

CCEE NEWS

DEPARTMENT OF CIVIL, CONSTRUCTION, AND ENVIRONMENTAL ENGINEERING



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CCEE graduate student Lexi Van Blunk in Quebec, Canada, working on an experiment to measure motion of objects along the coast.

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Jackie MacDonald Gibson

LETTER FROM THE DEPARTMENT HEAD

Welcome to our *Fall 2022 newsletter*. As CCEE's new department head, I follow in the venerable footsteps of Dr. **Mort Barlaz**. Dr. Barlaz oversaw double-digit growth in research funding and Ph.D. enrollments while maintaining CCEE's prized undergraduate program, awarding 200 degrees annually. During my first few weeks on the job, faculty, staff and students have uniformly shared that Dr. Barlaz nurtured a collegial environment that enables them to thrive while collaborating to solve the world's major engineering challenges.

Civil, construction and environmental engineering are in the national spotlight today more than ever. The new Bipartisan Infrastructure Law has committed \$1.2 trillion to rebuild the nation's infrastructure. Among other landmark provisions, the law mandates the largest investment in bridges since the interstate highway system was established, the highest allocation for passenger rail since Amtrak was created, \$55 billion for water infrastructure, \$50 billion for community climate resilience infrastructure, \$21 billion for hazardous waste site cleanup, the first national network of electric-vehicle chargers and the largest-ever federal investments in clean energy and public transit.

CCEE has the know-how to ensure these unprecedented investments are spent wisely. This newsletter features several stories illustrating how we are already contributing. Dr. **Brina Montoya** and Ph.D. student **Pegah Ghasemi** have pioneered biology-based methods to prevent coastal roadway erosion (*page 3*). Drs. **George List**, **Eleni Bardaka** and **Jeremiah Johnson** are building tools to decrease energy used by railways (*page 4*). Dr. **Katherine Anarde** and Ph.D. student **Thomas Thelen** are designing ways to protect coastal infrastructure from chronic shallow flooding (*page 5*). New CCEE research projects (*page 6*) are designing offshore renewable energy platforms, improving pavement durability, extending the lives of bridges and conceptualizing public micro-transit systems. Two CCEE faculty members have been appointed to national leadership positions that will influence how infrastructure funds are spent — Dr. **Chris Frey** as the Environmental Protection Agency's assistant administrator for research and development and Dr. **Joe DeCarolis** as administrator of the Energy Information Administration (*page 23*).

I arrived at NC State on Aug. 15 after three years as a department chair at Indiana University, Bloomington, and 12 years as a professor in the Department of Environmental Sciences and Engineering at the University of North Carolina at Chapel Hill. I have a dual Ph.D. degree from the Department of Civil and Environmental Engineering and the Department of Engineering and Public Policy at Carnegie Mellon University, a master's degree in civil and environmental engineering from the University of Illinois and a bachelor's degree in math from Bryn Mawr College. My research combines engineering and social science tools to solve complex problems at the intersection of science, technology and society.

I am pleased to welcome two other new faculty members: Dr. **Ghadir Haikal**, a structural engineer who works to improve the resilience of buildings and bridges (*page 42*), and Dr. **Idil Akin**, a geotechnical engineer who studies fundamental mechanisms controlling soil behavior (*page 44*).

Another CCEE change is the retirement of beloved professor Dr. **Jim Nau** after four decades (*page 38*). Former students call him "a terrific mentor who was incredibly humble and always put students first." Dr. Nau's legacy provides an enduring model of excellence in engineering education.

Over the next couple years, CCEE will hire five new faculty members to prepare for a major expansion of engineering education under the NC General Assembly's Engineering North Carolina's Future initiative. I encourage our alumni and other supporters to recommend applicants. Please contact me (jmacdon@ncsu.edu) to suggest candidates.

In closing, thanks to the entire CCEE community — faculty, staff, students, alumni, advisory board members and others — for the gracious welcome. I am humbled to join this exceptional group of scholars and practitioners.

Jackie MacDonald Gibson

CCEE Department Head



Dr. Morton Barlaz

STEPPING BACK

— A note from former Department Head Dr. Morton Barlaz

Dear Friends,

I have been at NC State since 1989 and have served as department head since 2010. It is now my pleasure to return to the faculty and turn over the reins to Dr. **Jackie MacDonald Gibson**. The past 12 years have been rewarding for me personally and for the department. We experienced many changes and have grown together. We are settled into Fitts-Woolard Hall. We moved in the middle of a pandemic, which brought its own set of challenges, but we were successful, thanks to the dedicated work of many. Our old home in Mann Hall will be used to meet other needs within the university after it undergoes major repairs.

We have hired 26 faculty since 2010, including our two newest members, Drs. **Ghadir Haikal** and **Idil Akin**, who joined us in August. Working with new faculty as they establish themselves is among the most exciting things that I do. Equally exciting is that faculty that we hired early in my time as department head are now taking on leadership roles in the department.

The university has put a lot of emphasis on increased enrollment in our Ph.D. programs while maintaining excellence at the undergraduate level. Ph.D. student enrollment has increased from 96 in the 2010-11 academic year to 152. Similarly, we have seen a 36% increase in research expenditures since 2010. Growth of this nature is due to the hard work of our faculty. I am thankful for the department's administrative team, including the associate heads for undergraduate programs, Dr. **Rudi Seracino**, and graduate programs, Dr. **Ranji Ranjithan**, as well as the director of our business office, **Ginger McGlamery**, and executive assistant, **Amy Alexander**. Everyone has been a pleasure to work with and continuously exhibited remarkable dedication to our mission.

As department head, I have had the opportunity to work with both faculty and the professional community on a variety of issues from research proposals to employer needs to the Paul Zia Distinguished Lecture Series. I learned a lot about civil, construction and environmental engineering through these interactions, and I am proud to have so many alumni who exhibit so much talent and commitment to the design, construction and maintenance of our public infrastructure.

Finally, I want to express my deepest appreciation for the support of so many dedicated CCEE alumni. Interacting with such a dedicated group of alums with a sincere interest in the well-being of the department has been gratifying, and I offer you my heartfelt thanks. I will remain in the department and look forward to continued interactions with you over time.

Sincerely,

Morton A. Barlaz

Distinguished University Professor



Ph.D. students in Montoya's research group working at NCDOT field site. Pegah Ghasemi (left) and Qianwen Liu.

RESEARCH UPDATES

How can we prevent erosion of coastal roads after storms?

Roadbeds supporting coastal highways in North Carolina are susceptible to erosion during large storms, when floods and waves can erode the soil and undermine the highway. Erosion at the interface of pavement and the subgrade can lead to the collapse of pavement and development of channels for flow across or along a barrier island. Preventing erosion of the subgrade soils and adjacent slopes can reduce damage to coastal highways and help maintain open and connected routes during the recovery period after major storms.

Associate Professor Dr. **Brina Montoya**, alongside graduate student **Pegah Ghasemi** (with fieldwork assistance from the Geo-Institute Graduate Student Organization), led a study funded by the North Carolina Department of Transportation (NCDOT) to assess the potential for biologically based methods to reduce erosion susceptibility of coastal subgrades. Her research group used natural soil bacteria to cement the soil together, a process called microbial-induced carbonate precipitation (MICP). The MICP process was applied to a sandy slope in Hertford County, North Carolina, at a NCDOT facility to study its ability to prevent erosion when subjected to the elements, including rain, wind and snow. Several methods to apply the MICP treatment were assessed for their ability to treat the surface of the slope over the design area, ranging from simple surface spraying to more complex shallow injections through geotextile drains. After the sandy slope was treated with MICP, the researchers monitored the slope over the course of a year to assess its performance when exposed to the elements.

The researchers found all application methods provided sufficient levels of cementation to the soil, and the simplest method, spraying the surface of the slope, resulted in the most uniform distribution of cementation. The sandy slope demonstrated a marked increase in erosion resistance, which was assessed immediately after the treatment and throughout the year of monitoring. The compressive strength of the cemented sandy slope also increased, which has implications for improved bearing capacity of the coastal rights-of-way.

Perhaps the most exciting result from this study was the performance of the MICP-treated slope. During the one-year monitoring period, the study area received cumulative precipitation of 738 mm (29") and experienced maximum and minimum temperatures of approximately 35°C and -8°C (95°F and 18°F), respectively. The field site was also subjected to a maximum average wind velocity that was higher than that needed to initiate wind-induced erosion. Researchers monitored soil performance periodically and after major events such as Hurricane Dorian. The cemented sandy slope behaved well with no apparent erosion. This study is the first to monitor a MICP-treated site for an entire year. The fact that no degradation of cementation took place when exposed to the natural elements helps advance the MICP technology toward mainstream implementation for soil improvement projects.

The work was recently published in the *Journal of Geotechnical and Geoenvironmental Engineering*. ■

CCEE AT NC STATE SUSTAINABLE INFRASTRUCTURE FOR SOCIETY

- **\$22.7 million** in research expenditures
- **270** ongoing research projects
- **17** winners of CAREER and other NSF young faculty awards
- **52** faculty members
- **290** graduate students
- **739** undergraduate students

How can we assess the challenge of reducing freight locomotive pollution?

Freight locomotives require massive amounts of energy — nearly four billion gallons of diesel per year — to move tons of goods and materials across the country. In a \$1.9 million project supported by Advanced Research Projects Agency-Energy (ARPA-E), CCEE researchers and their collaborators are developing an integrated approach to map out viable pathways for a low carbon future for rail freight.

Curbing the threat of climate change will require curbing greenhouse gases across every sector of our economy. In the U.S., the transportation sector is the largest contributor of greenhouse gasses and, while we are seeing more personal electric vehicles on our city streets, decarbonizing the rail freight industry will pose unique and difficult challenges. Reducing fuel consumption and the associated pollution will require careful planning and the strategic development of new energy infrastructure. Possible decarbonization routes include replacing diesel with freight electrification, hydrogen and biofuels, but each option carries with it advantages and disadvantages.

“NC State is perfectly positioned to address the challenge of reducing pollution from rail freight, given our long-standing strengths in transportation and railroad engineering, as well as our expertise in energy systems and life cycle assessment,” explained project lead Dr. **George List**, who is joined by Drs. **Eleni Bardaka** and **Jeremiah Johnson**, as well as collaborators at Virginia Tech, Oregon State University and DB Consulting. This team brings the diverse

set of expertise necessary to tackle this problem. Modeling efforts will include detailed consideration of single train performance, as well as system-wide behaviors through a multi-train network model. The project will also consider potential changes to the broader energy system, including the rapidly expanding share of renewable energy on our power grid, the shifting demand for freight and competition from non-rail alternatives.

“With global supply chains, our goods and materials are being transported over incredible distances,” Johnson said. “As we work to achieve massive reductions in our greenhouse gas emissions in the coming years, we must actively plan for a less polluting rail freight system.”

At the completion of this project, the team will release an open-source model that integrates train performance, network modeling and broader energy system futures to inform infrastructure planning and transportation policy to achieve emissions reductions for rail freight at the lowest possible cost.

The intent is that the model be used by various stakeholders to explore the impacts on decarbonization with different energy sources, which will also be influenced by government policy. Possible model users would be the railroads themselves, the American Association of Railroads (AAR), Surface Transportation Board (STB), Department of Energy, Department of Transportation, energy suppliers (such as utilities), researchers and policymakers. ■



How does chronic shallow flooding affect coastal communities?

The frequency of flooding in coastal communities is increasing, even when there is not a storm. These floods go by many names — sunny day floods, high tide floods, nuisance floods — and they can be caused by sea level rise, tides, wind, groundwater, rainfall runoff and river flows. In projects supported by North Carolina Sea Grant and the National Science Foundation, Dr. **Katherine Anarde** and Ph.D. student **Thomas Thelen** are trying to measure, model and understand the impacts of chronic shallow flooding in coastal North Carolina.

Tides now rise and fall on higher average sea levels, resulting in a higher frequency of “sunny day” flooding of roadways during high tides. Sea water can also infiltrate drainage networks at low tide levels such that ordinary rain storms now cause flash floods. The travel disruptions from flood-induced street closures, as well as damage to vehicles and infrastructure from salt water, can impose chronic stress on communities. At a local level, the causes and frequency of these floods are often not well understood, nor are the impacts to people and communities — partly because flooding by large storm events like hurricanes receives more attention, and partly because these hyper-local, multidriver floods are difficult to monitor and predict.

As part of a two-year North Carolina Sea Grant project that began in February 2022, Anarde and Thelen, alongside other researchers from the University of North Carolina at Chapel Hill, are working with the Town of Carolina Beach to deploy a real-time water level sensor network to continuously measure the stormwater network capacity. This data will validate a coupled hydrodynamic and hydrologic model of flooding in the town, which will then be used to simulate future flood risk and potential adaptation strategies. “I am passionate about this

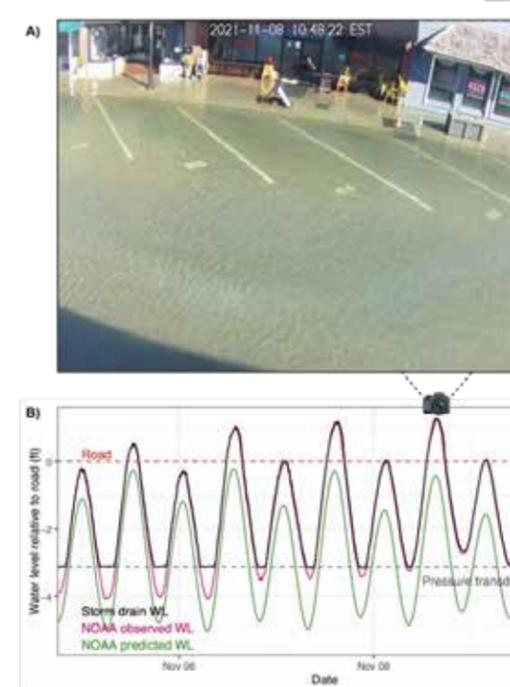


Photo of the flooded roadway during the highest observed water level on November 8, 2021. Bottom left: Measured water levels above the storm drain pressure transducer relative to the road surface. From Gold et al., (in review). Right: Thelen with a Sunny Day Flooding Sensor installed in a Carolina Beach storm drain.



project because it is science for action, shaped by community needs,” Thelen said. “The findings from this research will directly inform coastal resilience solutions and policies that will help our waterfront communities adapt to the rising seas of the coming decades.”

During the spring 2022 semester, Thelen organized a 20-person build-a-thon where students from NC State and UNC-Chapel Hill learned and utilized basic electrical engineering skills to construct 10 Sunny Day Flood Sensors (SuDS). These sensors have been deployed across North Carolina, including in Beaufort and New Bern, as part of the larger Sunny Day Flooding Project led by Anarde and Dr. Miyuki Hino, assistant professor at UNC-Chapel Hill. Real-time water level data from the SuDS are displayed online at go.unc.edu/sunny. Water-level data from the drain is supplemented with real-time photographs capturing the spatial extent of flooding. Email alerts are triggered when water levels approach the roadway, which allows for proactive implementation of flood warning measures by town staff. The SuDS in Beaufort has been operational for one year and has recorded 35 roadway flood events.

The Sunny Day Flooding Project was highlighted in the PBS documentary *State of Change* earlier this year. ■

In the first half of 2022, CCEE launched 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 in infrastructure and the environment in North Carolina and around the world.

FEDERAL GRANTS

Dr. **Katherine Anarde**, with support from the National Science Foundation, will collaborate with social scientists from the University of North Carolina at Chapel Hill to investigate the relationship between coastal flooding and human migration. Anarde will use custom sensors to capture detailed images of floods. The data on flood frequency will be integrated with measures of human intentions, capacity and actions regarding relocation. The goal is to provide new insight on the impacts of floods on coastal communities and how migration may unfold in the future as sea levels rise.

Dr. **Casey Dietrich**, with support from the Environmental Security Technology Certification Program, is working with collaborators at the University of Delaware and elsewhere to assess models for flooding at coastal military installations. The researchers are developing and comparing models for storm surge, waves and flooding at sites along the U.S. Atlantic and Gulf coasts and in the Pacific Ocean. This research will inform the selection of models for real-time predictions by the Department of Defense.

Drs. **Mo Gabr** and **Roy Borden**, in collaboration with Makai Ocean Engineering-Hawaii, received funding from the Department of Energy Advanced Research Projects Agency-Energy program to study the remote installation of micropiles — high-performance, high-capacity deep-drilled foundation elements constructed using high-strength, small-diameter steel casing and/or threaded bars — for various marine renewable energy harvest instruments including marine hydrokinetic energy devices, offshore floating wind turbines, geothermal energy harvesting foundations and offshore solar arrays.

STATE AND LOCAL GRANTS

Dr. **Shane Underwood** received funding from the Virginia Transportation Research Council to establish links between

the properties of asphalt mixtures and structural pavement design parameters. The study will use advanced asphalt mixture testing protocols, developed at NC State, to evaluate several asphalt mixtures from across Virginia and then input these properties into predictive models to evaluate the long-term performance of Virginia Department of Transportation (VDOT) pavements. This research provides a vital step to improving the long-term performance of VDOT's flexible pavements.

Drs. **Mervyn Kowalsky** and **Moe Pour-Ghaz** received funding from the Alaska Department of Transportation and Public Facilities (DOT&PF) to study the effects of structural condition (primarily due to the effects of aging, such as corrosion) on seismic performance. Currently, bridges are designed assuming that their properties remain constant throughout their service life. In this project, the research team will study how deterioration impacts the performance of bridges under natural hazards such as earthquakes. The team will conduct large-scale tests of deteriorated columns to understand the failure mechanisms so that adjustments can be made during the initial design phase to ensure that bridges achieve their intended objectives throughout their life.

Drs. **Kowalsky** and **Ashly Cabas** received funding from the Alaska DOT&PF to develop techniques for the rapid post-earthquake assessment of bridges. The research team will develop a methodology that will allow engineers to estimate the likely condition of a bridge following an earthquake using information related to the design details of the bridge and estimates of the seismic event. The research improves upon currently available techniques and is able to more accurately relate bridge damage to seismic demands. The approach will be deployed for the Alaska bridge inventory during followup activities.

Dr. **Kowalsky** also received funding from the Alaska DOT&PF to study the impact of directionality on the seismic design of bridges. Along with Ph.D. student **Ariadne Palma**, the team

will develop computational models of typical bridge typologies and subject those models to bidirectional earthquake inputs to study how the angle of attack impacts bridge response. The project will lead to the appropriate hazard definition that engineers should utilize to achieve a prescribed level of performance during an earthquake.

Dr. **George List**, with funding from the North Carolina Department of Transportation (NCDOT) and collaborators at UNC-Chapel Hill and Fayetteville State University, will conduct research to identify and adopt a new system for monitoring freight activity, especially truck weight distributions on highways across North Carolina. Their research will document the current and future expected use of weigh-in-motion data by different stakeholders including state and federal transportation engineers and private transportation companies.

Drs. **Anarde** and **Elizabeth Sciaudone** received funding from NCDOT to evaluate the resilience of coastal roadway networks to natural hazards. The research involves using network science and analysis to understand when the connectivity of road networks will be impacted during extreme events, both now and in the future, and which roadways and intersections are most critical for continued connectivity. Anarde will be deploying low-cost cameras with an onboard machine-learning algorithm for real-time detection of roadway flooding and communication of flood hazards.

Drs. **Sciaudone** and **Daniel Findley** (Institute for Transportation Research and Education) received funding from NCDOT to assess the vulnerability of the Ferry Division's assets to natural hazards including storms and sea level rise. The research will employ the Federal Highway Administration Vulnerability Assessment and Adaptation Framework to provide NCDOT with a list of facilities that may be vulnerable by 2040 and 2060, as well as potential adaptation alternatives. This project aims to assist the department with improving the resilience of all transportation modes across the state.

Dr. **Eleni Bardaka**, in collaboration with Kai Monast from the Institute of Transportation Research and Education, received funding from NCDOT to study new public microtransit systems — tech-enabled, on-demand shared transportation such as vans, shuttles or buses — in rural and suburban areas across North Carolina. This research will help transit agencies gain a better understanding of the benefits, costs and implementation challenges of microtransit.

Drs. **Brina Montoya** and **Gabr** received funding from the North Carolina Renewable Ocean Energy Program (NCROEP) to determine how the stability of the seabed affects the productivity and failures of marine energy-harvesting instruments such as wind turbines, devices to shore cable lines and open ocean aquaculture farms and their supporting infrastructure. The team will focus on how the stability of submarine slope is affected by site modifications and device installation.

Dr. **Gabr**, in collaboration with Dr. Wesley Williams (University of North Carolina at Charlotte), received funding from NCROEP to develop a prototype retrievable petal anchor used for anchoring multidirectional marine hydrokinetic devices, which capture energy from waves, tides, ocean currents, the natural flow of water in rivers and ocean thermal energy conversion devices. A 3D printed prototype will be installed and tested in the sand pit at the NC State Constructed Facilities Lab under axial and lateral loading.

Dr. **Gabr**, in collaboration with Dr. Anderson Rodrigo de Queiroz (North Carolina Central University), received funding from NCROEP to study the magnitude of dynamic forces in mooring lines that hold offshore marine renewable energy devices in place. They will study how hurricanes affect mooring lines' ability to withstand ocean current loading.

Dr. **Andy Ziccarelli** received funding from the NCROEP to develop numerical techniques to simulate fatigue crack propagation in marine hydrokinetic devices, which convert energy from marine currents into electrical energy. The ability to simulate fatigue crack propagation in turbine blades will allow for a more accurate assessment of structural performance over the lifetime of these devices, which will increase their reliability.

FOUNDATIONS / NONPROFITS

Drs. **Zisu Hao**, **Joel Ducoste** and **Morton Barlaz** received funding from the Environmental Research and Education Foundation to develop an open-source landfill reactor heat accumulation model named CLRHeat. The landfill industry is faced with decisions on whether to accept heat-generating waste, the quantity to accept and the burial strategy. CLRHeat will simulate heat generation, transfer and accumulation in landfills and predict waste temperatures based on the wastes received and their predicted energy generation. ■



At the Prague Transit Museum, students explored historic vehicles and related items at the old Sřešovice tram depot.



Summer around the world with CCEE

Ahoj from Prague!

“THINK AND DO” IS HOW NC STATE and the department have encouraged students to broaden their horizons and participate in new experiences. This summer, 12 CCEE students learned a new way to vocalize the mantra — “myslet a dělat” — as they journeyed 4,498 miles to study abroad in Prague, Czech Republic, from July 2 to Aug. 4. It was the first time in three years that students were able to make the trip, due to previous pandemic travel restrictions.

The program is offered through the NC State European Center, which is in the center of Old Town Prague and NC State’s only campus outside of North Carolina. It is supervised by Drs. **Daniel Findley** and **William Rasdorf**. Students had the opportunity to take CE 301: Surveying, taught by Rasdorf, and CE 305: Traffic Engineering, taught by Findley, earning six hours of credit while experiencing European culture firsthand. The group visited several famous civil engineering sites, including the Prague Transit Museum and graphite mine Český Krumlov. Students also engaged in fun cultural activities such as a Czech cooking class and a local caramel

factory tour and tasting.

Findley said that, in his experience, studying abroad is one of the most enriching activities in which students can participate.

“The small class size facilitates interactions and allows for engaging site visits,” he said. “Civil engineering works are everywhere, allowing us to compare and contrast various methods and applications in multiple domains within civil engineering. We observe students gaining self-confidence as they navigate cultural norms, learn enough basic language skills to conduct their daily lives, travel using a variety of transportation modes and develop skills that I hope will help them in their future careers and lives.”

Rebecca May, a BSCE student who went on the trip, said one of her favorite memories from her study abroad experience was a hike she took in the outskirts of Prague.

“It was amazing how good the views were just a few minutes outside of the city,” she said. “Prague is an amazing city for a study abroad experience.” ■

Planes, trains and automobiles

More than 5,100 miles away from Prague, Ph.D. candidate **Minerva Bonilla** and Ph.D. student **Morgan Westbrook**, advised by Dr. **William Rasdorf**, spent three weeks in South Korea this summer as part of the 2022 National Science Foundation (NSF) International Research Experience for Students (IRES) Program: Artificial Intelligence in Smart Transportation, which supports international research and research-related activities for U.S. science and engineering students. The main goal of this program is to enable American graduate students to research abroad and engage in a world-class research experience.

As part of the program, Bonilla and Westbrook learned the fundamentals of artificial intelligence (AI) and predictive modeling related to smart transportation at the Korean Advanced Institute of Science and Technology (KAIST). They attended lectures by several of the top researchers in the field of utilizing AI and machine learning to understand transportation and implement smart transportation strategies. Both students are working at the intersection of construction and transportation in their research, and exposure to various machine learning methods provided them with additional high-level alternatives to consider in their research methods.

Bonilla and Westbrook also spent time exploring South Korea, experiencing various elements of Korean culture and history. They visited the Joseon Dynasty palaces in Seoul, folk villages across the country, and the Bulguksa temple in Gyeongju, utilizing the country’s transportation systems in the country, including the KTX bullet trains that connect various regions.

“My favorite part of the trip was being able to visit the culturally significant and historic areas around South Korea,” Westbrook said. “The entire country is beautiful and rich in a history that I had very little knowledge of until the last few months.”

Bonilla said her favorite part of the experience was the opportunity to get immersed in the culture.

“I was able to wear a traditional dress (Hanbok), and I become proficient with the use of chopsticks,” she said. “I learned about Korean history and the origin of many of the customs and traditions that are in use today. Before, I didn’t know much about Korea, but I feel this trip allowed me to learn about and appreciate Asian culture in general.”

Above, top, the group took a cooking class at the NC State European Center in Prague, creating (and eating!) Czech cuisine.

Above, bottom, students visited a graphite mine in Český Krumlov, where they took a mine train 70 meters below ground to walk through the underground tunnels and look at period and modern mining machines.

Below, Bonilla and Westbrook wear traditional Korean Hanboks outside of Gyeongbokgung Palace in Seoul.



RISE to the top

SUMMERTIME FOR UNDERGRADUATES often conjures images of rest and relaxation on some far-off sunny beach, putting work and school on the back burner. But for some CCEE students, summer break provided the perfect opportunity to explore doctoral programs firsthand through the department's Research Internship Summer Experience (RISE) program.

As part of the program, which was initiated in 2015 by Director of Graduate Programs Dr. **Ranji Ranjithan**, 17 participants were paired with research mentors including faculty, graduate students and post-doctoral researchers. Students also participated in weekly sessions on research and professional development and bonded through social activities organized by graduate students.

At the end of the eight-week program, RISE students presented their research findings at the annual NC State Undergraduate Research and Creativity Summer Symposium.

Here's a look at the research students engaged in this summer through RISE.



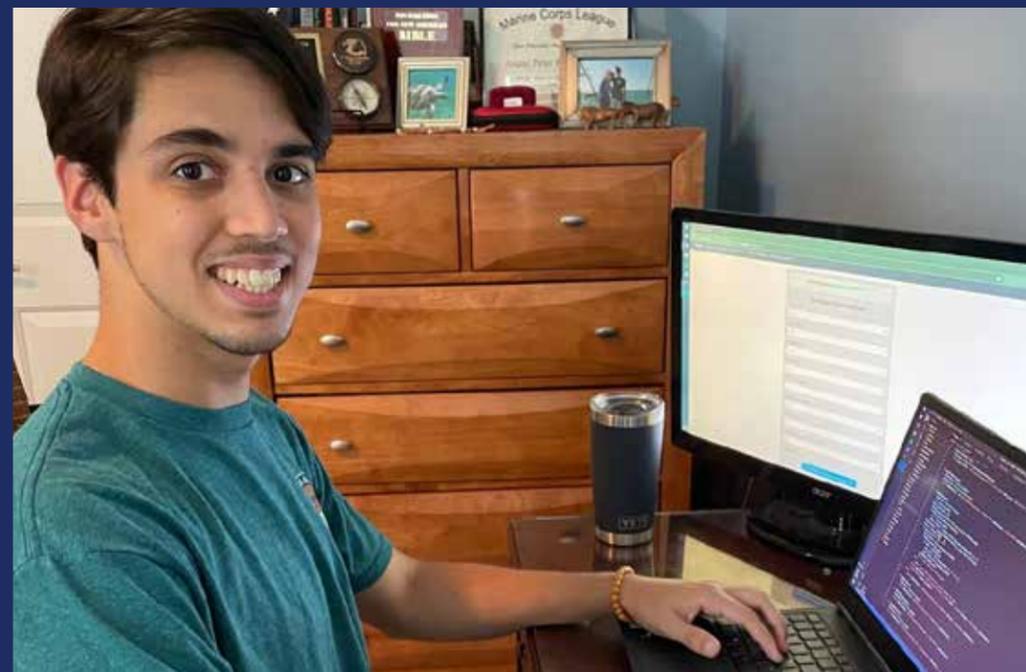
Ishita Pai Raikar, a computer engineering student double minoring in philosophy and cognitive science, worked on interdisciplinary research alongside CCEE's Dr. **George List**; Dr. Veljko Dubljević from the Department of Philosophy and Religious Studies; and Michael Pflanzler, a Ph.D. student in the Communication, Rhetoric and Digital Media program. The research, which Pai Raikar conducted remotely from her home country of India, was focused on media representation of the ethics of autonomous vehicles.

"It's qualitative research — I was reading a lot of articles, keeping records, doing further processing, working with software for further analysis and sorting etc.

"I remotely coordinated with my mentor and co-worker, and we had Zoom meetings every week for discussions and further plans," she said.

Pai Raikar is the lead author of the research paper, which she says they hope to complete and submit by the end of the year.

"It is very exciting as I get to work as a research assistant as part of the RISE program and AI in Society research group."



Recent CCEE grad **Jacob Harris** (BSCE 2022) worked with Dr. **Brina Montoya** and graduate student **Pegah Chasemi** to conduct geotechnical engineering research at NC State's Constructed Facilities Lab.

"My research this summer consisted of studying the effects of acid rain on microbially induced calcium carbonate precipitation (MICP)-treated soils, which can help us better predict the effects of acid rain on naturally cemented soils in the environment. I studied the soil mass loss rate, which also allowed us to experiment with soil to become more acid-resistant," he said.

Harris is attending graduate school at the University of Michigan.

Eli Kays is an environmental engineering student working with Dr. **Morton Barlaz**, Distinguished University Professor, to research abiotic cellulose hydrolysis under landfill conditions.

"We are testing the impact of temperature and pH on the abiotic hydrolysis of chemical pulp (copy paper) and mechanical pulp (newspaper) in landfill leachate. The difference between chemical pulp and mechanical pulp is that mechanical pulp contains some lignin as well as cellulose, which could affect the hydrolysis of the cellulose," he explained. The project will help to better describe and quantify mechanisms of heat accumulation in landfills.

Kays is continuing work on the project into the fall semester.

CCEE undergraduate student **Anand Bhatt** is working with Dr. **Ranji Ranjithan** and graduate research assistant **Galib Muktedir** to develop a graphical user interface in Python that will assist civil engineers in the design and analysis of bridges.

"More specifically, this program is focusing on the aspect of girders in bridges in which the designer can adjust parameter values to refine, create and explore new girder designs," he said.

"In this research, I am utilizing online resources such as textbooks, videos and coding documentation to create a website that includes this graphical user interface." ■

Summer around the world with CCEE



Far left, campers measured water flow in a nearby creek. Middle, campers constructed towers in the Student Projects Lab. Right, students created and experimented with water filtration systems.

Happy campers

CONSTRUCTING A SMALL-SCALE WOODEN TOWER, estimating water flow velocity while standing in a stream, building a water purifier from scratch using cost-effective materials — these were just a few hands-on activities experienced by 24 campers in CCEE’s weeklong summer camp workshop conducted in partnership with NC State’s College of Engineering.

Every summer, rising 11th- and 12th-grade high school students experience engineering and college life through camp while staying on NC State’s campus. The CCEE workshop, which took place from June 26 to July 1, enabled campers to experience the fields of civil, construction and environmental engineering and the varied nature of building a more sustainable society.

CCEE teaching professor **Steve Welton** and assistant teaching professor Dr. **Jonathan Miller** organized the workshop, and CCEE students **Isaiah Coleman** and **Zoe Smith** served as camp counselors. This year’s campers were from across the world, coming from as far as the Dominican Republic and Puerto Rico to as close as Raleigh, North Carolina.

“We show them the diversity in civil engineering,” Welton said. “We introduce them to the different kinds of problems they might be involved in solving.”

As part of the workshop, campers participated in several CCEE-related activities, such as designing, planning and constructing mini wooden towers to test lateral loads in Fitts-Woolard Hall’s Student Project Lab; computer modeling a cost-effective bridge that would bear the weight of a truck; creating and experimenting with water filtration systems; measuring water flow in a nearby creek; visiting the Constructed Facilities Lab to watch large-scale testing; and exploring campus. Raleigh-based engineering firm VHB hosted the students at its on-campus office for a site-planning activity that allowed campers to get a feel for real-world engineering planning using Legos and printed site maps.

“The workshop really showed the diversity of opportunities there are within the civil, construction and environmental engineering degrees,” Coleman said. “Not many schools have all three disciplines wrapped into one department. It’s great because they overlap so much. We were able to show the range of options available to CCEE students.”

Smith said the CCEE portion of camp is really valuable for students because they are able to “participate in activities and real-world applications related to their possible careers before they get to college and have to pick a major.”

“We were able to show structures, site development, water resources, bridge design, streams, transportation and more,” Smith said. “It can also inspire ideas or a new direction of civil, construction and environmental engineering that they didn’t know existed. They learn lessons about technical skills like sustainability, building, structures and water quality at a low level but in a way that exposes them to new things. They can also learn all that CCEE encompasses and the differences between disciplines.”

Coleman said a highlight of the week was when the campers built and stress-tested their towers.

“I looked around, and everyone had a smile on their face, and they were taking pictures of the towers on their phones,” he said. “They got a real college experience throughout the week, and their hard work paid off. I really enjoyed that they still had so much engagement at the end of the week, and I could see that the students really enjoyed it.”

“It’s really neat getting to know the campers,” Welton said. “I’ve had campers who I’ve later had as students in class. I’ve even had a camper who was in class who became a counselor — Zoe Smith. That is pretty special.”

Former camper-turned-counselor Smith said attending the camp inspired her to pursue civil engineering at NC State and “what kind of things I wanted to contribute to the world.”

“I wanted to be a counselor because of how much the camp did for me when I was in high school. I was a camper in the civil workshop as a rising high school senior in 2019 and loved learning about engineering and CCEE and being able to meet others who enjoyed the same things as me. I really enjoyed learning from Mr. Welton at camp and later at NC State in class. I wanted to help expose campers to CCEE and engineering in a fun and informative way.” ■

Empowering future engineers

While the number of women in engineering has continued to grow over the last four decades, women still only represent about 15% of the engineering workforce, according to data from the U.S. Census Bureau. Students from the Geo-Institute Graduate Student Organization at NC State University (G-I GSO) and Earthquake Engineering Research Institute (EERI) are hoping to increase that number by inspiring young girls through the Girls in Science Summer Camp, which was held on July 12 at Walnut Creek Wetland Park in Raleigh, North Carolina.

Four CCEE Ph.D. students — **Ana Paula Bona**, **Jessi Thangjitham**, **Lina Espinosa** and **Nancy Ingabire Abayo** — and undergraduate student **Natalie Hackman** set up fun and engaging activities related to engineering.

As part of the camp, the middle schoolers were tasked with building the strongest bridge at the lowest cost using pasta and marshmallows. They also assembled a world map puzzle divided into plate boundaries to learn about plate tectonics, where earthquakes occur and what causes earthquakes. The campers were shown how earthquakes could cause liquefaction (“a process where sand will flow like soup”) on the foundation of structures like the bridges they had just built.

Thangjitham, whose research focuses on structural engineering and mechanics, said the camp enhances the experience of girls interested in science, specifically targeting low-income families.

“Many girls are interested in science but have not had many opportunities to be exposed to engineering,” she said. “Our goal is to introduce these topics to the campers in a fun and exciting way to inspire them to careers in engineering. We spend time connecting with the campers by telling our stories about pursuing engineering. In this way, we show a representation of women in engineering and encourage the idea that they can become engineers, too.”



Above, top, the campers built bridges using marshmallows and pasta.

Above, bottom, Ph.D. students Ana Paula Bona, Jessi Thangjitham, Nancy Ingabire Abayo and Lina Espinosa, and undergraduate student Natalie Hackman helped organize the camp.

CCEE students bring engineering camp experience to rural Colombia

In June 2022, CCEE Ph.D. students **Ariadne Palma** and **Lina Espinosa**, with NC State's Earthquake Engineering Research Institute (EERI), collaborated with the Colombian youth organization Corazón Pacífico for its first summer camp, "Verano de Carreras" (Summer of Professions). The EERI members presented remotely while Corazón Pacífico volunteers conducted the activities with the campers in person at a local community library in an isolated seismically vulnerable region on Colombia's Pacific Coast.

Corazón Pacífico, which Palma and Espinosa helped start in 2020, promotes education in the remote region of Colombia. Since the beginning of 2022, the organization has worked with community library Sueño Pacífico of Ladrilleros, Valle del Cauca, and has donated computers, tablets and educational memberships. The group also organizes workshops for children and teenagers in the area with the help of fundraising and volunteers.

The organization's inaugural camp consisted of a series of workshops on different career paths with hands-on activities throughout the summer. Children learned directly from practicing professionals who volunteered to share their experiences through fun and interactive exercises. Palma and Espinosa organized a virtual presentation on what civil engineering is and how the campers could impact their community through the profession. One emphasis of the presentation was the importance of designing structures that can withstand earthquakes, due to the community's

high seismic risk from its location on the Colombian Pacific, which is along the Pacific Ring of Fire.

Other hands-on camp activities included constructing a building and changing the mass of the system, which was then subjected to "earthquake loads" via a manual shaking table. The EERI student chapter at NC State donated a set of toy model building parts to the local community library, and one of the in-person volunteers built the manual shake table, which was also donated to the library.

The second activity consisted of constructing bridges and buildings using spaghetti for the structural elements and marshmallows for the connections.

This workshop also had a significant impact on the library staff, as the children, teenagers and young adults of the area all learned about civil engineering. Their excitement and engagement were palpable with the active participation of the kids throughout the workshop, especially during the hands-on activities.

"I want to thank you for this experience that you brought to the community," said Sergio Pardo, founder of the library Sueño Pacífico and the NGO Plástico Precioso Uramba. "It was amazing to see the children paying attention, engaged, and behaving well during the presentation. I loved the interactive components and the participation of the children. It was an incredible activity."

Participants looked on as their building structure was tested on the manual shake table.



Picture perfect

PHOTO 1: Nearly 30 CCEE students and faculty members attended the 2022 Association of Environmental Engineering and Science Professors (AEESP) Research and Education Conference on June 28-30 at Washington University in St. Louis. The conference, which was themed "Environmental Engineering and Science at the Confluence," included workshops, plenary talks, panel discussions and oral and poster presentations.

"It's an opportunity to hear how others are tackling similar problems, ask questions, and start to put yourself out there as a future academic," said Ph.D. student **Leah Weaver**, who attended the conference. "I attended because it gave me the opportunity to present my work at a national conference and meet prominent leaders in the field. I had an absolute blast and will definitely attend again in the future."



PHOTO 2: Several CCEE faculty members, students and alumni attended the 26th International Conference on Structural Mechanics in Reactor Technology (SMiRT 26) in Berlin/Potsdam, Germany, on July 10-15. The motto of the conference was "Building the future on 50 years of experience – It's SMiRT to embrace change," celebrating 50 years of international collaboration and innovation in the field of structural safety for nuclear reactors. **Nicholas Crowder** (pictured here), a Ph.D. student studying with Drs. **Abhinav Gupta** and **Kevin Han**, was named a finalist for the Shibata Early Career Award at the conference.

"The recognition and appreciation received for my work validated the importance of my research," Crowder said.



PHOTO 3: Dr. **Jeremiah Johnson** and three CCEE students traveled to California to participate in the 2022 Macro-Energy Systems Workshop at Stanford University on June 20-21, taking part in a keynote address, lightning talks and research presentations.

"Kudos to outstanding grad students **Aditya Keskar**, **Qian Luo** and **Jethro Ssengonzi** for their work at the Macro-Energy Systemsconference," Johnson tweeted. "Love to see these students pushing forward methods and tackling big questions in energy systems and decarbonization."

Summer around the world with CCEE



4



5



6

PHOTOS 4, 5 AND 6: Dr. **Katherine Anarde** and graduate students **Thomas Thelen** and **Lexi Van Blunk** traveled to Quebec, Canada, to participate in a simulated munitions mobility experiment at the National Institute of Scientific Research (INRS) large wave flume. The multi-institution project was aimed at improving understanding of how munitions (i.e., bombs) of different sizes and densities are mobilized and buried in the surf and swash zones by waves. Anarde and team assisted in experiment preparations, including constructing the beach profile and instrumenting the flume with sensors to measure water levels, waves, currents, bed-level changes and munitions movement. This included organizing (and untangling!) three miles of cable for the sensors and placing 150 munitions. The work was sponsored by the Department of Defense Strategic Environmental Research and Development Program (SERDP).

PHOTO 7: Drs. **Andy Grieshop** and **Tarek Aziz** worked alongside Ph.D. student **Leah Weaver** and undergraduate researcher **Jimmy Lewis** on a project in Cary, North Carolina. The research team is investigating the air and water quality impacts of a special "smog-eating" pavement coating being pilot tested in the town. This photo was taken after the team deployed monitoring equipment to measure near-road air quality, temperature and light data. By testing roads with and without the coating, the team hopes to ascertain the performance of the pavement coating in reducing emissions and potential impacts on the environment.



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PHOTO 8: Members of NC State's Student Steel Bridge team and faculty advisor **Steve Welton** traveled to Virginia Tech over Memorial Day weekend to attend the American Society of Civil Engineers' Student Steel Bridge Competition National Finals. It was the first in-person national event since 2019 due to COVID restrictions.

"I am looking forward to what NC State can accomplish with Steel Bridge in the upcoming year," Welton said.



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PHOTO 9: Ph.D. candidate **Megan Johnson** traveled to Alaska for seven weeks as part of her Science to Action Fellowship with the U.S. Geological Survey (USGS) Climate Adaptation Science Center (CASC). The fellowship program allows graduate students to collaborate with USGS mentors to work on high-priority, real-world challenges in natural resources, and travel to their mentor's CASC office. Johnson's mentor is Jeremy Littell, a research ecologist at the Alaska CASC. Megan interacted with staff of the Alaska CASC and the Alaska Fire Science Consortium, and participated in Research to Operations workshops as part of a National Aeronautics and Space Administration Arctic-Boreal Vulnerability Experiment science team meeting. She traveled to the 2019 Swan Lake wildfire burn scar to meet with U.S. Fish and Wildlife Service staff and installed meteorological and soil sensors to monitor post-fire regrowth in the area. ■



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Dr. Katherine Anarde

Dr. **Katherine Anarde** was awarded the 2022 **Early-Career Research Fellowship with the Gulf Research Program** at the National Academies of Science, Engineering and Medicine. The 2022-24 fellowship supports emerging scientific leaders conducting research related to environmental protection and stewardship, with a focus on environmental and climate changes in the Gulf of Mexico and its coastal zones. Anarde will use the grant to support her work in modeling potential futures for developed barrier islands as they experience environmental, ecosystem and socioeconomic changes in a future climate.



Dr. Morton Barlaz

Dr. **Morton Barlaz**, Distinguished University Professor, is among eight NC State faculty members who have been elected **Fellows of the American Association for the Advancement of Science (AAAS)**, the world's largest scientific society and publisher of the journal *Science*. Barlaz was elected for "distinguished contributions to the field of environmental engineering, particularly for advancing understanding of solid waste engineering and related fundamental biological and chemical processes."



Dr. Francis de los Reyes III

Dr. **Francis de los Reyes III**, Glenn E. and Phyllis J. Futrell Distinguished Professor #2, received the **Alumni Distinguished Undergraduate Professor Award** as part of the NC State 2021-22 University Teaching Awards ceremony. The award is one of the most prestigious honors given on campus to recognize excellence in undergraduate education. Up to six recipients receive this recognition each year and retain the title for the duration of their career as an NC State faculty member. De los Reyes and recent CCEE graduate **Amanda Mattingly** (MSENE 2021) also won the Water Environment Federation (WEF) Rudolfs Industrial Waste Management Medal for their paper "Does Bioaugmentation of Aerated Stabilization Basins

Work? Lessons from Field Scale Trials with a Control." The paper, which was presented at the 2021 WEFTEC, was based on Mattingly's M.S. thesis and reported the results of a study that examined the effect of bioaugmentation (adding biological products to improve performance) to full-scale lagoons treating pulp mill wastewater.



Dr. Detlef Knappe

Dr. **Detlef Knappe**, S. James Ellen Distinguished Professor, was chosen as the spring 2023 recipient of the **Department of Environmental Quality (DEQ) Applied Research Fellowship**. The award, which was recently launched by the North Carolina DEQ and North Carolina Policy Collaboratory, was created to advance research of per- and polyfluoroalkyl substances (PFAS) in North Carolina, strengthening the partnership between state regulators and academic experts.



Dr. Shane Underwood

Dr. **Shane Underwood**, professor, received the 2022 **Outstanding Academic Member Award** from the Academy of Pavement Science and Engineering (APSE). Underwood, who has been an APSE member since its inception in 2015, has been a part of a research task force and currently serves as secretary.



Nancy Ingabire Abayo

Ph.D. candidate **Nancy Ingabire Abayo** was awarded an **American Association of University Women (AAUW) International Doctoral Fellowship**. The fellowship comes with a prize of \$20,000 for the 2022-23 academic year. Founded in 1881, AAUW is one of the world's largest sources of funding for female graduate students.

BSCE student **Emily (Emi) Boldor** was tapped as a **National Academy of Engineering (NAE) Grand Challenges Scholar** by the NC State College of Engineering's Office of Academic Affairs.



Emily (Emi) Boldor

Students participating in the NC State Grand Challenges Scholars Program must achieve competency in five areas including talent, multidisciplinary, multicultural, entrepreneurship and viable business model, and social consciousness. Scholars are required to expand their educational experience through activities related to the five competencies, such as completing mentored research related to their chosen Grand Challenge, participating in study abroad programs and engaging with the community through service.



Gunay Gina Aliyeva



Nancy Ingabire Abayo



Leah Weaver



Pegah Ghasemi

Four Ph.D. students — **Gunay Gina Aliyeva, Nancy Ingabire Abayo, Leah Weaver** and **Pegah Ghasemi** — were accepted into **NC State's Preparing for the Professoriate (PTP) program**. The nationally recognized, highly competitive program gives doctoral students and postdoctoral scholars an immersive mentoring and teaching experience. Aliyeva will be mentored by Dr. **Abhinav Gupta**, Weaver will be mentored by Dr. **Tarek Aziz**, Abayo will be mentored by Drs. **Brina Montoya** and **Ashly Cabas**, and Ghasemi will be mentored by Dr. **Rudi Seracino**.



Morgan DiCarlo

Ph.D. student **Morgan DiCarlo**, advised by Dr. **Emily Berglund**, received an **Outstanding Student Presentation Award from the American Geophysical Union (AGU) in the Science and Society section** for her presentation "Survey Exploring Water Utility Approaches to Smart Technologies and Customer Complaint Management." Her research focuses on people's decision-

making during water-related hazards, such as flooding or pipe failures, including surveys, social media and smart water meter analytics.



Cassie Gann-Phillips

Ph.D. student **Cassie Gann-Phillips** received a 2022 **National Science Foundation (NSF) Graduate Research Fellowship**, which recognizes outstanding graduate students who are pursuing research-based master's and doctoral degrees in NSF-supported science, technology, engineering and mathematics disciplines. Gann-Phillips, who is focusing on geotechnical engineering, is advised by Dr. **Cabas**.



Marlee Strong, Dr. Brina Montoya, Pegah Ghasemi and Jacob Harris

Ph.D. student **Pegah Ghasemi** and recent CCEE graduate **Jacob Harris** won **first place in the Geo-Prediction competition**, where students predict the behavior of the ground or a geotechnical structure in-situ, at Geo-Congress 2022, which was held in Charlotte, North Carolina. Ph.D. student **Marlee Strong** won **third place in the Geo-Poster competition**, where students share their research outcomes through poster presentations. Ghasemi and Strong won second place in the Geo-Video competition, where students produce a short video on any topic related to geotechnical engineering education and practice.



Samrin Ahmed Kusum

Ph.D. students **Pegah Ghasemi**, advised by Dr. **Montoya**, and **Samrin Ahmed Kusum**, advised by Drs. **Moe Pour-Ghaz** and **Joel Ducoste**, were among 15 winners of 2021-22 **Outstanding Teaching Assistant Awards** from the NC State Graduate Student Association's Teaching Effectiveness Committee. The awards are the primary university-level recognition for exceptional contributions made by graduate teaching assistants to the educational excellence of the university.



Saqib Gulzar

Ph.D. student **Saqib Gulzar**, advised by Dr. **Shane Underwood**, received the 2022 **Student Member Award** from APSE.

The awards are based on contributions in teaching or curriculum development, service to the professional community and research, as well as active

participation and leadership in APSE's committees, sponsored conferences and/or programs.



Aditya Keskar

Ph.D. student **Aditya Keskar**, advised by Dr. **Jeremiah Johnson**, was selected as an **NC STEM Policy Fellow** by North Carolina Sea Grant in partnership with the Burroughs Wellcome Fund. The fellowship is an opportunity for recent graduate students to explore in-state, non-academic career

options in science, technology, engineering and mathematics through yearlong assignments in high-level state agencies. His fellowship at the North Carolina Department of Environmental Quality: State Energy Office will focus on implementing the NC Clean Energy Plan agenda, which aims to reduce electric power sector emissions by 70% by 2030 and achieve carbon neutrality by 2050.



Jenero Knowles

Ph.D. student **Jenero Knowles**, advised by Dr. **Casey Dietrich**, was awarded the **Witherspoon Graduate Fellowship** for Summer 2022 from NC State's Graduate School. The competitive one-year award, named in honor of Dr. **Augustus M. Witherspoon**, who was the second Black graduate

student to receive a doctorate from NC State and the first Black professor at the university, is given to rising second-year graduate students who support Black communities at NC State and beyond.

MSCE student **Tomás Cuevas López** was awarded a **fellowship from the Chilean National Research and Development Agency**. The Beca de Magister en el Extranjero



Tomás Cuevas López

supports Chilean students pursuing master's degrees abroad. Awarded students are requested to eventually return to Chile to apply the new knowledge to contribute to the scientific, academic, economic, social and cultural development of the country.



Matthew Mottesheard

BSCON student **Matthew Mottesheard** is among seven students selected for **academic scholarships** from the National Academy of Construction (NAC). The scholarships provide funding for undergraduate and graduate students pursuing a bachelor's or master's degree in engineering or construction, or a closely related field, and who desire a career in the industry. Mottesheard and the other award recipients were recognized at the NAC Gala in Scottsdale, Arizona, in October.



Alyssa Paul

BSENE student **Alyssa Paul** received the **Ronald C. Harrell Engineering Scholarship** from the North Carolina Society of Engineers (NCSE). The scholarship provides financial support for tuition, fees and books for a full-time student who has a declared major in engineering or engineering technology.



Jethro Ssengonzi

Ph.D. student **Jethro Ssengonzi**, advised by Dr. **Jeremiah Johnson**, is one of six scholars named to the 2022 **cohort of Energy Data Analytics Ph.D. Student Fellows** at Duke University. The

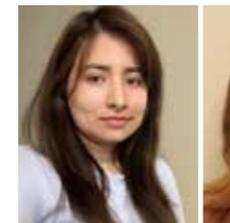
fellows will work with faculty mentors as they pursue independent research projects, take part in workshops on energy and data science topics, and polish their research communications skills. In addition to a stipend and partial tuition remission during the summer, the fellows receive funding for research and professional development.



Jessi Thangjitham

Ph.D. student **Jessi Thangjitham** was one of two graduate students awarded the 2022-23 **Earthquake Engineering Research Institute (EERI)/Federal Emergency Management Agency (FEMA) National Earthquake Hazards Reduction Program (NEHRP) Graduate Fellowship**. The one-

year award, supported by funds from FEMA, is designed to foster the participation of capable individuals in working toward goals and activities of the NEHRP and provides a stipend that can be used for tuition, fees, research expenses and attendance and participation at the 2023 EERI Meeting.



Minerva Bonilla



Morgan Westbrook

Ph.D. students **Minerva Bonilla** and **Morgan Westbrook**, advised by Dr. **William Rasdorf**, were awarded the 2022 **National Science**

Foundation International Research Experience for Students Program in Artificial Intelligence in Smart Transportation. Awardees traveled to South Korea in July to learn the fundamentals of artificial intelligence and predictive modeling related to smart transportation at the Korean Advanced Institute of Science and Technology.



Vie Villafuerte

Vie Villafuerte was selected for the 2022 **Distinguished Goodnight Award** from the NC State Goodnight Scholars Program. The award is presented to a graduating Goodnight Scholar from each cohort who best embodied the core values and mission of the program. Villafuerte graduated with

a BSENE in May 2022 and plans to continue as a graduate student in CCEE.

MSCE student **Javier Zapata**, advised by Dr. **Moe Pour-Ghaz** and Dr. Robert Hayes in the Department of Nuclear Engineering, received a **scholarship from the Expanded Shale, Clay and Slate Institute (ESCSI)** for his research



Javier Zapata

on the disposal of cemented liquid radioactive wastes. The annual award celebrates the work of John Ries, retired technical director of ESCSI, who was named as one of the 2018 Most Influential People in the Concrete Industry.

DR. JOEL DUCOSTE TAPPED AS COLLEGE OF ENGINEERING ASSOCIATE DEAN FOR FACULTY ADVANCEMENT



Joel Ducoste

AFTER TWO YEARS OF SERVING in the position on an interim basis, Dr. Joel Ducoste, professor in the department, was named the NC State College of Engineering associate dean for faculty advancement, effective July 1.

"Joel has shown a lot of passion for faculty development and has done a great job over the past

two years," said Dr. **Morton Barlaz**, former head of CCEE and Distinguished University Professor. "I am thrilled with his selection and am confident that he will bring excellent programs to the College of Engineering for years to come."

Ducoste succeeds Christine Grant, the founding associate dean for faculty advancement, who is serving as director of the Broadening Participation in Engineering program in the Engineering Education and Centers Division in the Engineering Directorate at the National Science Foundation (NSF).

"Joel has done an excellent job carrying on the pioneering efforts of Christine Grant and her staff to enhance our faculty's teaching and research and to make them feel supported, both professionally and personally," said Louis Martin-Vega, dean of the College of Engineering. "He has built important relationships with our faculty members during the past two years, and I'm very pleased that he will now continue permanently in this critical COE leadership role."

Ducoste is a recognized expert in modeling water and wastewater treatment processes using Computational Fluid

Dynamics (CFD) and has more than 170 peer-reviewed publications and research reports to his credit. He also served as president of the Association of Environmental Engineers and Science Professors (AEESP) from 2020-21 and is a board-certified environmental engineer with the American Academy of Environmental Engineers and Scientists.

A fellow of the Water Environment Federation (WEF), Ducoste has received many awards and recognitions throughout his career, including an NSF Faculty Early Career Development (CAREER) Award, an AEESP Distinguished Service Award and the Fair Distinguished Engineering Educator Medal from WEF. He has also served on the Environmental Protection Agency (EPA) Science Advisory Board and its numerous committees, on the North Carolina Louis Stokes Alliance for Minority Participation Advisory Board, and on the editorial boards of leading environmental engineering journals.



DR. ASHLY CABAS WINS NSF CAREER AWARD

ASSISTANT PROFESSOR DR. ASHLY CABAS RECEIVED

a National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award. The award is one of the highest honors given by NSF to young faculty members in science and engineering.

"These last two years have been hard, with the pandemic affecting many aspects of our personal and professional lives," Cabas said. "I am thankful for those who support me, embrace my fascination with earthquakes and soils, and share my dream of changing the world by empowering our amazing students."

Cabas and a team of CCEE researchers will study the response of soils to earthquake ground shaking at

multiple scales and enable its incorporation into system-level probabilistic seismic hazard assessments for water distribution systems.

"I am very excited for Ashly and her research group," said Dr. **Morton Barlaz**, former CCEE head and Distinguished University Professor. "She is doing important work on seismic hazard assessment that will advance our understanding of the response of soils to ground motion. Ultimately, her work will make it safer for everyone who lives in seismically active locations."

Cabas completed her undergraduate studies at Universidad Católica Andrés Bello in Caracas, Venezuela, and earned her M.S. and Ph.D. in civil engineering at Virginia Tech. Her research interests include the assessment of seismic hazards, performance-based design in geotechnical engineering and prediction of the response of soils and foundation systems to seismic loading and dynamic soil-foundation-structure interaction. She focuses on the advancement of the current understanding of the impact that local soil conditions have on ground motions, improving the assessment of site-specific seismic hazards and elucidating the correlation between ground motion parameters and structural response and damage.

Cabas has received numerous accolades including 2021 NC State Impact Scholar, 2021 New Faces in American Society of Civil Engineering Geo-Institute, 2020 Fellow for the National Science Foundation Enabling the Next Generation of Hazards and Disasters Researchers Fellowship Program and 2017 ASCE Excellence in Civil Engineering Education (ExCEED) Fellow. She was invited to become a Faculty Fellow of the NC State Center of Geospatial Analytics, which works with researchers, policy experts and industry leaders to apply geospatial analytics to advance innovative solutions to grand societal challenges.

Cabas also received the 2021 Earthquake Engineering Research Institute (EERI) Shah Family Innovation Prize, which recognizes creative and innovative thinkers under 35 who have demonstrated the potential to make major contributions to the field of earthquake-risk mitigation and management in the early stages of their careers. Cabas was selected because of her leadership in the areas of site response analysis and ground motion characterization at the interface of engineering seismology and geotechnical engineering, as well as her leadership in fostering a diverse, community-driven earthquake engineering profession through her mentorship of underrepresented groups. ■

CCEE faculty to serve in key White House roles



Joseph DeCarolis



Christopher Frey

OUR STUDENTS, FACULTY MEMBERS and alumni are known for playing an important role in engineering for sustainable infrastructure, but the recent appointments of two faculty members to roles in the Biden administration have turned an even brighter spotlight on the importance of CCEE's work.

Dr. **Christopher Frey** stepped into the role of assistant administrator for the Office of Research and Development (ORD) at the Environmental Protection Agency (EPA), and Dr. **Joseph DeCarolis** joined the U.S. Department of Energy (DOE) as the new administrator of the Energy Information Administration (EIA). Both appointments were confirmed by the Senate earlier this year.

"It is very gratifying to see Dr. Frey in a Senate-confirmed position," said Dr. **Morton Barlaz**, former CCEE head and Distinguished University Professor. "He has provided much leadership in his areas of expertise over his career, and I am pleased that he has been given the opportunity to apply his knowledge to serve the country."

"I am also thrilled that Dr. DeCarolis will be able to bring his expertise to the EIA, and I appreciate his availability to serve the U.S. in this capacity."

Frey said he is proud to serve in the new role.

"Science and the environment have long been my passions and my purpose," Frey tweeted. "I am a champion of science and its essential role in informing decisions to protect human health and the environment. I am inspired every day by my ORD at EPA colleagues."

Frey, who served previously as deputy assistant administrator for science policy in the Office of Research

and Development as an appointee of the Biden / Harris administration, is the Glenn E. and Phyllis J. Futrell Distinguished University Professor at CCEE, where he has served on the faculty since 1994. He has taken a leave of absence from NC State during his tenure at EPA. Frey focuses on scientific integrity and the role of science to inform decision-making related to climate change, environmental justice, per- and polyfluoroalkyl substances (PFAS) and lead.

"Science is a top priority at EPA, which is why I am so proud to have Dr. Christopher

Frey — a widely-respected and trusted scientist — lead our science and research efforts," tweeted EPA Administrator Michael Regan.

Professor and University Faculty Scholar DeCarolis' research at CCEE focuses on energy issues informed by engineering, economics and public policy. He co-leads an open-source modeling effort involving a large multi-institutional research team, leads an interdisciplinary faculty group at NC State focused on sustainable energy and established a university-wide Energy Collaborative.

"I'm incredibly honored to lead the amazing team at @EIAgov," DeCarolis tweeted. "Given the complex and evolving energy challenges we face as a nation, EIA data and non-partisan analysis have never been more important."

"Joseph DeCarolis is going to be an incredible EIA Administrator," tweeted Dr. **Jeremiah Johnson**, CCEE associate professor. "We will miss him at NC State and the Open Energy Outlook Project."

U.S. Secretary of Energy Jennifer M. Granholm said she feels grateful for DeCarolis stepping into the role.

"Now more than ever, Americans need timely, relevant and accurate information about the U.S. energy sector," Granholm said. "Joseph's deep technical expertise and prior government service make him the perfect fit for this role, especially as he shepherds new efforts at the EIA to model immense growth and opportunities in clean energy and zero-carbon technologies. I am thrilled that he's willing to serve the American people once again, and we're so excited to welcome him to DOE." ■

Our research and teaching are only possible with the assistance of our nearly 300 graduate students, each of whom has a strong personal history and a promising future. We shine a spotlight on a few students.

HARITYA SHAH



Haritya Shah is a second-year master's student with a concentration in structures.

He grew up in Vapi, a town in western India. He is advised by Dr. **Murthy Guddati**. He is working on research to refine the method of liver elastography, a noninvasive method of liver diagnosis.

What influenced you to go into engineering?

SHAH (S): Growing up, I saw the construction of a six-kilometer bridge in Mumbai, India. This made me appreciate the sheer scale of structures that engineers are able to design and build with what looked like relative ease. I saw all the stages of bridge construction and was in awe of the engineers who made this possible. This nudged me toward engineering.

What problem(s) are you trying to solve? Why was NC State / CCEE a good fit for you?

S: I picked this research field because it was a good opportunity for me to apply concepts of civil engineering, aid in overcoming challenges in the field of medical diagnosis, and to address the concerns of the traditional invasive methods of liver diagnosis.

Being from a dual-major background that includes biology, NC State was a good fit for me because of the many multidisciplinary research projects undertaken here and interdepartmental collaboration. This gives me the opportunity and a platform to apply engineering concepts to different fields to help solve problems. That is really exciting for me.

Where do you see yourself in five years?

S: My goal is to continue doing research at the intersection of multiple disciplines and help apply engineering concepts to different real-world problems.

VISHAL NANASAHEB RANDHAVE

What influenced you to go into engineering?

RANDHAVE (R): It runs in the family. Ever since I was a child, I remember my father bringing plans, contracts and details home to study. The more I learned about it, the more interested I was in civil engineering. After I graduated with a bachelor's degree, I focused on construction as my specialization. I worked as a field engineer for three years, where I could use my technical knowledge and engineering skills.

What problem(s) are you trying to solve? Why was NC State / CCEE a good fit for you?

R: One of the major issues with construction is adapting to the latest and innovative technology, and I am fascinated to know how it can help to solve problems. NC State has flexible course options, allowing me to choose my courses and integrate my engineering, management and technical courses. This provides me with more opportunities to learn and achieve my goals.

Where did your passion for this particular focus come from?

R: I come from India, which is a fast-paced developing nation. The astonishing growth of infrastructure, marvelous buildings, and its continuous development always amazed me, and increased my interest in civil engineering. My passion and drive for a master's degree started after I graduated with my bachelor's degree. I worked on construction projects and realized how problem-solving abilities and experience are vital in the industry. I am motivated by complex problems, practical applications of my knowledge and all the connections I get to make with different teams.

Where do you see yourself in five years?

R: I see myself working in a construction firm with lots of responsibilities and having decision-making skills that can help change the construction field. Construction and many engineering professions are headed toward digital transformation, and I would like to contribute to



Vishal Nanasaheb Randhave is a second-year master's student with a concentration in construction engineering. He is interning at STV Inc. as a roadway design intern and is publications coordinator for the Civil Engineering Graduate Student Association. Randhave is also a member of the Air & Waste Management Association. An international student from India, he is advised by Dr. **Kevin Han**.

making construction more accessible, safer and productive. I want to work in a team environment where I can develop as a professional and take on interesting projects and opportunities leading to success.

SOPHIA ROSENBERG



Sophia Rosenberg is a second-year master's of science in civil engineering student with a concentration in coastal engineering. She grew up in Chesapeake, Virginia, and is advised by Dr. **Elizabeth Sciaudone**. Her research involves calibrating a 2D morphologic model (XBeach) to predict storm-driven barrier island change due to a new management strategy in North Carolina's Outer Banks. She is also involved in a project that assesses present and future coastal highway vulnerability of highway NC 12 on the Outer Banks.

What influenced you to go into engineering?

ROSENBERG (R): I decided to go into engineering after finishing my undergraduate degree in environmental science. During an internship following graduation at a consulting firm, I found I liked the technical nature of engineering projects and decided I wanted to become a coastal engineer. Once I graduate, my plan is to design erosion-control structures (both hard and nature-based) that help protect coastal communities from hurricanes and sea level rise.

What problem(s) are you trying to solve? Why was NC State / CCEE a good fit for you?

R: I am trying to better understand how climate change may impact vulnerable beaches in the future. NC State was a perfect fit for me because I get to work on projects directly related to beach erosion and sediment transport modeling. I also have a great advisor and an amazing coastal engineering team that have made my experience at NC State very memorable.

Where did your passion for this particular focus come from?

R: My passion mainly comes from growing up in an area that is stressed by hurricanes and flooding. I want to become a coastal engineer in order to better equip communities to deal with issues in the future. I also love modeling waves and sediment transport, using spatial mapping programs such as geographic information system software, and coding in general.

Where do you see yourself in five years?

R: I see myself working as a coastal engineer for either a private or federal agency (preferably on a beautiful beach).

DREW DESCARY



What influenced you to go into engineering?

DESCARY (D): When my brother, John, was going off to college, I was in sixth grade. One evening, my father said, "Andrew, what's on your mind?" My response (as a sixth-grader) was "I guess I should figure out what I want to study when I go to college." "Well, what subjects interest you?" asked my father. "I like to build things and I am pretty good with math," I replied. "Excellent! You should study civil engineering," my father said. "What's a civil engineer?" I asked. "I don't know, but they are good with math and they like to build things," answered my father. So with that as my guide, I knew I needed to be a civil engineer.

What problem(s) are you trying to solve? Why was NC State / CCEE a good fit for you?

D: The problem that I am wanting to solve is how to deliver clean energy at an economically feasible price. I have long been fascinated by nuclear energy and was lucky enough to meet an extraordinary engineer one day from Fresno, California, Sam Iacobellis, who really inspired me. In addition to being "The Father" of the B-1 Bomber, and launching Global Positioning System (GPS), he also worked in nuclear energy. Through his example, I realized that the answers are out there if you work hard enough.

I chose NC State because I consider North Carolina home. My first duty station was Marine Corps Air Station Cherry Point, and my time there had an impact on me. NC State has a long and storied past of being a military-friendly school. Dr. Brandon McConnell (Engineering Online liaison and advisor for active duty military and veterans) and the staff at Jeffrey Wright Military and Veteran Services have been incredibly supportive. They are the "game changers."

Where did your passion for this particular focus come from?

D: When my brother was in junior high school, he competed in the History Field Day competition. His topic was the nuclear bomb and how that changed the world. It made an impression on me that a little bit of fissionable material could release so much energy. The Manhattan Project created the

Drew Descary is a first-year master's of civil engineering student with a concentration in construction. He grew up in the Central Valley of California. He is advised by Drs. **Abhinav Gupta** and **Kevin Han**. His research focuses on construction issues surrounding nuclear energy — particularly micro nuclear reactors.

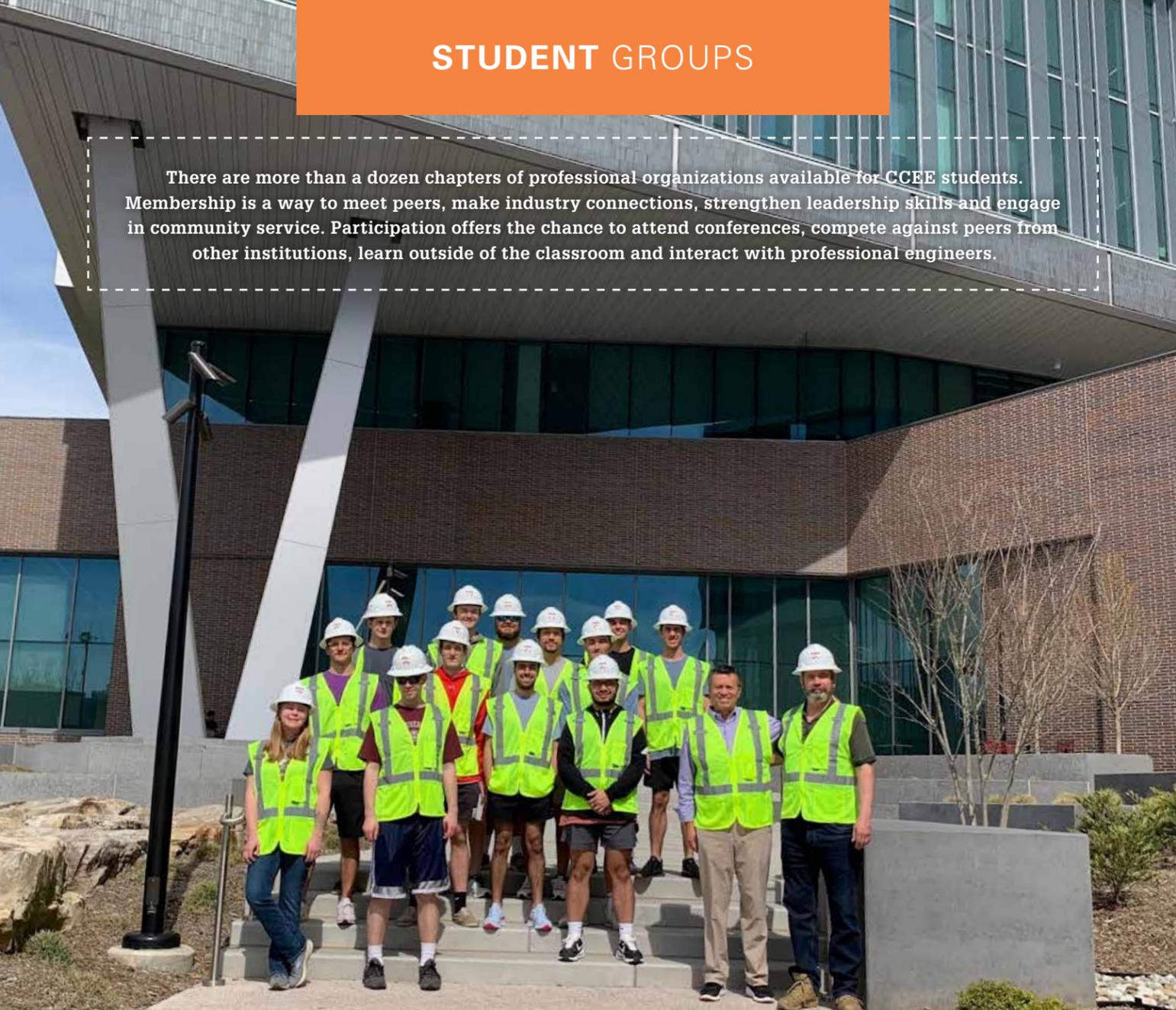
nuclear energy industry, nuclear medicine and a whole lot more.

Where do you see yourself in five years?

D: I see myself as the commanding officer of a SEABEE battalion. ■

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.



NC State ACI student chapter.

American Concrete Institute (ACI)

The NC State ACI student chapter was given “Outstanding University” status by ACI, which identifies universities based on their participation in select ACI-related activities and programs through a points system. This year, 86 universities received recognition as part of the ACI Universities Award Program.

The awards program, which was instituted in 2010, has two designation levels: Universities that earn 12 or more points are recognized with the Excellent University Award, and universities that earn 6 to 11 points are recognized with the Outstanding University Award. Since 2010, the NC

State chapter has earned seven Excellent awards and three Outstanding awards.

“The award recognizes the overall department-wide involvement with the mission of the American Concrete Institute,” said faculty liaison **Roberto Núñez**, who serves as a CCEE lecturer and senior construction extension specialist. “The award criteria measure leadership activities of faculty, students and student chapters of universities around the world in support of advancing knowledge and technology of concrete. This year’s award is of special significance because NC State faculty and students were significantly involved in ACI activities despite COVID limitations.”



Above, left, CCEE students (from left to right), Tana Harris, Zoe Smith, Hunter Bowman, Erica Mahoney, Cecilia Sanchez, Ellie Reimer and Isaiah Coleman, and CCEE teaching professor Steve Welton pose with the NC State team’s Student Steel Bridge at the ASCE 2022 Carolinas Student Symposium. Above, right, (from left to right) Mahoney, Smith, Harris and Reimer won third place in the Freshmore competition, which challenges a team of freshmen and sophomore students to solve an engineering-related problem.

Recipients of the ACI University Award were recognized during the Spring ACI Concrete Convention in Orlando, Florida, on March 27-31 and were featured in *Concrete International* magazine. The NC State chapter, which has 15 members, sent four students and Núñez to the convention, where they attended various technical sessions, a student award ceremony and a traditional Wolfpack Dinner with NC State alumni.

“I am proud of NC State, our CCEE department and our ACI student chapter,” Núñez said. “I’m happy to see our students and faculty being recognized for contributing to the progress and enhancement of concrete infrastructure knowledge and technology.”

American Society of Civil Engineers (ASCE)

Seven CCEE students attended the ASCE 2022 Carolinas Student Symposium with **Steve Welton** in Columbia, South Carolina, in early April. This year’s symposium, which drew 120 civil engineering students from seven universities across the Carolinas, was hosted by the University of South Carolina and included competitions, professional and personal development opportunities, and networking.



“It was the first conference for all of us, and it was very enjoyable to see ASCE get back up and running after an in-person hiatus,” said CCEE student **Hunter Bowman**, who attended the conference. “The student chapter at the University of South Carolina put in a lot of effort to make it happen, and it was a great experience.”

CCEE students participated in four competitions: the American Institute of Steel Construction (AISC)/ASCE Student Steel Bridge Competition; Quizbowl, a Jeopardy-style trivia game that covers topics on the Fundamentals of Engineering Exam for Civil and Environmental Engineers; the Daniel W. Mead Prize for Students competition, which involves writing a paper on professional ethics; and the Freshmore competition, which challenges a team of freshmen and sophomore students to solve an engineering problem.

The students earned first place in the aesthetics category of the Student Steel Bridge Competition and third place in the Freshmore challenge.

“My team is extremely proud of the work and dedication we put into the design and fabrication,” said Bowman, who served as captain of the Student Steel Bridge team. “Being recognized for that effort is an honor.”



Above, top, the NC State EERI undergraduate team after competing in the Seismic Design Competition. From left to right: Anna Settlemyer, Ivan Rosales-Flores, Ting Lin, Kendon Gann, Natalie Hackman, Taylor Brodbeck, Kaitlyn Zych, David Comaniciu, Julio Samayoa and Willie Rumbos.

Above, bottom, the EERI team loads their balsa wood structure with weights. From left to right: Ivan Rosales-Flores, Kendon Gann and Anna Settlemyer.

Earthquake Engineering Research Institute (EERI)

The NC State EERI group journeyed to Salt Lake City, Utah, on June 27 to July 1 to attend the U.S. National Conference on Earthquake Engineering, hosted by EERI.

The NC State EERI undergraduate team competed in the annual Seismic Design Competition with dozens of other universities from around the world. The contest involves testing teams' constructed balsa wood towers on a shake table to determine whether they can survive a simulated earthquake while supporting weights. The design challenge

this year was to create a building with a vertical irregularity. The team used the new Fitts-Woolard Hall Student Projects Lab to build their structure. After months of designing and building, the team's structure survived the simulated ground motion pulse, which caused a third of the structures to collapse.

"The seismic design competition was an incredible learning experience filled with challenges, discoveries and unforgettable memories," said **David Comaniciu**, who served as team captain.

NC State's nine-person team was the largest to date, including Comaniciu, **Kendon Gann**, **Natalie Hackman**, **Ting Lin**, **Ivan Rosales-Flores**, **Willie Rumbos**, **Anna Settlemyer**, **Kaitlyn Zych** and **Hunter Bowman**. The team was advised by graduate students **Taylor Brodbeck** and **Julio Samayoa**. The NC State team placed 15th in the international competition.

"I had the amazing opportunity to meet and interact with civil engineering students from around the world as well as connecting with professionals in my field," Hackman said.

In addition to the competition, graduate students **Jessi Thangjitham**, **Victor Calderon** and **Diego Martinez** presented their research at the conference. ■

FACES OF CCEE

Our FACES of CCEE media project celebrates outstanding alumni and illustrates to current students the varied careers available to them. This is an ongoing project, so if you'd like to bring someone to our attention (including yourself), then please do so! We want to know what our alumni are doing. Please send an inquiry or information to our communications director, **Taylor Wanbaugh** (twanbau@ncsu.edu).





PAUL KOCH
(BSCE 1989, MCE 1997)

Koch is a vice president and transportation business leader for the U.S. Gulf region of Edmonton, Alberta-based Stantec Consulting Services. Located in Raleigh, North Carolina, he leads environmental planning for transportation planning projects and is a registered professional engineer in North Carolina, Florida and Georgia. He was named to *Business North Carolina* magazine's 2022 Power List, an annual report that highlights the state's most influential leaders.



MISTY MARLEY MANNING
(BSCE 2005)

Manning serves as a water resources engineering manager at Fayetteville Public Works Commission (PWC) in Fayetteville, North Carolina. Her team oversees engineering and project management at PWC's water treatment and reclamation facilities, as well as rehabilitation and replacement efforts and design and installation of water and sanitary sewers. Manning is affiliated with the National Society of Professional Engineers, Professional Engineers of North Carolina South Central Chapter, Construction Managers Association of America and American Waterworks Association / NC One Water. She was recently named to the *Fayetteville Observer's* 40 Under 40 Class of 2022.



STEPHANIE VEREEN
(MSCE 2002, Ph.D. 2013)

Vereen is a limited-term assistant professor at Kennesaw State University in Marietta, Georgia. She is also the founder and principal of Vereen Construction Services, which specializes in startup, close-out, procurement and constructibility consulting services. Vereen is passionate about the civil engineering profession and all aspects of infrastructure and serving the public. In her professorial role, she seeks to encourage students and inform them of the realm of possibilities, locally, nationally and globally, in civil and construction engineering.



JOEY HOPKINS
(BSCE Construction Option 1989)

As chief operating officer of the North Carolina Department of Transportation (NCDOT), Hopkins oversees the Division of Highways, Ferry Division, Aviation Division, Rail Division, the Integrated Mobility Division, Division of Planning & Programming and the Communications Office. He has worked at NCDOT for more than 30 years in a variety of roles. As a member of NCDOT's Transformation Management Team, he was instrumental in developing the Strategic Prioritization Process, the forerunner of the Strategic Mobility Formula, a data-driven process used to help prioritize transportation projects in North Carolina.

Photo by Reilly Dehner, NCDOT



Katie Finegan (MENE 2017) joined the South Carolina Sea Grant Consortium as the coastal processes specialist. The position is shared with the Burroughs and Chapin Center for Marine and Wetland Studies at Coastal Carolina University. In this role, she assists in providing science-based information about coastal processes — the connection between watersheds and the ocean, coastal hazards and how to enhance resilience to these hazards.

Josh Blount (BSCE 2012) was promoted to regional director for the western region of the Ductile Iron Pipe Research Association (DIPRA). He previously served as a senior regional engineer for the western states. He will provide training and presentations, assist with relevant references and guides, and aid utility contacts and other DIPRA staff with support on technical issues, applications, material comparisons and more.

Chris Boyd (BSCON 2004) was named to the Carolinas Associated General Contractors of America (CAGC) Class of 2022 Top Young Leaders. The award recognizes professionals under 40 who play critical roles in the community and professional arenas of the construction industry. Boyd has worked for Crowder Construction for 18 years, and he now leads Preconstruction Services for Crowder's Heavy Civil Division.

Otis Crowder (BSCE with Construction Option 1970) was recognized for his achievements in engineering by the Carolinas Associated General Contractors (CAGC) as a Class of 2022 Hall of Fame honoree. He joined his family's business, Crowder Construction Co., upon graduation and went on to serve as president, chairman and board member of the company and its subsidiaries.

Joseph Bordeaux (BSCE 1958) was posthumously named to the Carolinas Associated General Contractors' Class of 2022 Hall of Fame Legacy. He founded Bordeaux Construction Co. Inc. in 1977 with his wife, Agnes. The Raleigh, North Carolina-based company continues as a third-generation family business with projects across North Carolina and annual sales exceeding \$75 million.

Neil Deans (BSCE 1993) was named to *Business North Carolina* magazine's 2022 Power List, an annual report that highlights the state's most influential leaders.

Deans serves as senior vice president of Raleigh, North Carolina-based planning and engineering firm Kimley-Horn and is responsible for 10 offices in the Carolinas, Georgia, Kentucky and Tennessee.

Mark T. Gibbs (BSCE 1993) was promoted to western deputy chief engineer of the North Carolina Department of Transportation. Gibbs, who previously served as a Division 13 engineer, will oversee NCDOT operations in the western half of the state. He has worked for NCDOT for 28 years.

Capt. **Joseph Halley** (MCE 2019) received the 2021 Secretary of the Air Force Leadership Award in the Company Grade Officer category. Halley serves as an instructor within the Air Force Institute of Technology's Civil Engineer School and was involved with 21 courses that reached 742 students under pandemic operations. He also consulted on the series development of the new pavement management courses, supporting more than 400 engineers per year.

Dr. **Ozge Kaplan** (MSCE 2001, Ph.D. 2006) created a video that was selected as one of 50 "science short films" to be featured in *Nature's* new Science in Shorts video library. The video highlights research featured in a recent U.S. Environmental Protection Agency (EPA) paper about transportation emissions scenarios for New York City. Kaplan serves as a senior research engineer at the EPA.

Will Letchworth (BSCE 2002, MSCE 2004) was named vice president of transportation of McAdams, headquartered in Durham, North Carolina. Letchworth has more than 18 years of experience in transportation planning and design. He serves the community and profession in a variety of roles including as chairman of the Johnston County, North Carolina, Planning Board and as a board member of the American Council of Engineering Companies of North Carolina.

Ramey Kemp (BSCE 1965, MCE 1972) was named Outstanding Engineer of the Year by the North Carolina Society of Professional Engineers. Kemp founded transportation consulting group Ramey Kemp Associates more than 30 years ago. The Raleigh, North Carolina-based company has been recognized as an *Engineering News-Record* "Top Design Firm in the Southeastern U.S." and has six offices across the Carolinas and Virginia.

Will Larsen (BSCE 2009, MCE 2012) was selected to serve on the Junior Board of Directors for the North Carolina Chapter of the American Council of Engineering Companies (ACEC). Larsen is a regional manager of the Wooten Company's Greenville Regional Office. He graduated from the ACEC North Carolina Future Leaders Program in 2019 and was named by the state chapter as a 2020 Young Professional of the Year.

Anna Lynch (MCE 2009) won a 2022 Women in Business Award from the *Triangle Business Journal*. Lynch is CEO of Raleigh, North Carolina-based Lynch Mykins and has won several accolades, including being named a 2021 *Triangle Business Journal* CEO of the Year.

Dr. **Harleen Kaur Sandhu** (Ph.D. 2021) recently earned her Professional Engineer Licensure in the state of North Carolina. Sandhu currently works as a postdoctoral scholar with Dr. **Abhinav Gupta** in the CCEE department.

Willy Stewart (BSCE 1981, MSCE 1983) was named to *Business North Carolina* magazine's 2022 Power List. He leads engineering firm Stewart, based in Raleigh, North Carolina. Stewart has grown to more than 200 people with offices across the Carolinas and has received many industry accolades and workplace recognitions.

Robby Stone (BSCE 1998) was named public services director for the city of High Point, North Carolina. Stone has worked for the city for nearly a decade and previously served in various public service department roles for the city of Winston-Salem, North Carolina.

Dr. **Yixuan (Wendy) Wang** (Ph.D. 2021) tied for second place for the Air and Waste Management Association (A&WMA) Dissertation Award for her research on life cycle assessment of solid waste management systems. Wang serves as a postdoctoral researcher at the Argonne National Laboratory, operated by UChicago Argonne for the U.S. Department of Energy in Lemont, Illinois.

Jim Westmoreland (BSCE 1988) joined the Board of Directors for Oak Ridge Financial Services and Bank of Oak Ridge in Oak Ridge, North Carolina. Westmoreland serves as the interim executive director at Gateway Research Park Inc. and oversees the development and operations of two 75-acre research campuses.

Neal Wright (BSCE 1977) was promoted to senior vice president and federal business development director of STV. Wright has more than 40 years of experience in the civil and environmental engineering field. He joined STV in 2019 as a vice president and business development director for Department of Defense clients.

Ryo Yamamoto (BSEE 2019) joined Thomas and Hutton's Civil Department in Charlotte, North Carolina, as a designer. He will assist the civil team with site development construction drawings and engineering design considerations for water, sewer and stormwater drainage infrastructure, and permit applications associated with industrial building sites and public infrastructure in the Charlotte region. ■

SHARE YOUR NEWS

There are thousands of alumni of the Department of Civil, Construction, and Environmental Engineering working throughout the nation and around the globe. We invite you to provide us with updates about career accomplishments, awards or recognitions, as well as other news. We aspire to create a community of alumni who 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 **Taylor Wanbaugh** at twanbau@ncsu.edu.

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

Also, we invite you to connect with us on social media to keep up with the latest news.

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 [go.ncsu.edu/cceelinked](https://www.linkedin.com/company/go.ncsu.edu/cceelinked)

How Your Support Makes A Difference



Top photo: Students work in the Student Projects Lab in Fitts-Woolard Hall.

Bottom photo: Assistant Professor Dr. Tarek Aziz works with a student in the Hydraulics Lab in the Fitts-Woolard building on Centennial Campus.

Photos by Becky Kirkland.

ENDOWED FACULTY SUPPORT

Faculty members are the heart and soul of the Department of Civil, Construction, and Environmental Engineering, 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 AND AWARDS

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 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

A regular 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, in 2020 we deployed teams to the field for time sensitive monitoring of SARS-CoV-2 before external funding was available. 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 members to pursue a new research idea. Sponsorships are also available for this newsletter, the welcome back ice cream each fall 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 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. Our new large monitors in Fitts-Woolard Hall provide opportunities for firms to display information highlighting notable projects and other information. The Firm of the Month program provides participating firms with name recognition for recruiting and business opportunities, demonstrates to students the ways in which they can use their degrees, and provides information on employment opportunities. ■

2022 CORPORATE DONORS

The firms listed here have provided endowments or made contributions from January 2022 through the end of August 2022. Many on the list have supported multiple activities in the department. We would like to extend our sincere appreciation.

ACI Carolina Chapter	FDH Engineering Inc.	Kimley-Horn & Associates, Inc.	RTP Chapter of the Air & Waste Management Association
Allan Myers	Fluhrer Reed, PA	Leith Marketing Services	Scalene Design
American Institute of Steel Construction	Frank L. Blum Construction Company	McDonald-York Building Company	SCS Engineers
American Tower Corporation	Frederick County Developmental Center	McGill Associates	Smith Gardner, Inc.
Art Guild, Inc.	Freese and Nichols	McKim & Creed	Smith, Kesler & Company, PA
Benesch	General Contractors Association of Raleigh	Mead & Hunt	Smithson, Inc.
Bennett & Pless, Inc.	George Finch / Boney & Associates	Metromont Corporation	Stantec Consulting Services, Inc.
Brasfield and Gorrie	Geosyntec Consultants	Moffatt & Nichol	Stewart Engineering
Citadel Management Services, LP	Giles Flythe Engineers, Inc.	National Christian Foundation	Structural Engineers Association
Clancy & Theys Construction	Hazen and Sawyer	National Coatings, Inc.	Timmons Group
CMAA North Carolina Chapter	Holder Construction Company	NC Department of Transportation	Tindall Corporation
Cowan and Company, LLC	IQ Contracting, LLC	NC Licensing Board for General Contractors	TriSure Corporation
Dewberry	J. E. Dunn Construction Company	New Belgium Brewing Company	Westside Hauling, Inc.
ECS Carolinas	James R. McAdams Company	Omega Construction	Wetherill Engineering, Inc.
EM Structural	Kaydos-Daniels Engineers, PLLC	Pickett and Associates, LLC	Williams Engineering Associates PC
Environmental Research & Education Foundation		Pope Custom Homes, Inc	WithersRavenel, Inc.
EOS Remediation, LLC			

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 **Michael Auchter**, our director of development, at mrauchte@ncsu.edu.



Dr. Jim Nau

“An incredible teacher.”

“The kind of professor and person that you never forget.”

“A trusted resource who provided advice and guidance.”

“A great teacher and friend.”

“A terrific mentor who was incredibly humble and always put students first.”

“One of the best professors and humans I've known.”

A lasting legacy

What do all these accolades have in common? They are praises from former students of Dr. **Jim Nau**, a CCEE professor, who retired this summer after 40 years with the department.

Although his former students speak effusively about Nau, he shies away from the spotlight. When asked about his four-decades-long career, he assured me there are a myriad of other professors and mentors who deserve higher praises.

“I don't do anything special,” he shrugged. “I just teach the way I want to be taught.”

Nau always knew he wanted to be a teacher. Growing up in Hickory, North Carolina, his father doubled as an ordained minister and a professor at the local college, Lenoir-Rhyne University, home of the “Bears.”

“He made me a Lenoir-Rhyne Bear,” Nau said. “I have the fondest memories of going to those athletic events.”

Nau always had an innate interest in building and figuring out how things worked, mechanically speaking. Nau grew up building model airplanes and still enjoys working on old cars. So engineering was a good fit.

“I've always been pretty good with following directions,” he said, laughing.

Nau headed to Raleigh in the 1970s to earn a B.S. and M.S. in mechanical engineering at NC State before earning his Ph.D. in civil engineering from the University of Illinois at Urbana-Champaign. Nau's fond memories of North Carolina and academia brought him back to CCEE in 1982, when he began as an assistant professor. He was promoted to professor in 2000 and has now earned professor emeritus status. He taught numerous courses at the undergraduate and graduate level including statics, solid mechanics, reinforced concrete design, structural steel design and the senior design project course.

During his four decades as a professor, Nau won countless awards and accolades for his teaching, including the AT&T Foundation Award for Excellence in Instruction of Engineering Students; the NC State Outstanding Teacher Award; George K. Wadlin Distinguished Service Award, Civil Engineering Division, from the American Society for Engineering Education; the Chi Epsilon Excellence in Teaching Award for the Cumberland District; and NC State's

Alumni Association's Alumni Distinguished Professor award.

Working with Dr. **Mervyn Kowalsky** and other CCEE faculty members, Nau's research is mainly in the area of earthquake engineering. Over the years, he has been engaged in research projects on the seismic response, repair and durability of steel and concrete bridge components. This research, supported by the Alaska Department of Transportation & Public Facilities, involves material and large-scale experimentation at the Constructed Facilities Lab. Nau's research interests include various means of structural repair of earthquake damaged components and systems.

But to Nau, the most rewarding part about his job was the effect he had on his hundreds of students over the years.

“It didn't happen every semester or every course, but an overwhelming majority of the comments I got from students were positive,” he said. “I always looked at those. I always tried to take any constructive criticism the best I could to make a change if I thought I needed to. I still write on the blackboard. I don't use PowerPoint. I don't want students sitting there with their arms folded. I want them engaged.

And I try to respond to them in a timely fashion.”

Bill Martin (BSCE 2007, MSCE 2010), president of Tower Engineering Professionals, TEP Design Build, Tower Engineering Canada, remembered having Nau for a wood design course and senior design class. He noted that, although Nau continued to make a considerable impact through research on civil and structural modeling and materials, he still emphasized teaching.

“The best teachers have a way of explaining complex topics in simple terms, resulting in a broad understanding of the material,” Martin said. “Dr. Nau embodied this ideal and explored topics until they were ‘crystal’ clear to his students. His approach to teaching went beyond just reviewing content, he demonstrated its use, leading to a full understanding and bridging the gap between theory and design. I routinely referenced his course notes early in my career.”

Martin credited Nau with his decision to pursue a career in the field of civil and structural engineering, helping build Tower Engineering from a 15-person regional engineering firm to a more than 1,000-person engineering and construction firm serving the U.S. and Canada.

“Dr. Nau's influence has a cascading effect and his retirement, although well deserved, will create a large void in the civil engineering program,” he said. “Those are going to be some big shoes to fill. He is an incredible teacher.”

Similarly, Nau had a big influence on **Sarah Mann** (MSCE 2020), whose first class with Nau was Reinforced Concrete Design.

“I always looked forward to going to his class because you could tell he enjoyed teaching,” she said. “He was always willing to talk and answer questions about anything. He definitely helped motivate my interest in wanting to become a professor because I want to exemplify his teaching style and philosophies.”

Hannah Ford (BSCE 2018), a staff engineer II at Atlas Engineering, said Nau was a very gifted professor who always took the time to explain complex mathematics and engineering problems to his students in a way that promoted true understanding and knowledge.

“I can truly say that I had so much fun in his courses, but also during office hours,” she said. “Dr. Nau was open to questions throughout the day. Later in my college career, when I was applying for jobs, Dr. Nau was a trusted resource who provided advice and guidance on what to value in an engineering company. I attribute part of the reason I chose my firm, Atlas Engineering, to Dr. Nau's advice and confidence in the engineers at this firm. It was due to Dr. Nau's assurance that I made the decision I did, and just celebrated four years with my dream company.”

Craig Fisher (MCE 1995), principal of E+M Structural, remembered that, although he worked hard during his time at NC State and was a good student, he struggled with an incredibly challenging class during his last semester.

“Dr. Nau knew this and he could see things that others could not see — a special gift,” Fisher said. “He knew the course was hard. It was my last final before I could earn my master's. I went to him and told him about the final. I passed the exam. To this day, I still think that Dr. Nau had an influence on that class and that final exam. I am forever grateful for his dedication.”

CCEE teaching professor **Steve Welton** (BSCE 1988, MSCE 1992) said he was lucky enough to have Nau as both an instructor and, later, a colleague.

“I have been honored to have Dr. Nau's mentoring on both ends of my career,” he said. “During the last nine years, I have enjoyed the pleasure of having Dr. Nau as a colleague and a dear friend. His assistance has enabled me to have a successful transition to academia, and now to be able to serve as a teaching professor. As a former student, I am indebted to Dr. Nau; and now, as my very dear friend, he is Jim.” ■



Meet Dr. Jacqueline MacDonald Gibson

"I am thrilled to return to North Carolina. I raised my children here and regard North Carolina as home. My husband grew up in Raleigh and is an NC State alumnus, so our return is a welcome homecoming for him, as well."

MACDONALD GIBSON

Though she is new to the role and department, CCEE Head Dr. Jacqueline MacDonald Gibson is a veteran when it comes to academia and research in North Carolina. Before her recent roles as professor and chair of the Department of Environmental and Occupational Health at Indiana University, Bloomington, she spent 12 years on the faculty of the Department of Environmental Sciences and Engineering in the Gillings School of Public Health at University of North Carolina at Chapel Hill. She has continued to conduct important water contamination research in the state over the years.

Before **MacDonald Gibson** joined CCEE in August, there was already a Wolfpack member in the family.

"I am thrilled to return to North Carolina," MacDonald Gibson said. "I raised my children here and regard North Carolina as home. My husband grew up in Raleigh and is an NC State alumnus, so our return is a welcome homecoming for him, as well."

Engineering also happens to run in the family.

"I am the proud mother of three sons and two stepsons. Four of the five are engineers: three are aerospace engineers, and one is a music production engineer."

In her research, MacDonald Gibson parses complicated environmental problems into manageable elements that can be modeled mathematically and re-integrated to inform environmental and public health policy decisions. She has worked across the globe, from the U.S. to the United Arab Emirates, examining environmental risks to health at the scale of communities, building models that integrate knowledge of how pollutants are distributed through communities, how people become exposed to pollutants and other environmental risks factors, and how these exposures, in turn, increase risks of illness or premature death.

MacDonald Gibson's accolades include being named an RTI University Scholar and receiving the IBM Junior Faculty Development Award and the Newton Underwood Award for Excellence in Teaching, Department of Environmental Sciences and Engineering from UNC-Chapel Hill.

In her first few weeks as department head, MacDonald Gibson offered insight into her new role and future plans in the following Q&A. You can learn more about MacDonald Gibson's professional background, accolades and research at go.ncsu.edu/macdonaldgibson.

What makes you excited about being head of CCEE?

MACDONALD GIBSON (MG): I am thrilled to join an exceptionally talented group of engineering faculty who are passionate about empowering students to improve the world for all. CCEE is not only one of the nation's largest civil engineering departments but also one of the most talented. For example, one-third of our faculty have received a CAREER award from the National Science Foundation. The CAREER award is the most prestigious grant given to young faculty members to recognize their potential to serve as academic role models and to lead advances in science and engineering.

What are your priorities as department head?

MG: My top priority is to continue to hire the best people while also enhancing the racial and gender diversity of the department's faculty and students and, ultimately, the diversity of the fields of civil, environmental and construction engineering. Our nation can achieve its greatest potential in engineering only by ensuring that our entire talent pool is represented in our engineering professions. Real or perceived

barriers that discourage some groups of young people from pursuing engineering careers result in a loss of brainpower and creative ideas, to the detriment of our entire society.

Are there any specific areas or initiatives you intend to focus on as department head?

MG: I am especially excited about working toward advancing equity in access to all aspects of civil infrastructure, including high-functioning water and sanitation systems, modern and low-emissions transportation systems, safe buildings and livable communities.

What do you see as key strengths of CCEE?

MG: I asked this question of the CCEE faculty when interviewing for the department head position. Uniformly, they responded that CCEE's strength is its people, including faculty, staff and students. The department promotes an atmosphere of collegiality, prioritizing the mutual goal of engineering a better world over personal advancement. Another great strength is the breadth of civil engineering sub-disciplines represented in the department. Our faculty members have expertise spanning the vast range of activities in which civil engineers may be involved — from designing highway and rail systems, to constructing buildings that can withstand earthquakes, to designing new paving materials that can decrease costs while also limiting environmental impacts, to preparing our communities to be resilient to extreme weather and climate, to tracking down and eliminating sources of air, water and soil pollution that endanger health.

Do you have a message for alumni?

MG: You are part of an exceptionally talented group. CCEE alumni have led some of the world's most ambitious projects in civil, construction and environmental engineering, leaving their mark by improving the quality and safety of every aspect of infrastructure that supports communities but that many people take for granted. Examples include safer bridges, buildings and transportation systems and cleaner environments. I look forward to meeting as many of you as possible this year. Please visit us in Fitts-Woolard Hall.

Favorite vacation spot or favorite place you've traveled to?

MG: The North Carolina mountains, with the endless view of rolling blue ridges, are my slice of heaven. ■



Meet Dr. Ghadir Haikal

She is bringing her intellectual juggling act to CCEE, where she is teaching CE 325: Structural Analysis during the Fall 2022 semester.

Haikal was previously a group leader in the Computational Materials Integrity Section, Materials Engineering Department, Mechanical Engineering Division, at Southwest Research Institute in San Antonio, Texas, and an assistant professor at the Lyles School of Civil Engineering at Purdue University. She earned her master's and Ph.D. in civil engineering from the University of Illinois at Urbana-Champaign in 2004 and 2009, respectively, and a Bachelor of Civil Engineering in civil (structural) engineering from Tishreen University in Syria in 1998.

Haikal's awards and honors include being named a distinguished engineer by the American Society of Engineering Education and a Fulbright fellowship alumna.

Haikal said she regards the CCEE program at NC State to be one of the "top programs in the country with fantastic faculty, great resources and excellent students."

"I look forward to working with students, both through research and in the classroom, growing my research program, and collaborating with other faculty on exciting new projects," she said.

Haikal is a native of Tartous, Syria — a small city on the Mediterranean coast. She said she is excited to be in North Carolina, as the state's close proximity to the ocean and mountains reminds her of Tartous.

"The landscape is beautiful, and the Research Triangle area is full of great food, music and interesting places to explore," she said. In her free time, Haikal enjoys reading, hiking, yoga and learning to play the piano. ■

You could say Dr. **Ghadir Haikal**, a new associate professor in the Structural Engineering and Mechanics group at CCEE, is a juggler of sorts. Her research, which is in the broad area of computational mechanics, juggles a mixture of mathematics, physics and computer methods.

"The goal is to develop computer models of civil engineering buildings, bridges and materials to study structures beyond what we can typically test in a lab," she said.

She focuses on problems where multiple components interact through an interface — such as the interface between steel and concrete in reinforced concrete.

"Interfaces are very hard to model, and yet they are critical to the assessment of the overall structure as most damage mechanisms start at these interfaces," Haikal said. "I am also looking to develop new methods that combine machine-learning techniques with our more traditional mechanics-based methodologies to improve speed and efficiency in modeling complex engineering problems."

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

Jennifer Brandenburg
BSCEC 1986
AgileAssets,
A Trimble Company

Glenda Gibson
BSCE 1987
Mott MacDonald

Skeet Gray
BSCEC 1983, MSCE 1993
Eagle Engineering Inc.,
Retired

Christine Herrick
BSCE 2011
Kimley-Horn & Associates

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

Joe Hines
BSCE 1991
Timmons Group

Jonathan Holtvedt
BSCE 2015, MCE 2017
D.R. Horton

Joey Hopkins
BSCE Construction Option 1989
North Carolina Department of Transportation

Street Lee
BSCE 1983
McKim & Creed

Will Letchworth
BSCE 2002, MSCE 2004
McAdams

Chad Link
BSCEC 1996
Crowder Construction Company

Mark McIntire
BSENE 1995, MSCE 1997
Duke Energy Corporation

Tonya Mills
BSCE / BSENE 1994
Tri Properties Inc.

Lisa Patterson, Secretary
BSCE 1989, MCE 1990
Hazen and Sawyer

Dan Pleasant
BSCE 1972, MCE 1973
Dewberry, *Retired*

Sandra Stepney
BSCE 1983
WGI

Gray Talley, Past Chair
BSCEC 1998
Shelco Inc.

Steve Thomas
BSCE 1984, MSCE 1986
SEPI Engineering

Stephanie Vereen
MSCE 2002, Ph.D. CE 2013
Kennesaw State University,
Vereen Construction Services

Mike Wayts, Vice Chair
Freese and Nichols Inc.

Eddie Wetherill
BSCE 1979
Wetherill Engineering Inc.

Ryan White
BSCE 2000
Stantec Consulting

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For more information contact:
Michael Auchter
Director of Development
Phone: 919.515.1467
Email: mrauchte@ncsu.edu



Meet Dr. Idil Akin

"I am interested in post-wildfire wetting-induced shallow landslides, erosion and associated debris flows, and hillslope stabilization," she said. "In ongoing research, we will use a variety of techniques — lab measurements, field sensors, remote-sensing method Light Detection and Ranging (LiDAR) — to understand how the recovery of a forest environment relates to soil water retention and landslide susceptibility."

In the biogeotechnics field, Akin said she is interested in the use of biofilms to improve soil mechanical behavior.

Akin is bringing her unique field experiences and creative thinking to the classroom. She is teaching CE 342: Engineering Behavior of Soils and Foundations during the Fall 2022 semester and plans to teach CE 593: Unsaturated Soil Mechanics in the future.

Akin previously served as an assistant professor of civil and environmental engineering and Colf Distinguished Professor in Geotechnical Engineering at Washington State University. She earned a master's degree and Ph.D. in civil and environmental engineering from the University of Wisconsin-Madison in 2014 and 2017, respectively. She has a Bachelor of Science in civil engineering from Middle East Technical University in Turkey.

She has received several awards and honors including the NSF CAREER Award and the American Society of Civil Engineers (ASCE) Excellence in Civil Engineering Education (ExCEE) Teaching Fellowship.

Although the strong geo-group at CCEE was originally what caught Akin's eye, she said that meeting department and university faculty members, students and staff members during the interviews is what really sold her on NC State CCEE.

"I think it is the culture; the people are happy, supportive and productive," she said. "I am looking forward to working with the bright students and the amazing collaboration opportunities within and outside of the department."

Akin, who moved to Raleigh this summer with her husband and cat, enjoys the great outdoors — you can find her hiking, trail running, skiing, sailing, enjoying the beach and making pottery. Originally hailing from Ankara, Turkey, Akin said she is excited to work in North Carolina.

"I'm looking forward to being close to the ocean and the mountains, and the vibrant life in Raleigh." ■

Bio-geotechnical engineers, like new CCEE faculty member Dr. **Idil Akin**, use methods inspired by nature.

In the hot sandy dunes of the Arizona desert, small rodents scurry across what seems like an inhabitable climate. But that's the surprising thing about kangaroo rats: They not only survive in the harsh desert elements — they thrive. The furry creatures build complex burrows that withstand the extreme weather conditions for years, a fact that has long fascinated Akin, who joined the CCEE faculty in August as an associate professor in the Geotechnical and Geoenvironmental Engineering group. Akin spent time this summer in the scorching desert as part of a three-year, National Science Foundation (NSF) grant enabling her to study kangaroo rats as synergistic bio-geotechnical engineers.

"We are investigating how burrows in loose desert sand can stay stable in extreme environments, and how kangaroo rats tackle a geotechnical challenge," she said.

Her research is built on the fundamental mechanisms that control the physicochemical, mechanical and hydraulic behavior of soils in saturated and unsaturated conditions. Her current work focuses on post-wildfire slope stability and bio-geotechnics. Specifically, a lot of vegetation is lost during wildfires and that vegetation is essential for stabilizing soils. Thus, understanding when and why unstable conditions develop is critical for protecting communities and infrastructure on or below these slopes.

IDIL AKIN
Geotechnical / Geoenvironmental,
Associate Professor

ALEX ALBERT
Construction, Associate Professor

KATHERINE ANARDE
Coastal, 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
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Professor

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Systems, Professor

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Water Resources / Computing and Systems,
Professor

ASHLY CABAS
Geotechnical / Geoenvironmental, Assistant
Professor

DOUGLAS CALL
Environmental, Associate Professor

CASSIE CASTORENA
Transportation Materials, Associate Professor

FRANCIS DE LOS REYES
Environmental, Professor and University
Faculty Scholar, Glenn E. Futrell
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for Faculty Advancement

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University Professor

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Environmental, Assistant Professor

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Structures / Materials, Professor

GHADIR HAIKAL
Structures, Associate Professor

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Structures, Professor and Vice Chancellor
for Information Technology

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BILLY WILLIAMS
Transportation Systems, Professor and Director
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