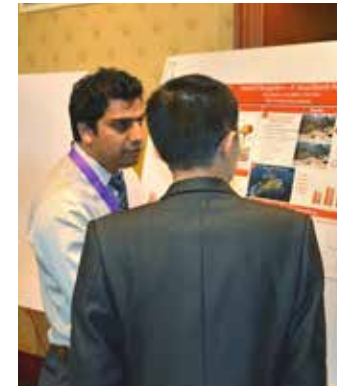
recipients for 2018. This scholarship, sponsored by the Jacobs Engineering Group, supports student research aligned with the regional Environmental Protection Agency's research agenda. Bittner's research is on low-cost air quality monitors, and her adviser is Dr. **ANDREW GRIESHOP**. Bittner was awarded the scholarship on November 7, 2018 at an awards dinner held in Durham, NC.



Left: Alireza Gharagozlou

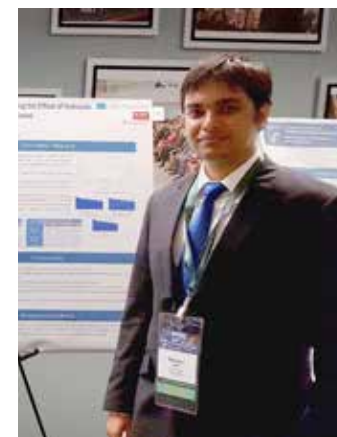
Ph.D. student **ALIREZA GHARAGOZLOU** was awarded the Student Educational Award at the American Shore and Beach Preservation Association (ASBPA) National Coastal

Conference in Galveston, Texas, on November 1, 2018. This award is given annually to an undergraduate or graduate student who, through his or her research, is furthering the state of the science of coastal systems as it relates to the goals and mission of the ASBPA. Gharagozlou is researching coastal erosion during storms, especially how to connect predictions of dune erosion to flooding of protected communities. He is advised by Dr. **CASEY DIETRICH**.



Idris Jeelani

Ph.D. student **IDRIS JEELANI** received the second-best poster award at the 2018 Construction Research Congress held in New Orleans. His poster, titled "Hazard Recognition – A Visual Search Perspective," presented research in which construction hazard recognition was examined as a visual search task using eye-tracking technology. The visual search task is similar to an individual searching for a product in a supermarket, or security personnel screening baggage at an airport terminal. The research is aimed at improving worker safety in the construction industry. Jeelani is advised by Drs. **ALEX ALBERT** and **KEVIN HAN**.



Rowshon Jadid

Ph.D. student **ROWSHON JADID** was a winner of the Student Paper Competition sponsored by the Association of State Dam Safety Officials Committee on Education Outreach in conjunctions with their dam safety conference in September 2018. His paper was titled "Deformation-Based versus Limit Equilibrium Analyses to Assess the Effect of Repeated Rise and Fall of Water Level on the Stability of Princeville Levee." He characterized the damage level resulting from hurricanes on the stability of the Princeville, NC levee. Jadid's work informs risk assessment and the development of a rehabilitation program for earth structures. He is working with Drs. **MO GABR** and **BRINA MONTOKA**.



Ashtad Javanmardi and Dr. Min Liu

Ph.D. student **ASHTAD JAVANMARDI** and Dr. **MIN LIU**, Associate Professor and Edward I. Weisiger Distinguished Scholar, received the Best Paper Award at the 2018 International Group of Lean Construction (IGLC). The paper, titled "Constraint Removal and Work Plan Reliability: A Bridge Project Case study," used Information Theory to analyze the amount of information gain and transmission efficiency in construction planning meetings. It also investigated the impact of uncertainty in information exchange on plan reliability and recommended an optimal order for planning meeting discussions to improve work-flow reliability.

They received the award at the July 2018 IGLC conference in Chennai, India.

Ph.D. student **ASHKAN NAFISI** was selected as the 2018-2019 recipient of the Vern Case Scholarship provided by the International Association of Foundation Drilling (ADSC). This scholarship is provided to support a student's academic and professional goals in the field of civil engineering. Nafisi evaluates the behavior of bio-cemented sand at micro- and macro-scales by conducting triaxial tests and a series of micro-scale measurements.

The scholarship was presented at the annual ADSC meeting in February 2019 in Nassau, Bahamas. Nafisi is advised by Dr. Brina Montoya.



Sierra Schupp

Masters student **SIERRA SCHUPP** was selected for a 2018-2019 Floyd Hasselriis award from the American Society of Mechanical Engineers (ASME) Materials and Energy Recovery (MER) Division. The award is given to a graduate student who is specializing in solid waste engineering. Schupp is studying the biodegradability of materials in landfills and the impact of elevated temperature on methane production in landfills. She is advised by Dr. **MORTON BARLAZ**.



Three new alumni inducted into the CCEE Hall of Fame

In early November of 2018, the department inducted three new members into the CCEE Hall of Fame. Established in 2017, the Hall of Fame welcomed its second class of inductees, including **Mr. John C. Brantley, III**; **Mr. Peter M. Lehrer**; and **Dr. William J. Wilhelm, Ph.D., P.E.**

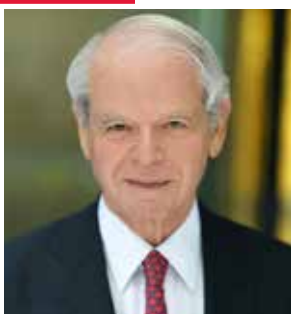


Mr. John Brantley

Mr. **Brantley** received his B.S. in civil engineering with a construction option in 1964. Following graduation, he went on to Northwestern University to complete a graduate degree before spending the rest of his career in the aviation field.

In the Fall of 1982, Brantley was asked to become Raleigh-Durham International's CEO, a position he held for 29 years. During that time, RDU grew into a major commercial service airport with 200+ daily departing flights.

Between 1982 and 2016, he taught a biannual course on airport planning and design in the CCEE Department as an adjunct professor. In addition to teaching, he helped to found the Advisory Board for the Department, is a Life Member of the Alumni Association, a longtime member of the Wolfpack Club, and a generous donor to the CCEE Department.



Mr. Peter Lehrer

Mr. **Lehrer** received his B.S. in civil engineering with a construction option with honors in 1963. In 1979, Lehrer co-founded Lehrer McGovern, Inc., a top-ranked construction management firm. They later merged with Bovis and he became vice chairman and chief executive of U.S. subsidiaries. In 1996, he founded Lehrer, LLC to provide construction consulting services. He is currently CEO of Lehrer Cumming. He has overseen projects that include the 1996 Atlanta Olympic Games, Disneyland Paris, restoration of the Statue of Liberty and Ellis Island. Lehrer is a member of the board of the National September 11 Memorial and Museum, the Statue of Liberty-Ellis Island Foundation and has chaired several government commissions focused on reducing costs and improving efficiency for multi-billion-dollar capital programs. Lehrer is a long time supporter of the department who credits his education with providing a critical foundation for his successful career. In addition to being inducted into the CCEE Hall of Fame, the College of Engineering also recognized Lehrer as a Distinguished Engineering Alumnus.

Left to Right: Mr. John C. Brantley, III, Mr. Peter M. Lehrer, and Mr. Robert Wilhelm accepting the award for his father Dr. William J. Wilhelm, Ph.D., P.E.



Dr. William J. Wilhelm, Ph.D., P.E.

Dr. **Wilhelm** received his Ph.D. in 1968 in civil engineering. Upon completion of his Ph.D., he accepted a position on the CE faculty at West Virginia University. While at WVU, he progressed through the ranks and served as chair and professor of civil engineering for five years. In 1979, he was selected by Wichita State University to serve as Dean of Engineering. He retired in 2000 and was named Dean and Professor of Engineering Emeritus. Wilhelm has been a long time member of the NC State Alumni Association and he and his wife, Patricia, have contributed to the College of Engineering Annual Fund for many years.

"We are here to celebrate accomplishments,"

Department Head Dr. Morton Barlaz told the audience of alumni, friends and family. He reiterated the selection criteria, which include:

- Service to the Profession including advances to the technology or fundamental principles of their chosen field or career.
- Service to the Local, National, or Global Community
- Service to the University
- Service to the Welfare of Society



Left to Right: Mr. John Brantley with Department Head Morton Barlaz.

Barlaz also spoke of the role of leadership, judgment, dedication, and of contributions to infrastructure. "It is my true honor to recognize such an accomplished group of people. I am so proud of the impact that our civil engineering alumni have in so many areas of society."

Each of the three new members spoke briefly upon receiving their award. The resounding themes were gratitude for family support; the role of professors in recognizing their strengths and guiding them toward their area of interest and eventual expertise; the importance of recognizing opportunity which sometimes presents itself in unexpected ways including just being in the right place at the right time; and that all accomplishments are the result of passion, persistence and teamwork. ■

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ALUMNI FEATURE



Left to Right: Charles T. Wilson, Chuck Wilson, Charlie Wilson. Photograph taken in 1993 in front of Mann Hall after graduation ceremony.

Meet the Wilsons: Three generations of CCEE graduates with a tradition of giving back.

To our knowledge, there is only one case in which three generations from one family have graduated from our department and also worked in the same family business. Meet Charles, Chuck, and Charlie Wilson, of the C.T. Wilson Company: Charles Thomas Wilson (BSCE 1930); Charles ‘Chuck’ Wilson, Jr. (BSCE 1965); and Charles ‘Charlie’ Wilson, III (BSCE 1993). As a family and as a company, they have contributed greatly to the community, the profession, and the department.*

When **Charles Thomas Wilson** graduated in 1930, he was one of 11 students to be awarded a degree in what was then designated as Construction Engineering. There were also 9 Civil Engineering Degrees, and 7 degrees awarded in Civil and Highway Engineering that year. It’s worth noting the steady growth of our department since then with 176 undergraduate degrees, and another 107 graduate degrees awarded in 2018.

In 1952, Charles founded C.T. Wilson Construction. Chuck remembers his father running the company from a backroom in their house for the first few years. Chuck also recounts that he began working ‘in the field’ for the company when he was only 11 years old. “My mom probably wanted me out of the house,” he jokes. But that early exposure to construction sites would influence him. After he received his B.S. in 1965, he immediately began pursuing his graduate degree, but by 1966, in the midst of the Vietnam War, he joined the Navy. He was commissioned as an Ensign, and worked as a Chief Engineering Officer on a ship. “I realized in the Navy, while sitting behind a desk as a structural engineer, that I had to have something that got me in and out of the office more. I knew construction engineering would do that. I got out of the Navy on Thanksgiving Day in 1969, and went to work with my father. By that point he had about 250 employees, and only 4 of them worked in the office.”

Chuck says he had to work his way up, and points out that his father, Charles, ran the company until 1980 when he passed the leadership to Chuck. When his father passed away in 1995, Chuck and his mother created the Charles T. Wilson scholarship. Additionally, Chuck and his wife Jean endowed the C.T. Wilson Construction Company Association of General Contractors (AGC) Student Chapter Fund to honor his Father’s role as a founder of the student chapter. The family has also been very active in the professional chapter, Carolinas AGC. Charlie is slated to serve as Treasurer in 2019, and President in 2021 — another example of the Wilson family’s leadership within the construction engineering profession.

When Charlie graduated from NC State in 1993, he went straight to graduate school and in 1995 received a Masters in

“I realized in the Navy, while sitting behind a desk as a structural engineer, that I had to have something that got me in and out of the office more. I knew construction engineering would do that.”

– Chuck Wilson

Civil Engineering specializing in Construction Management from the University of Texas. “I was already working before I even finished my thesis, and I stayed in Texas until 1997. That was the plan. I knew I needed to see how others did things,” Charlie declared, and his Dad echoed. “You don’t need to come out of college and go straight to work in the family business,” Chuck said. “The Navy did that for me.”



Chuck and Charlie Wilson review construction documents at the new science building jobsite on Durham Academy’s upper campus.

THREE GENERATIONS OF LEADERSHIP

In 2016, Chuck handed the official title of President to Charlie, and recognizes that his son was really running the company for 4 to 5 years before that. Besides the setback from the 2008 recession, the company has grown steadily, doing about \$90 million in projects last year. There are 90 employees, including 30 superintendents and 10 project managers. Many of the construction jobs are now filled by sub-contractors. Charlie, who also grew up working on construction sites, says many of the master carpenters on their current jobs are people he worked for as a kid.

STAYING CONNECTED

Chuck has served many years on the Engineering Foundation Board. One time per year, Chuck and Charlie attend a student

chapter AGC meeting, and they both work at the Career Fairs. “We want the brightest and the best to hire, so we like to have our company represented. I like them to see our faces, and I want to get to know the students also,” Chuck says. “You always learn something new staying involved,” Charlie adds.

“CCEE has trained all our owners,” Chuck says. “For that, we are very much in debt.”

The family, and the business, have made significant contributions toward the building of Fitts-Woolard Hall, our new home on Centennial Campus. The undergraduate suite is named in honor of Chuck and Jean Wilson, and the graduate suite of offices is named in honor of the C.T. Wilson Construction company.

Students for generations to come will know about the multi-generational success and benevolence of the Wilsons: Charles, Chuck, and Charlie.

**EDITORS NOTE: At the winter graduation ceremonies, we met another 3 generations of graduates from the same family. The photo below was taken after graduation. If you have other examples of three or more generations from the same family all receiving their degrees from our department, please reach out to us with that information. ■*



Another family with three generations of graduates from our Department! L to R, Victor Patrick Thompson from the class of 1958, Victor Tucker Thompson, class of 2018, and Victor John Thompson from the class of 1981!

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.

Connect with us on social media to keep up with the latest news.



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NC State Civil Construction and Environmental Engineering

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

Name, Address, and Email: _____

Company Name and Address: _____

Degree, Major, Class Year, and Announcements: _____

STUDENT GROUPS

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

AMERICAN CONCRETE INSTITUTE (ACI)

A team of four students represented NC State at the International “Pervious Concrete” Student Competition at the Fall 2018 ACI Convention in Las Vegas, NV. The NC State team prepared test specimens and a report documenting their mixture proportions and design approach. Their goal was to produce a specimen with optimal hydrologic and strength performance. NC State placed 2nd on the quality of their report and 12th overall among 54 teams from around the world.

The team also visited the Hoover Dam and participated in various ACI Committee meetings, technical presentations, and Student-Faculty-Industry liaison activities.

“It was neat to see the ACI community and to network with some of the great minds when it comes to concrete! Getting to learn more about mix designs and the mixing process will be useful in my career. Also, a trip to the Hoover Dam was something that I will never forget!” said senior Nathan Choplin.



NC State team at the Fall 2018 ACI Convention. Left to Right, Francisco Jativa, Nathan Choplin, Alexandra Farraher, Lauren Hedley, Roberto Nunez.

COASTS, OCEANS, PORTS AND RIVERS INSTITUTE (COPRI)

The COPRI Student Chapter held their first service event in November 2018. “In line with our mission, this year we volunteered with the North Carolina Coastal Federation on their Living Shoreline Reef and Marsh Monitoring project,” said chapter secretary Johnathan Woodruff. Student members volunteered at an oyster reef monitoring event at Morris Landing to evaluate oyster recruitment on new reefs. Members were able to see

sustainable ways of working with living shorelines.

“This event taught us how to identify and measure local fauna and flora growing on the oyster reef and in the surrounding marsh,” Woodruff added. “We were educated on some of the best practices for designing the reefs and what goes into maintaining them. It was awesome to see how well the reefs withstood the impacts of Hurricane Florence where many hard structures like bulkheads in nearby areas failed.”



Left to Right: Evan Beyerl (NCCF intern) Jashira Torres, Faith Johnson, Caleb Mitchell, Jonathan Woodruff, Russell Nasrallah, Grayson Sanner (NCCF intern) Alireza Gharagozlou, Ted Wilgis (NCCF).

EARTHQUAKE ENGINEERING RESEARCH INSTITUTE (EERI)

The 2018 EERI distinguished lecture was held on Centennial Campus in November and given by Dr. Reginald DesRoches, who is the William and Stephanie Sick Dean of Engineering at the George R. Brown School of Engineering at Rice University. DesRoches was the recipient of the 2018 annual distinguished lecture award of the EERI, which is conferred to recognize and encourage communication of outstanding professional contributions of major importance for earthquake hazard mitigation.

About 40 people attended the lecture, including professors, graduate, and undergraduate students from CCEE and other departments at NC State. The presentation highlighted the growing applications of smart materials, specifically shape memory alloys, in improving the performance of structures subjected to earthquake loading. These materials have the unique property of undergoing large deformations while still being capable of reverting back to their original undeformed shape.

“I had previously heard Dr. DesRoches lecture during the EERI annual meeting held last summer in Los Angeles, CA,” said graduate student and president of the student chapter Ariadne Palma. “I was really happy that many of my fellow students and co-workers at NC State also got the opportunity to hear this very informative and engaging lecture.”



Left to Right: Vice-president, Ishika Chowdhury, and president of the chapter, Ariadne Palma, with Dr. Reginald DesRoches outside the Constructed Facilities Laboratory on Centennial Campus.

GEO-INSTITUTE GRADUATE STUDENT ORGANIZATION (G-I GSO)

The G-I GSO chapter hosted a guest lecture by Dr. Paul W. Mayne, Professor of Civil and Environmental Engineering at the Georgia Institute of Technology. The event was held in November, and Dr. Mayne discussed the measurement of soil parameters using the piezocone penetration and the flat dilatometer tests. More than 30 professionals representing private industry and government agencies were also in attendance.

The student organization also organized the 4th annual symposium on geotechnical engineering in June. The symposium was attended by practicing professionals, graduate students, and the faculty. The event included industry presentations and a student presentation competition. Best student presentations were conferred to three students including Rowshon Jadid, Amin Rafiei, and Arash Bozorgy. Dr. Roy Borden of NC State gave the keynote address entitled “Correct Calculations — Necessary but not Sufficient,” and Dr. Robert Bachus of Geosyntec Consultants also presented a talk entitled “Where are the Giants? A tribute to Professor George F. Sowers.” Sowers was the author of over 130 technical papers and eight books, including the well-known textbook Introductory Soil Mechanics and Foundations: Geotechnical Engineering that was used extensively in civil engineering curricula across the United States.

PROFESSIONAL ENGINEERS OF NORTH CAROLINA (PENC)

The student chapter of PENC hosted three Fall semester events that focused on professional mentorship, community service, and engineering licensure. The professional mentorship program was held in coordination with industry professionals representing the Central Carolina Chapter of PENC. As part of the program, 24



Left to Right: 1st row: Dr. Mohammed Mulla, Dr. Ashly Cabas (Faculty at NC State), Qianwen Liu, Jinung Do, Ashkan Nafisi, 2nd row: Ishika Nawrin Chowdhury, Md Ahsanuzzaman, Dr. Atefeh Zamani, Pegah Ghasemi, Zahra Faeli, Chunyang Ji, Dr. Arash Bozorgy, Rowshon Jadid, Dr. Seyyed Hamed Mousavi, 3rd row: Amin Rafiei, Dr. Robert Bachus, and Dr. Roy Borden (Emeritus Faculty at NC State).

NC State students were paired with industry mentors to discuss potential engineering paths and career opportunities. These relationships and discussions will continue throughout the Spring semester.

PENC members also participated in an annual stream cleanup in coordination with the Central Carolina Chapter of PENC, and partnered with Chi Epsilon to host an engineering licensure information session attended by more than 40 students. Andrew Ritter from the North Carolina Board of Examiners for Engineers and Surveyors (NCBEES) presented information on the fundamentals of engineering (FE) exam, the professional engineering (PE) exam, and the engineering licensure process. In addition, NC State Alumni Jon Becker, Lauren Wellborn, Erin Gallimore, and Sharan Suresha led a panel discussion on their experiences with the FE and PE exams and provided recommendations on effectively preparing for the exams.

NC AWWA-WEA (NC SAFEWATER)

In November members of the NC SafeWater student chapter attended the 98th NC AWWA-WEA Annual Conference in downtown Raleigh along with more than 1400 professionals. Students had the opportunity to attend seminars on water and wastewater treatment, water collection and distribution, and water policy and management. Ph.D. student Samrin Kusum earned second place in the student poster competition, with her poster “Reducing the Adhesion of Fat, Oil and Grease (FOG) Deposition on Sewer Line Surface”. ■



Left to Right: Casey Dolan, Janhavi Kulkarni, Pradnya Latkar, Samrin Kusum, Eric Polli, Giovanna Portioli, Monica Camacho and Chuhui Zhang.

How your support makes a difference.



Dr. Ashly Cabas' research focuses on the impact that local soil conditions have on ground motions, and elucidating the correlation between ground motion parameters and structural response and damage. Here she inspects a bridge after a recent magnitude 7 earthquake in Alaska.

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

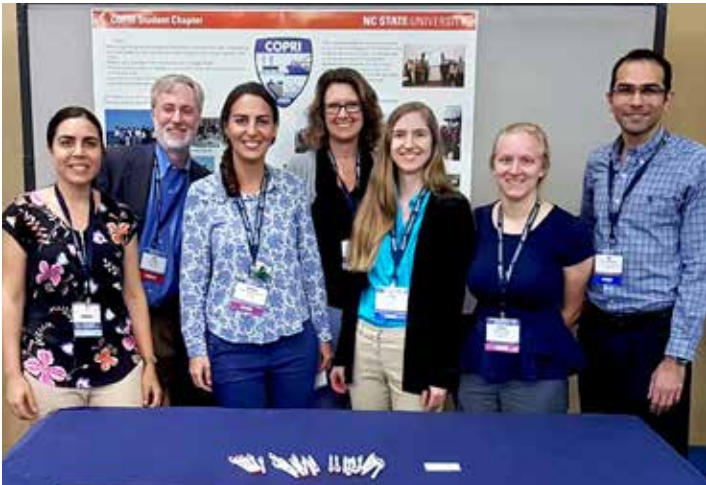
We strive to attract the best and brightest graduate students from the U.S. and around the world. Departmental rankings, faculty recruitment, research success, and undergraduate education all depend on the presence of talented graduate students. Competition for the best graduate students is intense, 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. Your support enables recruitment and retention of the best and brightest faculty and students, support for our student organizations, field trips to complement classroom instruction, and opportunities for faculty and students to present at conferences in their fields of study. Our enhancement fund is critical to the department as we strive to continue to provide opportunities for students and faculty.



RECOGNIZING OUR CORPORATE SPONSORS

Our corporate sponsors provide support for our faculty and students. Sponsorships are also available for this newsletter, the welcome back ice cream and our graduate symposia. These symposia allow students to prepare a poster to describe their research and make a presentation to the local engineering community. The activities of our student groups (see page 22) are also dependent on external financial support.

The **Firm of the Month** program recognizes corporate partners who have made an ongoing commitment to the department. It allows us to thank and promote our partners

while educating our students about current engineering practice. Firms prepare a series of slides for our monitor in the lobby and also display posters throughout Mann Hall to highlight notable projects. Firm of the Month provides participating firms with name recognition for recruiting and business opportunities, demonstrates to students the ways that they can use their degrees after graduation, and provides information on employment opportunities. Firms may also set up information tables in the Mann Hall lobby. Our most recent Firms of the Month include Allen Myers, Mckim & Creed, and Withers Ravenel.



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 or **919.515.7738**.

2018 Corporate Donors

The firms listed here have provided endowments or made contributions between August 2018 to December 2018. Many on the list have supported multiple activities in the department. We are grateful.

AECOM	Dewberry	LHC Structural Engineers	Smith Gardner, Inc.
Alpha & Omega Group	ECS Southeast, LLP	Little Diversified Architectural Consulting	Spectra Engineering & Design
American Society of Civil Engineers Eastern Branch	Ellinwood + Machado, LLC	Lysaght & Associates	Stantec Consulting
Anderson Hydra Platforms, Inc.	Exxon Mobil Company	Mead & Hunt	Structural Engineers Association of NC Triangle Chapter
Andrew Consulting Engineers, PC	Fluhrer Reed	Metcon, Inc.	TEP OPCO, LLC
Ashland Construction Company	Fluor Enterprises, Inc	Metromont Corporation	Terracon Consultants, Inc.
Balfour Beatty Construction	GeoStructures, Inc.	Pope Custom Homes, Inc	Timmons Group
Beam Construction Company, Inc.	Haskell Company	Schnabel Engineering LLC	Trader Construction Company
Brasfield & Gorrie	Hazen and Sawyer	Securitas Electronic Security, Inc.	Vaughn & Melton Consulting Engineers
Cary Oil Foundation	HDR Engineering, Inc.	Shelco, LLC	Wetherill Engineering, Inc.
CT Wilson Construction	IQ Contracting, LLC	Simpson Engineers & Assoc.	
	Kimley-Horn and Associates, Inc.		

ALUMNI BRIEFS

RAASHEDUDDIN AHMED (Ph.D. 2013) has been working with ANSYS, Inc. in their headquarters at Canonsburg, PA, since his graduation, and is currently a Senior R&D Developer. Ahmed recently presented a paper at The Conference on Advancing Analysis & Simulation in Engineering in Cleveland, OH. The paper was entitled “A Gradient-regularized coupled damage-plasticity microplane model for concrete-like materials.” The analysis of concrete structures suffers from numerical stability issues. The novel concrete model presented by Ahmed tackles this problem through implementing an advanced “gradient regularization” scheme.

KEVIN B. CONNER (BSCE 1996) is the Chief of the Water Resources section of the Wilmington District of the U.S. Army Corps of Engineers. This section includes coastal engineering, hydraulics and hydrology, and water management activities for five reservoirs within the watershed boundaries of North Carolina. He is currently identifying coastal storm and flood risks along the Atlantic coast as part of the South Atlantic Coastal Comprehensive Vulnerability Study, which will be completed over the next year. His current projects include re-evaluation of the coastal storm risk management projects at Folly Beach, SC, Wrightsville Beach, NC, and Carolina Beach, NC. He has been with the District since 2001, and was promoted to section chief in 2015.

CHRISTOPHER G. CREED, PE (BSCE 1989) is the Principal / Vice President for Olsen Associates, Inc., a professional coastal engineering consulting firm in Jacksonville, Florida. He was the Engineer-of-Record for the recent restoration of a coral reef located about 1 mile offshore of Fort Lauderdale, where two ships had run aground and crushed the reef’s structure. Creed worked with the Florida Department of Environmental Protection’s Coral Reef Conservation Program to develop and implement engineering solutions to stabilize and rehabilitate the reef, which is now being



Another day at the “office” for Christopher Creed.

used for coral transplantation. The project focused on the use of a specialized underwater cement to recreate a stable structure, consistent with the natural uninjured reef.

KENNETH P. KEEL, PE (BSCE 1991) accepted a position with Pender County as the Public Utilities Director. He manages the water, wastewater, and solid waste departments from his office in Burgaw, NC. Keel is active in the Professional Engineers of North Carolina and NC Rural Water Association, holds several water and wastewater certifications, and is a licensed general contractor. He was designated a PENC Fellow in 2017, and PENC Engineer of the Year in 2012. He previously served as Town Engineer/Utilities Director of Hillsborough, NC for 18 years.

JAMES “JIM” KESSLER, PE (BSCE 1972) was named 2018-2019 President of the American Railway Engineering and Maintenance-of-Way (AREMA). Kessler has more than 45 years of experience in railroad engineering. He joined North Carolina Railroad Company in 2013 and has led many projects to completion including double tracking, new rail sidings in Johnston and Lenoir Counties, and the rehabilitation of the Trent River railroad bridge in New Bern.

KATELYN E. MUELLER (BSCE 2016, MSCE 2018) joined Cadmus, an energy and environmental consulting firm, as an energy storage analyst. As part of the Strategy and Policy practice in Boston, MA, she supports efforts for municipal and commercial clients related to energy efficiency, energy storage procurement, and resiliency planning in the face of climate change.

YURIY VEYTSKIN (Ph.D. 2015) completed a postdoctoral appointment in materials characterization at Sandia National Laboratories (Albuquerque, NM) and started a new position as a senior scientist at the Savannah River National Laboratory (Aiken, SC) in the Advanced Characterization and Processing Department. Veytskin works on developing additive manufacturing technologies and materials in support of Department of Energy missions. ■



Loose rubble was removed, boulders placed and underwater cement used to create a stable structure.



A view of Fitts-Woolard Hall construction taken in late December 2018. Photo provided by Clark Nexsen and SkySite Images.

Fitts-Woolard Hall: Supported and Constructed by Alums for the Next Generation

On December 12th, the highest beam on Fitts-Woolard Hall was placed and a traditional “Topping Out” ceremony marked that construction milestone. Dr. Louis Martin-Vega, Dean of the College of Engineering, spoke of the large numbers of alumni involved in both the design and construction, as well as those who have made financial contributions.

The project is on schedule, and plans are moving ahead quickly for our department to move into our new home on Centennial Campus for the beginning of the Fall 2020 semester.

NC STATE ALUMS CONTRIBUTION

416 + 15 Subcontractors or Vendor Managers
19 Design Team Members
382 Donors

WHO WILL CALL FITTS-WOOLARD HALL HOME?

1. Edward P. Fitts Department of Industrial and Systems Engineering
2. Department of Civil, Construction, and Environmental Engineering
3. College of Engineering Dean’s Administration

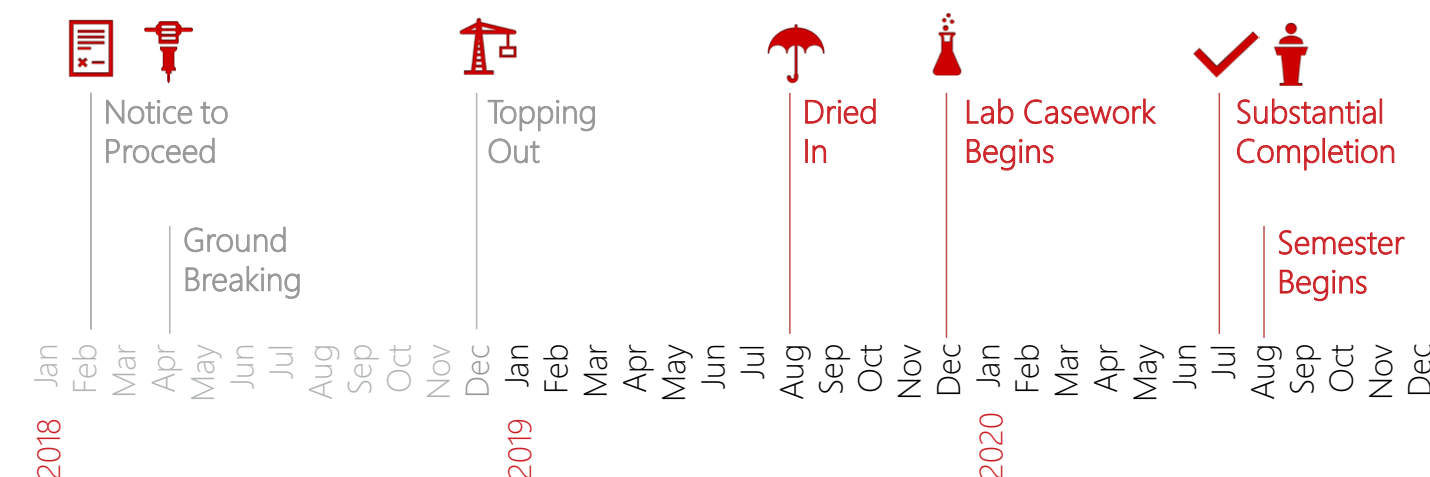


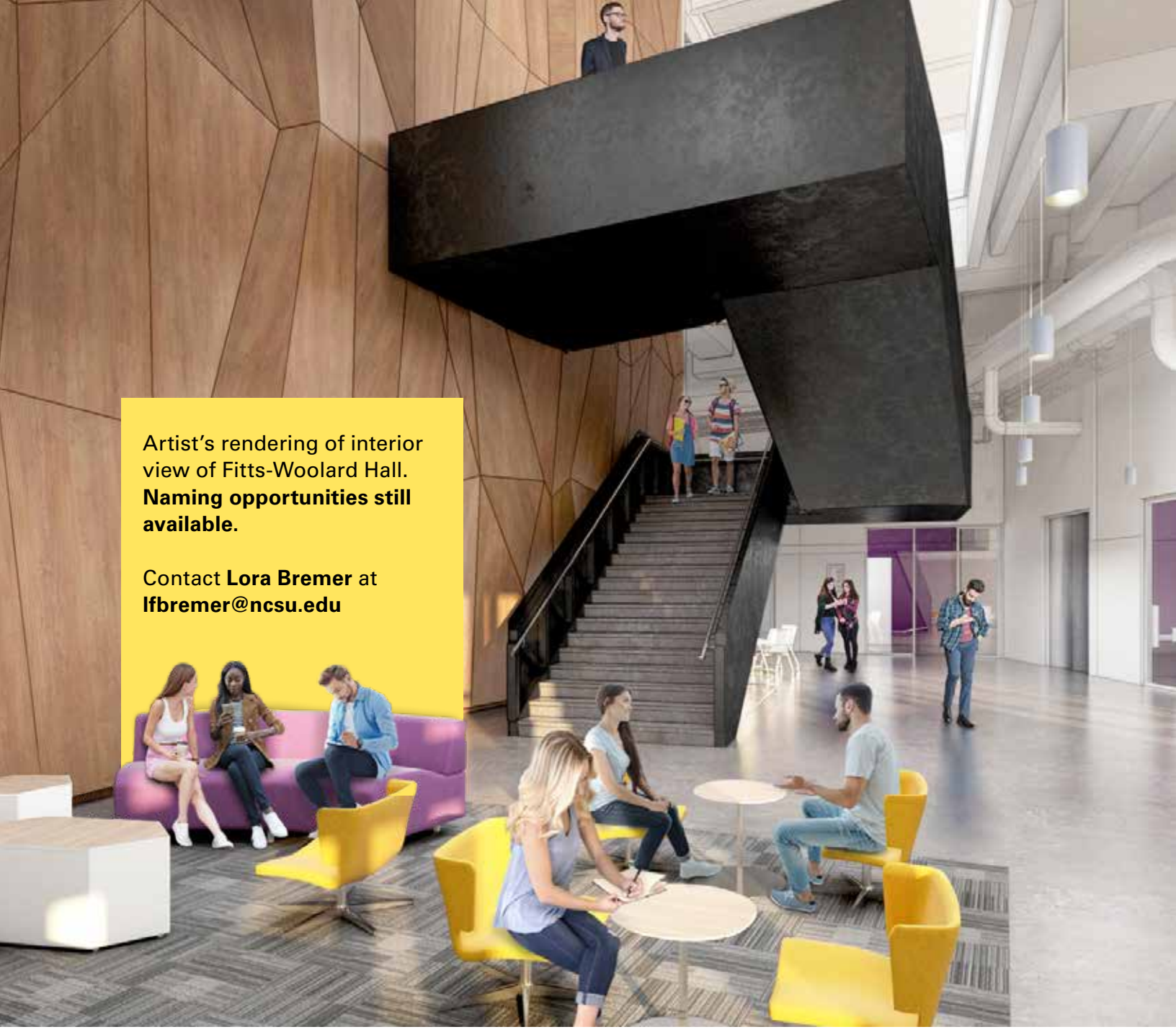
“When people ask me how it’s going I say it’s going great, we have a lot of alums who have their heart in this building. That is one thing that really makes this special.”

– Dr. Louis Martin-Vega

227,000 SQUARE FEET

Teaching Labs
Academic Classrooms
Research Labs
Departmental Offices





Department Advisory Board

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

Jennifer Brandenburg BSCEC 1986 Volkert	John Lucey McKim & Creed	Alan L. Stone BSCE 1987, MSCE 1989 Hazen and Sawyer
Heather Denny, Past Chair BSCEC 1995 Wells Global	Tonya Mills BSCE/BSENE 1994 Tri Properties Inc.	Gray Talley, Secretary BSCEC 1998 Shelco Inc.
Christine Herrick BSCE 2011 Kimley-Horn & Associates	Mike Munn BSCEC 1995 The John R. McAdams Company	Steve Thomas BSCE 1984, MSCE 1986 Sepi Engineering
Joe Hines BSCE 1991 Timmons Group	Dan Pleasant BSCE 1972, MCE 1973 Dewberry	Hans G. Warren, Jr. BSCEC 1984 Warco Construction, Inc.
Jonathan Holtvedt BSCE 2015, MCE 2017 Lennar Corporation	Bill Pope, Vice Chair / Nominating Chair BSCEC 1983 Pope Custom Homes	Mike Wayts Freese and Nichols, Inc.
Tyler Highfill BSCE 1992, MSCE 1994 Highfill Infrastructure Engineering, P.C.	Stacey Smith, Chair BSCEC 1992, MCE 2004 Smith Gardner, Inc.	
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YES, I WOULD LIKE TO SUPPORT CCEE

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☐ \$50 ☐ \$100 ☐ \$250 ☐ \$500 ☐ \$1000 other \$ _____

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Please enter your credit card number in the above spaces provided

Expiration date (month / year)

Your signature and date (above)

Investing in the Department

We ask that you 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, Inc. Please indicate on the check, or with a note, the purpose of your gift and that it is directed to CCEE. See form on **page 29**.

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. 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

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environmental engineering



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