NC STATE

CCEE NEWS

DEPARTMENT OF CIVIL, CONSTRUCTION, AND ENVIRONMENTAL ENGINEERING

STUDENTS INSPIRING STUDENTS 25

SPRING 2022

IN THIS ISSUE

ABOUT THE COVER

G-I GSO and EERI officers at the Girls in Science camp. From left to right: Jessi Thangjitham, Cristina Lorenzo-Velazquez, Nancy Ingabire Abayo, Marlee Strong, and Pegah Ghasemi

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

Dr. Morton Barlaz

CCEE AT NC STATE
SUSTAINABLE INFRASTRUCTURE FOR SOCIETY

- **$23 million** in research expenditures
- **265** ongoing research projects
- **15** winners of CAREER and other NSF young faculty awards
- **53** faculty members
- **301** graduate students
- **772** undergraduate students

LETTER FROM THE DEPARTMENT HEAD

Welcome to our *Spring 2022 newsletter*. Overall, the fall semester went well. Despite the challenges associated with COVID-19, we were able to offer almost all of our classes in person. I am proud of our students. The overwhelming message was that they wanted to be on campus and were taking precautions to keep themselves and those around them safe. I am writing this letter just after our December graduation, our first in-person graduation in two years. We recognized 52 bachelor's, 35 master's and 19 Ph.D. graduates in what is always an uplifting celebration.

I am pleased to welcome new members to our department. Dr. **Andy Ziccarelli** joins as an assistant professor in structural engineering; read more about him on *page 36*. **Emad Tawadrous** joins as our new machinist. Emad, who is originally from Egypt, has been at NC State for 10 years. His hobbies include reading and playing pingpong. **Rachael Clark** joins as our new undergraduate programs assistant. She comes to us from the History Department at the University of North Carolina at Chapel Hill, and her hobbies include hiking, traveling, gardening and attempting to bake. Finally, **LaTonya Scott** joins our business office as a contracts and grants manager. She has lots of interests and hobbies including drawing, painting, knitting, poetry, live music and traveling. Finally, Dr. **Akhtarhusein (Akhtar) Tayebali** has retired after 28 years in CCEE, and we wish him well in retirement.

This newsletter features stories on some of the research led by our faculty, highlighting the department's contributions to the well-being of society. Dr. **Casey Dietrich** is working to increase the speed of models that are used to predict storm surge, which leads to improvements in the information available to those involved in making evacuation decisions. Drs. **Giorgio Proestos**, **Greg Lucier** and **Rudi Seracino** are working with 60-year-old concrete bridge girders from the now-deconstructed Bonner Bridge to compare girder behavior with model predictions. Dr. **Kevin Han** is utilizing advances in visual sensing and robotics to automate selected construction activities. Drs. **Doug Call**, **Detlef Knappe**, **James Levis** and **Dan Obenour** are participants in a National Science Foundation center to reduce our dependence on mined phosphates and minimize phosphate release into soils and water.

Thank you, as always, for your financial support. I am grateful for the confidence that you have placed in the department. Your support enables strategic initiatives and special projects for undergraduates, allows graduate students to make presentations at national conferences, and helps us recruit and retain the best students and faculty in the world. We need your support as we strive for excellence in all that we do.

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

Thank you,

Morton A. Barlaz
Distinguished University Professor and CCEE Department Head

Above: The Marc Basnight Bridge was built to replace the Herbert C. Bonner Bridge in 2019. Photo courtesy of HDR. Left: Dr. Giorgio Proestos' research group marking cracks during the testing of a Bonner Bridge Girder at the Constructed Facilities Lab.

The old Bonner Bridge provides a new kind of service

The Herbert C. Bonner Bridge was a vital lifeline to the Outer Banks, but it was replaced and deconstructed in 2019. CCEE researchers are testing some of the old bridge components to understand how it lasted so long, and how to better design and maintain future bridges.

When the Bonner Bridge opened over North Carolina's Oregon Inlet in 1963, it was projected to have a lifespan of 30 years. It was a lifeline connecting the seven small villages on Hatteras Island to the northern Outer Banks. The bridge replaced a ferry service, and, after its opening, tourism blossomed along Cape Hatteras' shore. The bridge endured the harsh Outer Banks environment for nearly twice its projected lifespan, but decades of stormy weather and the harsh saltwater environment led to millions of dollars in maintenance and repair costs. Bonner Bridge was officially replaced in 2019 when the long-awaited Marc Basnight Bridge opened after years of design and construction. Now, Bonner Bridge is being deconstructed. Much of the concrete will go to create artificial reefs, but the old structure will provide ongoing service by helping researchers determine how to extend the service lives of concrete bridges.

Funded by the North Carolina Department of Transportation (NCDOT), Drs. **Giorgio Proestos**, **Rudi Seracino** and **Gregory Lucier** are conducting laboratory tests to understand how concrete bridge girders perform after nearly 60 years of degradation and use.

"This deconstruction provides a chance to evaluate the aged girders of the bridge and to compare their performance with model predictions," Proestos said. "This is an incredible opportunity to conduct full-scale load testing of multiple large girders that have been in service for almost six decades."

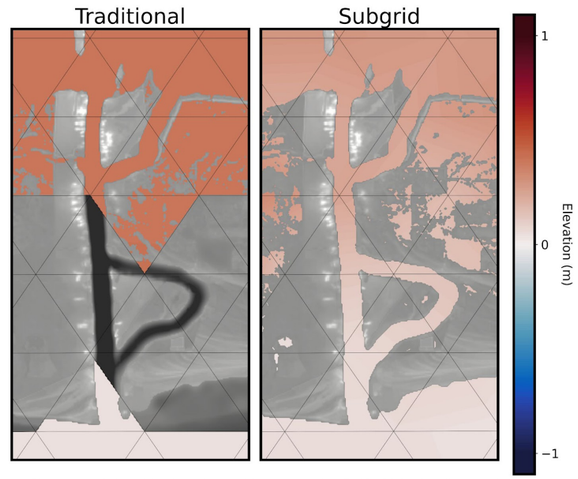
Evaluation of the Bonner Bridge girders will include full-scale load testing of multiple 61-foot-by-45-inch-deep prestressed concrete beams. The load testing is being conducted in the Constructed Facilities Lab (CFL) located on NC State's Centennial Campus.

Prestressed concrete girders are built with high-strength steel strands that are stretched and used to compress the concrete surrounding them. This precompression helps mitigate cracking and therefore reduces the prevalence of steel corrosion and other forms of degradation. As concrete bridges age, this beneficial precompression reduces as a result of stresses relaxing in the steel strands, the concrete creeping under the compressive stresses and the concrete material itself shrinking over time. As a part of regular safety evaluations, prestress losses are estimated and used to determine which bridges should be retrofitted, repaired or require weight restrictions.

This research aims to better understand these long-term loss effects by conducting numerical analyses and large-scale structural tests of actual bridge girders that have been in service for many years. The research will result in recommendations and guidelines the NC DOT can use to decide which bridge structures can have their service lives extended. ▪

How do you protect infrastructure from storm surge? New study examines predictive flood modeling in vulnerable communities

During coastal storms like hurricanes, most of the infrastructure damage and loss of life are caused by water. Strong winds push storm surge — the rise of ocean waters above the normal tides — which cause flooding in coastal communities. To predict this flooding, computer models must represent the flow of water from the open ocean, through inlets and navigation channels, across marshes and low-lying floodplains, over barrier islands, against flood mitigation structures and into communities. These model predictions can be slow (e.g., 1-2 hours on a supercomputer), especially because of the computational complexity associated with making calculations over a range of spatial resolution — homes and roadways are much smaller than a hurricane.



Close-up of the shipping channel between the Gulf of Mexico (bottom) and Calcasieu Lake, Louisiana (top). Colors indicate: high-resolution digital elevation model of the region (grayscale), and water levels as predicted by a storm surge model (red-blue). In the Traditional model, its low resolution (shown in triangles) is insufficient to represent water in the channel. In the Subgrid model, the same low resolution can now represent water in the channel and in the bayous of Louisiana.

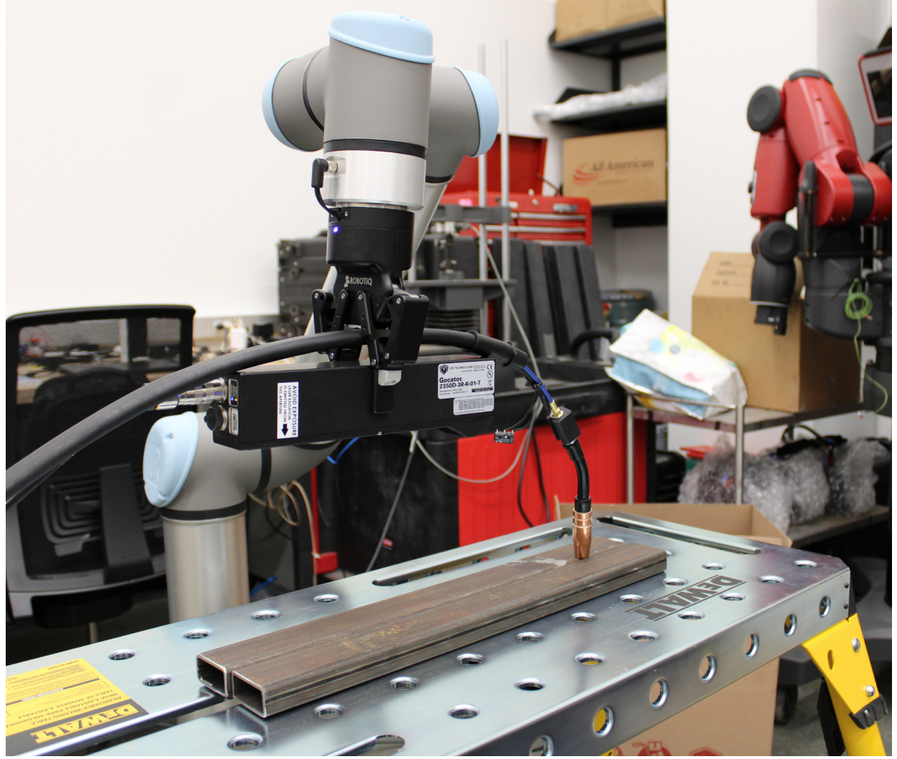
> "These corrections are exciting because they allow the model to be 10 times faster but with the same or better predictions of which regions will be flooded."
>
> **DR. CASEY DIETRICH**

In a project supported by the National Science Foundation, Dr. **Casey Dietrich** and his Ph.D. student **Johnathan Woodruff** are speeding up model predictions without sacrificing accuracy. With collaborators at the University of Notre Dame, they are developing subgrid corrections, which represent flows through the smallest channels and against the smallest barriers, without having to represent their exact shapes in the model. Subgrid corrections work by averaging information (like the ground surface) from higher resolution (like a digital elevation model) and using it to correct computations at lower resolution (like a storm surge model). Their goal is to include these corrections in the ADvanced CIRCulation (ADCIRC) model and its real-time forecasts of storm surge and flooding (cera.coastalrisk.live). ADCIRC is the leading model for storm surge and coastal flooding, and it is used by the United States Army Corps of Engineers, Federal Emergency Management Agency and National Oceanic and Atmospheric Administration.

"These corrections are exciting because they allow the model to be 10 times faster but with the same or better predictions of which regions will be flooded," Dietrich said. "This will allow us to share the predictions with decision-makers more quickly during a storm."

In a recent publication, Woodruff and Dietrich demonstrate the benefits of the subgrid corrections in a simulation of Hurricane Rita (2005) in southwest Louisiana. This region has been affected by several recent storms (including three tropical cyclones in 2020), which push storm surge across Calcasieu Lake and up the Bayou Contraband to the community of Lake Charles, Louisiana. A typical model would have to represent all of the small channels and connections in the bayou, but the model with sub-grid corrections was able to represent these features at much lower resolution. The water levels were predicted within 0.25 meters at the community of Lake Charles, and the simulation was 30 times faster. During a storm, this efficiency gain could reduce the simulation times from 1-2 hours to only 5-10 minutes.

These results demonstrate that utilizing subgrid corrections for real-time storm surge forecasting is a promising advancement. In ongoing work, the researchers are developing models for much larger regions, such as the entire southeast coast from Florida to North Carolina. These models will be used for real-time forecasts in future hurricane seasons. ▪



Left: Inspection robot with a terrestrial laser scanner, vertical lift and an unmanned ground vehicle with Light Detection and Ranging (LiDAR) for autonomous navigation; Right: A welding robot with a robotic arm, line laser scanner and a modified welding torch for automation.

How can welding be automated on construction sites?

The American Welding Society has estimated the shortage of skilled welders could increase to more than 400,000 by 2024, according to industry group Tradesmen International. With the pandemic and early retirements, this problem may continue to worsen. Automated welding with robotics can help the construction industry with this labor shortage. The manufacturing industry has benefited greatly from the use of a relatively simple robotic arm affixed to a welding station, but welding in construction is a much more complicated problem, because the welding robot needs to be mobile in the field.

The Construction Automation and Robotics Lab (CARL) directed by Dr. **Kevin Han** works on automating construction operations through advances in visual sensing and robotics. CARL is developing a field welding robot that uses an unmanned ground vehicle (UGV) with a robotic arm, laser scanner and camera. This integrated field robot will be able to navigate on a construction site, locate two pieces of metal to be welded, recognize and scan the welding joint, and weld.

"Building a welding robot is a complex engineering problem that involves civil engineering, robotics and computer science," Han said.

> "Building a welding robot is a complex engineering problem that involves civil engineering, robotics and computer science."
>
> **DR. KEVIN HAN**

Developing a robot like this involves multiple research tasks. The robot must be programmed to understand and navigate the surrounding environment. The robot must also recognize objects — such as metal pieces and joints — from 2D images and then move a robotic arm with a laser scanner to scan the welding joint. The scanned welding joint needs to be analyzed so that the exact joint profile is used to carefully control the welding gun attached to the same arm. All of these operations need to be performed in real time.

The current version of the robot can successfully detect a joint, operate the laser scanner and perform different welding patterns. CARL is working on the UGV integration so the welding robot can navigate on construction sites. ▪

NEW **RESEARCH PROJECTS**

During the latter half of 2021, CCEE launched numerous new research projects with funding from federal and state agencies, foundations and industry sponsors. This support will enable CCEE faculty members, their research teams and their collaborators to address problems facing infrastructure and the environment in North Carolina and around the world.

FEDERAL GRANTS

Dr. **Eleni Bardaka**, with Drs. **George List** and **Ali Hajbabaie**, is leading a National Science Foundation planning grant to bring together a diverse group of researchers from engineering, computer science, psychology and education to study the potential of moving away from traditional pricing incentives in public microtransit trips and inducing prosocial behavior. Behaviors include volunteering to shift one's trip time to accommodate others, share-a-ride programs, cooperating with other users to improve outcomes for the user community and prioritizing the transportation of people with limited access to transit options or a critical trip.

George Bonner, in collaboration with colleagues from the Coastal Studies Institute and the University of North Carolina at Charlotte, received funding from the U.S. Department of Energy for the Energy Transitions Initiative Partnership Project. The program provides technical assistance to vulnerable islands and remote communities seeking to enhance their energy infrastructure and mitigate risks. The objective is to address energy challenges, promote holistic clean energy solutions, build capacity and accelerate the sharing of best practices.

Bonner and colleagues from the Coastal Studies Institute also received support from the U.S. Department of Energy as a consortium partner for the newly founded Atlantic Marine Energy Center. Consortium partners include the University of New Hampshire, Stony Brook University and Lehigh University. The center will focus on research and development to advance responsible marine energy solutions.

Dr. **Emily Berglund**, with collaborator Dr. Avi Ostfeld from the Technion - Israel Institute of Technology, received funding from the U.S. - Israel Binational Science Foundation to explore how changes in water demand due to social distancing and working remotely can affect the management of water distribution systems. Their research will combine models of human behavior, survey data describing risk perceptions and simulations of water flows in pipe networks to develop new understanding for managing water infrastructure during pandemics.

Dr. **Ashly Cabas**, with collaborators Drs. Chris Cramer from the University of Memphis and James Kaklamanos from Merrimack College, received funding from the U.S. Geological Survey (USGS) to improve the central and eastern U.S. coastal plain seismic hazard model by accounting for the effects of local soil conditions in the region. In the past, the thickness of sedimentary columns, variability in soil properties and soil nonlinear behavior have not been considered. This new model will address those limitations in a probabilistic framework, which will enable its use in the USGS National Seismic Hazard Model.

NEW **RESEARCH PROJECTS**

continued

Dr. **Cassie Castorena** received funding from the National Cooperative Highway Research Program for Innovations Deserving Exploratory Analysis to investigate a new method to quantify recycled binder availability, which reflects the percentage of total asphalt binder in reclaimed asphalt pavement (RAP) that blends with the new asphalt in an asphalt mixture. Most current asphalt mixture design procedures assume that all of the RAP binder is available, which may yield mixtures that lack durability. A means to quantify recycled binder availability is expected to enable the design of high RAP content asphalt mixtures that meet performance requirements, resulting in cost savings and environmental benefits.

Dr. **Murthy Guddati**, with collaborators Dr. Vladimir Druskin of Worcester Polytechnic Institute and Dr. Elena Cherkaev of the University of Utah, received a grant from the National Science Foundation to develop new mathematical algorithms to simulate complex viscoelastic systems. They aim to replace complex mechanical systems by simpler networks, similar to those encountered in artificial intelligence, but informed by the underlying physics. The algorithms would be useful in a wide range of applications in nondestructive testing, geophysical and biomedical imaging.

Drs. **Abhinav Gupta** and Mihai Diaconeasa (Department of Nuclear Engineering) were awarded a U.S. Department of Energy grant under the Nuclear Energy University Program to develop an open-source web-based Probabilistic Risk Assessment (PRA) platform to support real-time decisions in the operation of nuclear power plants. The project aims to address the major challenges of the current legacy PRA tools by improving the quantification speed through high-performance computing as well as improving tool capability by integration of multi-hazard risk models.

Dr. **James Levis** is part of a multidisciplinary group that received funding from the U.S. Department of Energy to investigate the use of artificial intelligence and remote sensing to improve the identification, assessment and separation of materials in residual municipal solid waste. The focus will be on improving the purity and suitability of separated waste streams for conversion to fuels or electricity. Levis will lead the effort to investigate how these technologies may improve environmental performance compared to conventional waste-management alternatives.

Drs. **Shane Underwood**, **Richard Kim** and **Murthy Guddati** received funding from the Federal Highway Administration to develop a mechanistic model to predict the long-term performance of pavement overlays. Engineers rely on empirical methods to analyze and design overlays, but such methods do not fully account for traffic, climate and existing road conditions, and overlay performance varies substantially. In this study, current asphalt pavement cracking models that can be applied to reflective cracking will be assessed and pilot experiments will be carried out to select the most promising method for further development.

STATE AND LOCAL GRANTS

Dr. **Emily Berglund** received funding from the North Carolina Water Resources Research Institute, in collaboration with Dr. Caren Cooper (College of Natural Resources) and Dr. Valerie Johnson from Shaw University, to collect data about households that are at risk of lead pipes in plumbing and lead in tap water. This project will implement Crowd the Tap, a citizen science portal where households share information about their drinking water infrastructure. A citizen science internship program at Shaw University will engage student interns as ambassadors for Crowd the Tap to conduct outreach, collect data and develop a statistical model to reliably predict household risk from lead.

Dr. **Angela Harris** will support Wake County in monitoring SARS-CoV-2 infections using wastewater. The project will track concentrations of SARS-CoV-2 genetic material in wastewater collected from multiple wastewater treatment plants in Wake County. The project is in partnership with Wake County Public Health, Wake County wastewater utilities and the North Carolina Department of Health and Human Services. Data will be included in the Center for Disease Control's National Wastewater Surveillance System.

NEW **RESEARCH PROJECTS**

continued

Drs. **Angela Harris** and **Daniel Obenour** and Dr. Ryan Emanuel (College of Natural Resources), with support from the North Carolina Water Resources Research Institute, will research water quality in the Great Coharie River in Sampson County, North Carolina. Working with local stakeholders, including the Coharie Tribe, the team will shed light on the sources of fecal contamination in a culturally and environmentally significant water body in the eastern part of the state while also advancing fundamental science related to biological water quality.

FOUNDATIONS / NONPROFITS

Dr. **Doug Call**, with collaborators Drs. Sonja Salmon and Nelson Vinueza (Department of Textile Engineering), received funding from the Environmental Research & Education Foundation to study a biological process to recover resources from post-consumer textile waste. The team will use enzymes to transform the waste into a pumpable slurry of sugars and high-value fibers (such as polyester). After recovering the synthetic fibers, they will determine how much methane gas (a valuable energy resource) can be recovered from the sugar-rich waste stream in lab-scale anaerobic digesters.

Funds were received from the Environmental Research and Education Foundation for two projects related to landfills. Drs. **Florentino B. De la Cruz** and **Morton Barlaz** will compare field measurements of methane emitted from municipal solid waste landfills to emissions predicted by a number of models. Landfills are estimated to be the third-largest source of methane emissions that are attributable to human activity in the U.S., and initial work showed that a number of models overestimated emissions for one relatively new landfill. In this project, data from four older landfills will be evaluated. In a second project, Barlaz will evaluate the impact of the disposal of a range of nonhazardous industrial wastes that are known to contain poly- and perfluoroalkyl substances (PFAS), on PFAS concentrations in landfill leachate. Landfill leachate is known to contain PFAS as a result of its use on many consumer products. This project will evaluate whether the disposal of additional PFAS-containing wastes will increase leachate PFAS concentrations. PFAS is coming under considerable scrutiny from regulatory agencies because it does not break down to harmless byproducts.

Dr. **James Levis** received funding from the Environmental Research and Education Foundation to compare the costs, material and energy use, and environmental emissions and impacts of emerging chemical recycling technologies for plastics to existing waste-management alternatives such as mechanical recycling, landfill and incineration. This study will use the Solid Waste Optimization Life-cycle Framework in Python (SwolfPy) developed by CCEE researchers to determine how and if chemical recycling of plastics can be used to cost-effectively improve the sustainability of managing waste plastic.

INDUSTRY

Dr. **Ashly Cabas**, with collaborator Dr. Marco Pilz from the Helmholtz Center Potsdam - GFZ German Research Center for Geosciences, received financial support from Pacific Gas and Electric to study energy dissipation characteristics of rocks in California. This interdisciplinary effort connecting principles of engineering seismology and geotechnical engineering will investigate the role that shallow and deep geologic structures play in modifying the amplitude and other characteristics of seismic waves. Outcomes of this effort will lead to advancements in ground motion modeling in California.

Drs. **Abhinav Gupta**, **Kevin Han** and Nam Dinh (Department of Nuclear Engineering), sponsored by TerraPower, are collaborating on digital engineering and digital twin technologies to improve design, construction and operation of next-generation advanced nuclear reactors. TerraPower, an advanced nuclear reactor vendor company founded by Bill Gates, is leading work on the development and demonstration of their Natrium small modular reactor. ▪

Rendering of the new Plant Sciences building.

New NSF Center on Centennial Campus will advance phosphorus sustainability

CCEE faculty members — including Drs. **Doug Call**, **Detlef Knappe** and **Dan Obenour** — will join with colleagues across NC State University to lead a national research effort to reduce dependence on mined phosphates and the amount of phosphorus that leaches into soil and water. The research, funded by the National Science Foundation (NSF), will focus on issues relevant to both food security and environmental quality.

THE NSF SCIENCE AND TECHNOLOGY CENTER will be headquartered on Centennial Campus. The center, known as Science and Technologies for Phosphorus Sustainability (STEPS), is a joint effort between NC State and eight partner institutions and is funded by an initial five-year, $25 million grant that is renewable for an additional five years. Dr. Jacob Jones, Kobe Steel Distinguished Professor in the Department of Materials Science and Engineering, will be the center's director.

Phosphorus sustainability is an important and urgent societal problem. An essential chemical element, phosphorus plays a critical role in fertilizers used in food systems. But there are problems with supply — the industry relies on mined, non-renewable phosphates that could soon be depleted — as well as system inefficiencies and downstream effects on the environment.

"The STEPS center will bring national and international attention to CCEE," said Call, a CCEE associate professor whose research focuses on water- and wastewater treatment-technologies. "We will collaborate with researchers across the country to create new knowledge and understanding of phosphorus and the steps needed to improve the sustainable use, recovery and reuse of phosphorus.

"Environmental engineers in CCEE will conduct research to support the center's mission of 25-in-25 (25% reduction in human dependence on mined phosphates and a 25% reduction in phosphorus losses to soils and water within 25 years)."

Research activities will expand understanding of how to efficiently recover phosphorus from wastes (wastewaters, urine, animal manures), remove it from natural environments (lakes, rivers, runoff) and transform it into forms that can be readily used in fertilizers. Researchers will also study the fate and transport of phosphorus from runoff and other sources and their potential impacts on the environment.

Current food production systems rely heavily on phosphorus fertilizers, most of which originate from non-renewable phosphate deposits that are mined outside of the U.S. Once in the food system, only 20% of the input phosphorus is incorporated into the human diet due to multiple system losses and inefficiencies. The "lost" phosphorus accumulates in soils and freshwater sources.

"Phosphorus-driven algal blooms impair safe drinking water and marine life, and the increasing flux of phosphorus to oceans also leads to an expansion of coastal dead zones," said Ross Sozzani, professor of plant and microbial biology at NC State and a STEPS co-deputy director. "Without intervention, the environmental, economic and sustainability issues involving phosphorus will escalate as the world's human population grows by another 2 billion people by 2050."

STEPS is an interdisciplinary center, integrating contributions across the physical, life, social and economic sciences, that focuses on developing materials, technologies and best management practices to recover, recycle and reuse phosphorus.

The center's headquarters will be housed in the new Plant Sciences Building, home of the university's Plant Sciences Initiative. Researchers will draw from disciplines ranging from agricultural engineering, chemical and biomolecular engineering and materials science to chemistry, crop sciences, economics and sociology. STEPS researchers will develop materials and technologies that can be deployed at the human scale while considering regional and global issues.

STEPS will also leverage a more than 50-year phosphorus field trial experiment at Tidewater Research Station in Plymouth, North Carolina. In this experiment, differing amounts of phosphorus have been applied to crops to study factors such as phosphorus-deficiency resilience as well as how phosphorus already remaining in the soil — so-called legacy phosphorus — can contribute as a nutrient for plants.

STEPS partner institutions include Arizona State University, Appalachian State University, North Carolina Agricultural and Technical State University, the University of North Carolina at Greensboro, the University of Florida, Marquette University, RTI International and the University of Illinois Urbana-Champaign.

Paul Westerhoff, a professor of environmental engineering at Arizona State, will serve as a center co-deputy director. ▪

CCEE research at the center

DR. DOUG CALL will work with collaborators at NC State and Arizona State University (ASU) to develop methods to identify organic forms of phosphorus in the bacteria that are used in wastewater treatment plants to remove phosphorus; study new approaches to transform organic forms of phosphorus, such as those found in food waste, into forms that can be more easily reused in fertilizers and other applications; and use electrochemical methods to recover phosphorus from waste streams such as urine.

DR. DETLEF KNAPPE, along with colleagues in materials science at NC State and computational chemistry at ASU, will study the mechanisms of phosphorus capture by metal-based sorbents. These materials can be used to recover phosphorus from aqueous environments, such as wastewater.

DR. DAN OBENOUR, with collaborators from NC State and ASU, will develop a national budget of phosphorus flows. Using remote sensing, data science and process-based modeling, researchers will characterize hot spots of phosphorus retention and loss across the U.S. The overall model will allow the team to evaluate strategies and technologies for capturing phosphorus as it moves through the landscape.

Connecting Montreal

Rendering of the Samuel De Champlain Bridge, courtesy of Infrastructure Canada.

THE SAMUEL DE CHAMPLAIN BRIDGE glows through the darkness of the night, its red, white and blue light illuminating the Saint Lawrence River below. The 2.1-mile-long structure is a sight to behold, with its 200-foot width making it one of the widest cable-stayed bridges with two planes of cables in the world.

But the bridge plays a much more important role than as a stunning visual landmark — it serves as the connector between the Island of Montreal and the South Shore suburbs of Quebec, Canada, replacing the deteriorated, 57-year-old similarly named Champlain Bridge. The new bridge boasts eight lanes, a multiuse lane for cyclists and pedestrians, and the South Shore branch of the Réseau express métropolitain light rail system. Using stainless steel and high-performance concrete, it is built to last at least 125 years.

The 2021 Paul Zia Distinguished Lecture on the design and construction of the Samuel de Champlain Bridge highlighted the intensive durability demands of the project and the unique design features used to meet these objectives in an accelerated construction schedule of 42 months.

Now in its 20th year, the Paul Zia Distinguished Lecture Series was established in 2002 to showcase some of the world's most exciting and challenging projects and the engineers who work to make them happen. The lecture series honors Professor Emeritus Dr. **Paul Zia**, a former professor and department head of CCEE and a structural engineer who is eminent in research, professional society leadership and practice. For more than 50 years, he has been engaged in teaching, research and consulting in many areas of concrete materials, reinforced and prestressed concrete structures, and construction, advising more than 60 master's and doctoral students.

"Dr. Paul Zia contributed greatly to the field of civil engineering and influenced the careers of so many individuals," said Dr. **Morton Barlaz**, department head of CCEE. "This lecture series was created not only to honor Dr. Zia, but also with the purpose of providing a link for existing students to the real world of engineering practice. Through the years, the lecture has evolved into an opportunity for students, researchers, practitioners and the general public to learn about exciting projects from around the world. I personally have learned a tremendous amount about civil infrastructure from attending these lectures over the last 12 years."

At this year's lecture, Guy Mailhot, chief engineer of the Samuel de Champlain Bridge, discussed the existing conditions, challenges and durability objectives required of the new bridge. Due to temporary repairs to keep the old bridge operational, the new bridge was required to be completed on an accelerated schedule. Dr. Marwan Nader, engineer of record, explained how the design of the bridge met the various specification requirements for durability of the 125-year intended lifespan of the structure. The design decisions and materials selected had to be compatible with the harsh winter conditions including ice flows as well as seismic, wind, vessel collision and scour.

"The bridge is one of Canada's most important bridges," Mailhot said. "It links the Island of Montreal to the South Shore, and it plays a very vital role in the Canadian economy. ... There was a high expectation from the community for an iconic bridge, a bridge that would be easy to recognize. It is a gateway to Montreal. We think we achieved that objective by having an asymmetrical cable bridge, we have very distinctive W-shaped pier gaps, we have a curved bridge, and we have a sophisticated architectural lighting system."

The construction approach took full advantage of precast and offsite modular construction to maximize the construction efficiency during the summer construction window and required collaboration of workers from around the world. The total project cost was $3.3 billion, which includes a new transportation transit corridor in Montreal. To meet the diverse challenges of this project, precast piers were used to support W-frame steel bent segments that were post-tensioned together to support the bridge decks. The seaway crossing was made with a 787-foot span cable-stayed bridge supported by dual 551-foot concrete towers that support the cables in a harp configuration to suspend the bridge deck over the shipping channel. ▪

Quick facts about the Samuel De Champlain Bridge

- When the bridge opened in 2019, it was the widest cable-stayed bridge with two planes of cables in the world.
- The bridge serves 50 million vehicles and 11 million public transit users annually.
- $20 billion in Canada-U.S. trade crosses the bridge every year.
- A tunnel option was considered, but the bridge was selected because of lower construction costs (1.5 times less costly), less environmental impact during construction and it was easier to connect to existing infrastructure.
- Architectural requirements included a curve in the bridge to provide a better view of the Montreal skyline, merging of the corridors at the ends of the bridge, reducing the number of columns to have a better view under the bridge, and a sophisticated lighting system.

Presenters:

GUY MAILHOT

Mailhot has worked for Jacques Cartier and Champlain Bridges Inc. since 1999 and for Infrastructure Canada since 2012 as chief engineer of the Samuel De Champlain Bridge Corridor. He is a member of the Quebec Order of Engineers, a Fellow of the Canadian Society for Civil Engineering and a Fellow of the Engineering Institute of Canada. With more than 30 years of experience in designing, inspecting and rehabilitating bridges, he won the C.W. Gilchrist Award from the Transportation Association of Canada, an ACI-CCA Award of Merit from the American Concrete Institute-Cement Association of Canada and the CSCE P.L. Pratley Award for the Best Paper on Bridge Engineering.

DR. MARWAN NADER

Nader is a senior vice president and bridge technical director of T. Y. Lin International and served as engineer of record and design manager of the Samuel De Champlain Bridge. He has more than 30 years of experience in long-span bridge design and construction and received ASCE's Arthur Wellington Award. He is an inductee of the Academy of Distinguished Alumni at UC Berkeley and was appointed to UC Berkeley's Civil and Environmental Engineering Advisory Council. In 2016, Marwan received the International Association for Bridge Maintenance and Safety Senior Prize for distinguished achievements in the areas of bridge maintenance, safety, management, assessment or life-cycle cost.

The Samuel De Champlain Bridge illuminates the water below at night. Photo courtesy of Infrastructure Canada.


Courtney Fry


Brayan Esquivel


Isaiah Coleman

CCEE's undergraduate student ambassadors pave the way for prospective students

Wandering through the hallways of Fitts-Woolard Hall can be an intimidating and overwhelming experience for prospective undergraduate students and their parents as they weigh their options and decide why NC State is the best fit for them. ***What makes NC State's CCEE department special? What degree programs are available for first-year and transfer students? How can I get involved in CCEE and the overall campus?***

WHO BETTER TO ASK than CCEE's undergraduate student ambassadors, who come from different backgrounds and areas of study within the department?

This year, 10 undergraduate students were chosen to be a part of the ambassador program. They are representatives of the department and maintain a wide range of responsibilities including outreach, attending recruitment events and providing a student perspective while giving tours to potential students and visitors.

"Student ambassadors are chosen based on their ability to speak confidently and knowledgeably about opportunities within the department," said program advisor Dr. **Rudi Seracino**. "They should be enthusiastic about representing the department and engaging with prospective students and committed to actively participating in the program."

A few of CCEE's student ambassadors weighed in on why they chose NC State's program, their campus and department involvement, and plans for the future. Answers are edited for clarity and brevity.

COURTNEY FRY
Junior, Environmental Engineering

Why did you choose NC State?

CF: I chose NC State because I was unsure of what I wanted to pursue as a major coming into college. I felt comfortable deciding on a school that had such a diverse range of majors and knew I'd find a field of study I was passionate about. I've always loved math and science, and once I enrolled here, I knew I wanted to join the College of Engineering. I had multiple meetings with my adviser to discuss which engineering department I might fit in best. Ultimately, it was the broad spectrum of career paths available within CCEE that drew me to the department.

What made you want to go into environmental engineering?

CF: I wanted to join a field that centered on problem-solving and allowed me to enjoy my love of math. Any major within the CCEE department allows you to work and collaborate on real-world problems, so it was the perfect fit.

Are you a part of any clubs or organizations on campus?

CF: I'm a member of the NC State chapter of Professional Engineers of North Carolina (PENC) and the NC State chapter of NC Safewater. I plan on pursuing my PE license after graduation, so PENC helps prepare and connect you to other professional engineers across North Carolina. I joined NC Safewater after I became a student in CCEE, and it's great if you're interested in water treatment and promoting safe water access.

BRAYAN ESQUIVEL
Senior, Construction Engineering

Why did you choose NC State?

BE: The school drew my attention and felt like home from the first time I walked on campus. The vibrant atmosphere and the great community I saw displayed by the students when I first toured led me to pursue NC State. I knew it would also challenge me academically and allow me to grow and develop as an individual and future professional. I specifically chose CCEE because the department drew my attention academically, and I also felt that it created the greatest opportunities in terms of internships, scholarships and full-time employment.

What is your favorite part of Fitts-Woolard Hall?

BE: I love all the different study spots it has to offer. I am especially a big fan of the private rooms located on the third floor as well as the outdoor seating between James B. Hunt Jr. Library and Fitts-Woolard Hall.

What are your plans after graduation?

BE: This past summer, I had the opportunity to intern with JE Dunn Construction. My dream job after graduation would be as a project engineer out of their office in Nashville, Tennessee.

ISAIAH COLEMAN
Junior, Civil Engineering

What made you want to go into civil engineering?

IC: I originally became interested in civil engineering while designing mechanical parts using AutoCAD software in high school. Architecture is cool, but I cared more about the structure itself rather than the aesthetics. I learned about structural engineering from a close relative and decided that is what I wanted to do.

What has been your favorite class at NC State?

IC: This past semester, I took CE 332, which is materials of construction, and it is by far my favorite class. I am a hands-on learner, and the class is lab-intensive, so I already anticipated that it would be interesting. We learned about concrete and even had a chance to mix it in the lab, which was awesome. It was a very fun and interactive class that directly relates to my field.

Are you involved in any clubs or organizations on campus?

IC: I am involved in the American Society of Civil Engineers and National Society of Black Engineers. I am also a CO-OP Ambassador, and I also serve as a START Mentor for freshmen engineering students.

For the full Q&As with all of this year's student ambassadors, check out the digital version of this story at **go.ncsu.edu/cceestudentambassadors**. ▪

Student ambassadors for 2021-22; Top row: Raven McLaurin, Ting Ting Lin, Kendall Zorn, Sandra Geiselhart. Bottom row: Isaiah Coleman, Cecilia Sanchez, Brayan Esquivel, Carolina Brown, Jafeth Vasquez-Cerros. Not pictured: Courtney Fry

Dr. Ashly Cabas

Dr. **Ashly Cabas**, assistant professor of geotechnical engineering, received the **2021 EERI Shah Family Innovation Prize**. The award recognizes creative and innovative thinkers 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.

Dr. Joel Ducoste

Dr. **Joel Ducoste**, professor of environmental engineering and associate dean of faculty advancement, was awarded the **Fair Distinguished Engineering Educator Medal** by the Water Environment Federation. The medal recognizes Ducoste's accomplishments in research and contributions to the education and development of future environmental engineers.

Dr. Francis de los Reyes III

Dr. **Francis de los Reyes III**, professor of environmental engineering and University Faculty Scholar, has been named a **2021 Fellow of the Water Environment Federation**. He is among 15 fellows recognized for their contributions to the water industry and professional achievements. He was also granted certification (BCEEM) by the American Academy of Environmental Engineers and Scientists in November 2021.

From left to right, Lina Espinosa, Taylor Brodbeck, Ana Bona, Dr. Mervyn Kowalsky, Diego Martinez, Julio Samayoa and Diego Sosa

Dr. **Mervyn Kowalsky**, Christopher W. Clark Distinguished Professor of Structural Engineering, and a team of six Ph.D. students — **Ana Bona**, **Taylor Brodbeck**, **Lina Espinosa**, **Diego Martinez**, **Julio Samayoa** and **Diego Sosa** — won the Pacific Earthquake Engineering Research Center's **2021 Blind Prediction Contest**. The contest challenged participants with predicting the response and behavior of a reinforced concrete column subjected to lateral deformation. The predictions were compared against a column that was tested experimentally.

George Bonner

George Bonner, director of the NC Renewable Ocean Energy Program, was named a **2021-22 Veteran Advanced Energy Fellow** by the Atlantic Council's Global Energy Center. Bonner is among 15 fellows from across the country. Bonner will work with other leaders toward advancing responsible energy solutions.

Abdullah Alsharef

Ph.D. candidate **Abdullah Alsharef**, advised by Drs. **Alex Albert** and **Edward Jaselskis**, won **second place for the best poster competition** at the 2021 North Carolina Department of Transportation Research & Innovation Summit. Alsharef's research seeks to leverage data analytic methods to reduce the risk of work-related injuries in both the construction industry and the transportation sector.

AWARDS&HONORS

Adam Behr

M.S. student **Adam Behr**, advised by Dr. **Elizabeth Sciaudone**, was awarded the **Student Educational Award** by the American Shore & Beach Preservation Association (ASBPA) in September 2021. The award was presented at the ASBPA's National Coastal Conference in New Orleans, where Behr presented his work. The Student Educational Award is given annually to an undergraduate or graduate student who, through his or her research, is furthering the state of the science of coastal systems as it relates to the goals and mission of the ASBPA.

Smitom Borah

Ph.D. student **Smitom Borah**, advised by Dr. **Dan Obenour**, was awarded a Global Change Fellowship by the U.S. Geological Survey National Climate Adaptation Science Center. The fellowship will support modeling work that simulates the dynamics of nutrients such as nitrogen and phosphorus in Jordan Lake near Apex, North Carolina. Borah plans to use the models as forecasting tools to understand how these nutrient concentrations will vary in the future, especially under the changing climate.

Lucas Ford

Computing and Systems Ph.D. candidate **Lucas Ford**, advised by Dr. **Sankar Arumugam**, was one of five students from across the nation awarded the **New Frontiers Initiative Fellowship**. The award is made available as part of a joint initiative between the National Center for Supercomputing Applications, the National Geospatial Intelligence Agency and the National Science Foundation. The fellowship allows Ford an allocation of up to 100,000 node hours on the Blue Waters Supercomputer at the National Center for Supercomputing Applications to support his research, which focuses on improving water and energy systems and studying potential climate impacts.

Nooralhuda Saleh

Ph.D. student **Nooralhuda Saleh**, supervised by Dr. **Richard Kim**, received the **best poster award** at the 96th Association of Asphalt Paving Technologists Annual Meeting in Nashville, Tennessee, in August 2021. Saleh's poster was titled "Understanding and Modeling the Effect of Oxidative Aging on Asphalt Mixture Properties." Saleh's research will enable transportation agencies to better evaluate the aging of asphalt pavement materials over its service life.

Adam Schmidt

Adam Schmidt, a Ph.D. student studying transportation systems, received the **2021 Dwight David Eisenhower Graduate Fellowship** from the U.S. Federal Highway Administration. The Eisenhower Fellowship is designed to attract and support the brightest minds in the study of transportation-related disciplines. Schmidt, who is advised by Dr. **Eleni Bardaka**, is studying the impact of the light rail in Charlotte, North Carolina, on the value of single-family homes. He is focused on determining if there is a relationship between the light rail and gentrification in nearby neighborhoods. ▪

CCEE Department Head Dr. Morton Barlaz presents a Hall of Fame award to inductee Deborah Bell Young.

Six alumni inducted into **2021 CCEE Hall of Fame**

The Department of Civil, Construction, and Environmental Engineering Alumni Hall of Fame was established to inspire our current students and our alumni, and to celebrate the accomplishments of those extraordinary graduates who have used their education to excel in a profession, career or service.

The six inductees of the 2021 CCEE Hall of Fame represent an inspiring, interesting and influential group of alumni. Membership in the Hall of Fame is limited to about 1% of CCEE alumni.

This year's Hall of Fame Induction ceremony was held on Oct. 29, 2021.

Pam Townsend, senior vice president of WSP, was inducted into CCEE's Hall of Fame in 2017. When speaking at this year's induction ceremony, she said there is "no greater recognition or honor than having been inducted into this alma mater's Hall of Fame.

"My career has been touched by so many of the Hall of Fame inductees in some way," Townsend said. "This group includes former professors, clients, industry colleagues who I have worked with in so many different ways, and trailblazers, who through the tremendous contributions to our profession and society have paved the way for others to follow. Each of the inductees has gone on to an amazing career after their formative years in Mann Hall.

The contributions of this department to society have been invaluable. The role the department's grads have had on the transformation of this state over the years to one of the top economies in the world cannot be understated."

Dr. **Morton Barlaz**, department head, said he felt a "great sense of humility standing among so many giants and leaders in our field.

"The inductees' accomplishments and their contributions to society are inspiring, and I am so proud to claim them as alums of our department," Barlaz said.

Read more about each of the 2021 inductees:

Michael Banks Gwyn

Gwyn received his B.S. in civil engineering in 1980 and a master's in engineering in 1994. His nearly 40-year career in the construction industry started in 1981 at Paul N. Howard Co. After serving in numerous leadership roles at construction firms such as J. A. Jones Construction Co., Fluor, Leidos Constructors and The Benham Cos., as well as overseeing billions of dollars, Gwyn retired in 2020 as group president of Haskell's Federal, Healthcare & Energy Group. Gwyn has been involved in many engineering organizations, including as an American Society of Civil Engineers (ASCE) Fellow, the ASCE Construction Institute's Construction Engineering Education Committee and the National Council of Examiners for Engineering and Surveying Civil PE Exam Committee. Gwyn served on the Industry Advisory Council for ABET for many years and acted as chair for that group. Gwyn has been a longtime supporter of CCEE, serving on and chairing the advisory board and developing the Michael Banks Gwyn Scholarship Endowment in 2016 for need-based undergraduate students interested in Construction Engineering and Management.

He also served as an active member of the NC State Engineering Advisory Board for the Department of Biological and Agricultural Engineering and was named a Distinguished Alumnus. His family is a generous supporter of NC State academics and athletics, contributing to a number of undergraduate, graduate, athletic and athletic trainer endowed scholarships.

Jim Hipps

Hipps attended NC State on an athletic scholarship, receiving a B.S. in biological and agricultural engineering in 1973 and a professional degree in civil engineering in 1974. He started his engineering career at Moore-Gardner & Associates (MGA) upon graduation. After MGA was acquired by Black & Veatch Inc. in 1982, Hipps climbed the ranks at the company, serving in various leadership roles. He retired from B&V in 2009 as executive partner in charge of Strategic Planning, Mergers & Acquisitions & New Business Ventures after 35 years in the consulting industry. Hipps has been very active and played a leadership role in the Junior Diabetes Research Foundation, including serving on the Board of Directors for the chapter based in Kansas City, Missouri.

Dr. Herbert Rooney Malcom Jr. (posthumous)

Rooney received a B.S. in 1963, a master's in 1970 and a Ph.D. in 1973, all in civil engineering. Rooney retired as a professor from NC State in 2004 after 31 years with the university. He is a member of the NC State Academy of Outstanding Teachers, winning the Outstanding Teaching Award twice. Rooney's other honors include Outstanding Civil Engineer from the NC Section of the American Society of Civil Engineers, the Kimley Horn Faculty Award and the Outstanding Extension Service Award. Rooney was a longtime member of the Technical Advisory Committee to the North Carolina Sedimentation Control Commission. He also served on the Board of Directors of the Water Resources Division of the North Carolina Chapter of the American Public Works Association, on the Technical Committee of the Water Resources Research Institute and as a technical adviser to the Triangle J Council of Governments Committee on Water Resources.

David Simpson

Simpson received a B.S. in civil engineering in 1981. After more than 23 years with the NC Department of Transportation and two private engineering firms, Simpson started Simpson Engineers & Associates in 2004. Simpson is involved in several engineering education organizations including the NC Future City Competition, MATHCOUNTS, and the NC Science, Mathematics and Technology Education Center.

He is a member of the American Society of Civil Engineers, American Society of Highway Engineers, American Council of Engineering Companies, National Society of Professional Engineers and Women's Transportation Seminar. His honors include the Special Recognition Award and Small Architectural/Engineering Firm of the Year from NCDOT and the Award of Recognition, Advocate Partner from WTS. Simpson contributes regularly to the CCEE Enhancement Fund and Zia Lecture series and served on the department's Industry Advisory Board from 2010-18. Simpson and his brother, Michael, endowed the David B. and Annie P. Simpson Scholarship, named in honor of their parents.

Dr. Lawrence Twisdale

Twisdale received a B.S. in civil engineering in 1969, a master's in civil engineering in 1970 and a Ph.D. from the University of Illinois. He began his career as a senior engineer with Carolina Power and Light in Raleigh, North Carolina. He went on to found the Southeast Division of Applied Research Associates Inc. in 1982, which has become ARA's largest office with more than 300 employees. He was a principal of the firm and an executive vice president, serving on ARA's board for 30 years. He retired in fall 2020 and consults today on selected projects. He was principal investigator on more than 200 projects during his career. Twisdale developed the TORMIS software that analyzes tornado-generated missile risk to nuclear power plant components and structures. He also developed hurricane vulnerability, mitigation and loss models that became part of Federal Emergency Management Agency's HAZUS software suite and ARA's HURLOSS insurance software tool. Twisdale led the development of the first ever Tornado Wind Speed Risk Maps for the National Institute of Standards and Technology. He was an active member of American Society of Civil Engineers for more than 40 years. He and his wife, Fran, established a Charitable Remainder Unitrust in 2013 through the NC State Engineering Foundation.

Deborah Bell Young

Young was one of the first Black women to receive a B.S. in civil engineering from NC State (1977) and to earn an M.S. in civil engineering-environmental engineering from the University of Pittsburgh (1980). She received an MBA from Fuqua, Duke University in 1997. Young retired as the Global Health, Safety and Environmental Capital director for Honeywell International Inc., (AlliedSignal) in 2015. Young worked at Honeywell for nearly 35 years in various leadership roles. She was a charter member and president of NC State's Society of Women Engineers and a charter member of NC State's Delta Sigma Theta Sorority, Inc. Mu Omicron chapter. Young has been involved in several organizations including the Richmond Minorities in Engineering Partnership, The Links, Incorporated, and the NC State Engineering Foundation Board of Directors. She has held numerous roles in the Episcopal church, including vestry wardens and Diocese leadership. Young is a loyal contributor to CCEE, including endowment of the Deborah Bell and Gary Young Scholarship, the CCEE Enhancement Fund and Fitts-Woolard Hall.

CCEE Department Head Dr. Morton Barlaz presents a Hall of Fame award to inductee Dr. Lawrence Twisdale.

The CCEE Alumni Hall of Fame was established in 2017 with 19 inaugural inductees. There were three more inductees each year in 2018 and 2019, nine in 2020, and six in 2021.

Induction criteria include:

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

If you want to nominate someone to be considered for 2022, you will find instructions and the form at go.ncsu.edu/cceehalloffame. Nominations are due by June 15 of each year. ▪

"The inductees' accomplishments and their contributions to society are inspiring, and I am so proud to claim them as alums of our department."

Dr. Morton Barlaz
DEPARTMENT HEAD

GRAD **STUDENT SPOTLIGHT**

Our research and teaching are only possible with the assistance of our more than 200 on-campus graduate students, each of whom has a strong personal history and a promising future. We shine a spotlight on a few students.

TANMAY DAS

Tanmay Das is a third-year Ph.D. student with a concentration in transportation systems engineering. He grew up in the southern part of Bangladesh and is advised by Drs. **Nagui Rouphail** and **Billy Williams**. He is a member of the Institute of Transportation Engineers, the Transportation Research Board (TRB) Freeway Operations Committee and the TRB Traffic Simulation Committee. He also serves as treasurer for NC State's Bangladesh Student Association.

What influenced you to go into engineering?

DAS: I used to watch a TV show called *MacGyver* when I was a kid. The main character has a genius-level intelligence, exceptional engineering skills and excellent knowledge of applied physics, all of which have assisted many people in solving their issues. That persona has always inspired me to seek a career in engineering. Engineers can turn theory into practical application to improve lives. Civilization, in my opinion, owes a great debt to civil engineers.

What problem(s) are you trying to solve? / Where did your passion for this particular focus come from?

DAS: The inevitability of wasting hours stuck in terrible traffic — as well as having witnessed more than a few cases of death or injury of close relatives because of car crashes — has always prompted me to seek a solution to these critical issues. Most crashes are caused by human mistake. As a result, deploying automated vehicles to reduce human involvement in driving should improve safety. My research examines the present status of automated vehicle safety improvements and how they can make roadways safer and more efficient.

Why was NC State / CCEE a good fit for you?

DAS: The high quality of the department's transportation research and publications has always caught my attention. The Institute for Transportation Research and Education, in particular, does research that is closely related to my interests.

Where do you see yourself in five years?

DAS: I am enjoying what I have been doing now. Years from now, I see myself as a successful individual, carrying out extensive research in my preferred field and employed in a well-reputed research institution or at a distinguished university.

GRAD **STUDENT SPOTLIGHT**

TEMI IBITOYE

Temi Ibitoye is a third-year Ph.D. student with a concentration in water, sanitation and hygiene. She grew up in Bowie, Maryland, and is advised by Dr. **Angela Harris**. Outside of CCEE, Ibitoye, who is interested in advocacy and science diplomacy, is involved in a science policy group on campus called SciPolPack.

What influenced you to go into engineering?

IBITOYE: A big part of how I found this field started with my faith. During my junior year of high school, I started thinking about what I would want to study in college. I knew that I really enjoyed math and chemistry in high school, so I felt like engineering was a good fit for me, but I couldn't figure out what form of engineering. I spent a lot of time engaging in my faith and Jesus out in nature, and I was able to make the connection between the environment, chemistry and math — environmental engineering.

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

IBITOYE: I would like to help ensure that everybody has access to clean water and safe sanitation. When applying to graduate schools, I focused on programs that had water, sanitation and hygiene (WaSH) research. At NC State, there are several faculty that conduct WaSH research, and there is a cluster dedicated to it. It made me confident that I'd be able to explore my various interests within WaSH.

Where did your passion for this particular focus come from?

IBITOYE: Growing up in a Nigerian family, I heard tales of "Pure Water," a bag of water sold in Nigeria that is notorious for making people sick. While anecdotes about this infamous water made me laugh as a child, it did not occur to me until my adolescence that this water is the best option for many Nigerians. Similarly, in the U.S., marginalized communities like those in Flint, Michigan, and rural Alabama lack access to basic water and sanitation. These challenges, along with my love for STEM, humanitarianism and the environment, led me to the field of water, sanitation and hygiene.

Where do you see yourself in five years?

IBITOYE: I see myself working in science diplomacy, a field focused on using scientific collaboration among nations to address common problems and build constructive international partnerships.

NOORALHUDA ‘NOOR’ SALEH

Nooralhuda ‘Noor’ Saleh is a fifth-year Ph.D. candidate with a concentration in transportation materials. She was born in Iraq, grew up in Lebanon and is advised by Dr. **Richard Kim**. She recently traveled to Sacramento, California, to train a team from the California Department of Transportation on material test methods that were developed by Kim’s research group at NC State.

What influenced you to go into engineering?

SALEH: I am drawn to the problem-solving mindset instilled by engineering education and practice. It gives me confidence in being able to solve all kinds of problems inside and outside my profession.

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

SALEH: I am developing protocols that bridge the design of asphalt pavements, construction quality and the long-term performance of paved roadways. The NC State research group is at the forefront of cutting-edge research in the field of asphalt paving. It is important for me to understand the intricacies of new advanced test methods and models to be able to communicate research findings to decision-makers in easily digestible formats, diagnose any knowledge gaps and develop plans to address them.

Where did your passion for this particular focus come from?

SALEH: As it stands, all the capabilities that the tests and models provide in terms of performance prediction are not being utilized adequately. Understandably, construction can change hour-to-hour, while advanced mixture performance testing takes days, making the feedback loop impractical. This is where there is a substantial room for improvement and where I am excited to make a contribution.

Where do you see yourself in five years?

SALEH: My goal is to become a subject-matter expert who can provide solutions and the knowledge on how to bring research into engineering practice.

GRAD **STUDENT SPOTLIGHT**

JESSI THANGJITHAM

What influenced you to go into engineering?

THANGJITHAM: My dad is an engineering professor and influenced me to follow my passion for math and science. My interest in structural engineering started while I was an undergrad and worked as an intern for a state Department of Transportation. I saw all aspects of bridge construction from start to finish, and I appreciated the variety of work required to create a new structure. I knew I wanted to continue learning more about the field.

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

THANGJITHAM: I want to help bridge designers implement high-strength reinforcing steel in bridges by developing design equations for bridge codes. CCEE has a great lab for large-scale testing and many projects related to earthquake engineering. My ultimate goal is to go into academia, and I was drawn to the professoriate program at NC State, which helps graduate students who are on the academic track and gives them experience teaching a class.

Where did your passion for this particular focus come from?

THANGJITHAM: My passion for earthquake engineering started in my undergrad and graduate programs, where I first learned about the complexities of seismic loads. I wanted to understand more about how to design and improve structures to resist the effects of earthquakes. My master’s research focused on structural modeling for seismic loads, but I became more interested in the field when I worked in the industry as a building designer. After using the building codes, I wanted to study the other side of research to help improve the way we design for these complex loads.

Where do you see yourself in five years?

THANGJITHAM: I want to become a professor so I can continue research in structural and earthquake engineering and prepare students for successful careers in structural design.

Jessi Thangjitham is a fourth-year Ph.D. candidate with a concentration in structural and earthquake engineering. She grew up in Blacksburg, Virginia, and is advised by Dr. **Mervyn Kowalsky**. Thangjitham serves in committee leadership roles in the Earthquake Engineering Research Institute and American Concrete Institute national chapters.

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.

Institute of Transportation Engineers, American Society of Highway Engineers and American Railway Engineering and Maintenance-of-Way Association (ITE-ASHE-AREMA) and Women's Transportation Seminar at NC State (WTS)

The NC State student chapters of ITE-ASHE-AREMA and WTS partnered for an Adopt-A-Highway event in October 2021. NC State's ITE-ASHE-AREMA chapter has a long-standing commitment to maintaining a stretch along Jones Franklin Road in Raleigh, North Carolina, but this was the first Adopt-A-Highway event since the start of the pandemic.

Led by ITE-ASHE-AREMA Vice President **Mehedi Hasnat**, participants **Abdullah Al Farabi**, **Elizabeth Dogbe**, **Lindsey Dorn**, **Subid Ghimire**, **Adam Schmidt**, **Gray Subat**, **Lexi Van Blunk**, **Juan Wang**, **Kyle Wurtz** and **Leanna Yost** cleaned up trash along a mile-long stretch of Jones Franklin Road. More than 20 bags of trash and recycling were collected.

The event continued NC State's participation in the Adopt-A-Highway program and maintenance of its surrounding community. It also strengthened the connection between NC State's CCEE students and the NC Department of Transportation (NCDOT), through the rare opportunity to connect in person during the pandemic.

"NC State's ITE-AHSE-AREMA student chapter has been arranging the Adopt-A-Highway road cleanup event twice a year for more than 15 years," Hasnat said. "This year, we were glad to have the WTS group join us for the event. I hope this tradition of working together to serve our community will continue in the future."

Left Photo: G-I GSO and EERI officers (from left to right), Jessi Thangjitham, Pegah Ghasemi, Cristina Lorenzo-Velazquez, Marlee Strong and Nancy Ingabire Abayo with Girls in Science camp. **Middle Photo:** From left to right, Karenna Heighton, Renzo Cieza, Eleni Nakos, Sayf Altaie and Roberto Nunez working as supplemental examiners for concrete field testing certification. **Right Photo:** Tour guide Sara Davarbakhsh explains how waste is spread over a landfill cell and how it is covered daily to reduce odors.

Geo-Institute Graduate Student Organization at the NC State University (G-I GSO) and Earthquake Engineering Research Institute (EERI)

In July, graduate students from G-I GSO and EERI collaborated with the Girls in Science Summer Camp at Walnut Creek Wetland Park in Raleigh, North Carolina. Five students — **Pegah Ghasemi**, **Nancy Ingabire Abayo**, **Cristina Lorenzo-Velazquez**, **Marlee Strong** and **Jessi Thangjitham** — planned and implemented the event.

The collaboration included lessons on civil engineering, structural engineering — demonstrated through a pasta and marshmallow bridge-building contest — and geotechnical engineering; campers were shown the detrimental effect of liquefaction on the foundation of structures, similar to the bridges they had just built, conveying the importance of adequate soil to support superstructures, especially for extreme events like earthquakes.

CCEE students were able to link why building materials and foundations are important in the design of structures and how extreme events may dictate designs.

"It was refreshing to see the excitement of these young girls interested in STEM," said Thangjitham, a fourth-year Ph.D. student. "They really enjoyed learning about structural and geotechnical engineering through the hands-on activities."

The American Concrete Institute (ACI)

The ACI student group continues to support ACI concrete field testing technicians with obtaining Grade I certifications each month. Several new students have joined the NC State chapter and successfully attained their own concrete certification. Upon receiving certification, they are eligible to work as supplemental examiners. This unique opportunity allows students to connect with contractors to share cross-cutting knowledge and experiences in the concrete industry. Led by CCEE faculty advisor **Roberto Nunez**, the certification process was also made possible by students **Sayf Altaie**, **Renzo Cieza**, **Jacob Harris**, **Karenna Heighton**, **Eleni Nakos**, **Seth Steinbicker** and **Stephanie Wasik**.

"Participating in ACI concrete certifications has allowed me to make connections with students and subcontractors who are looking to achieve a new goal," said Cieza, a construction engineering student. "The certification process itself is not easy, and I have a lot of respect for the people who come out and demonstrate the necessary skills."

The certifications also allow ACI student members to connect in the industry. "I have been able to get certified for field testing of concrete which has opened many opportunities of work for me, including helping the organization to certify other people for field testing," said Heighton, a senior studying civil engineering. "I also had the chance to attend the fall 2021 convention, which was a great learning event and experience."

During the spring semester, the group will prepare for the semiannual ACI Convention in Orlando, Florida. This year's student competition will entail constructing a bowling ball from lightweight concrete.

NC State Student Chapter of Air and Waste Management Association (AWMA)

The AWMA student chapter visited the South Wake Landfill, located in Apex, North Carolina, during the fall with a group of 10 undergraduate and graduate students. Students observed and learned about an open municipal solid waste (MSW) landfill section, leachate collection pipes, a closed MSW landfill section, a closed waste transfer station, a household hazardous waste facility, a multimaterial recycling facility and a landfill gas to energy plant. Students also learned about the initiatives Wake County takes toward the community's waste management.

"Touring the landfill was so cool," said third-year Ph.D. student **Savanna Smith**. "I learned a lot about solid waste management. The visit changed my view on solid waste and made me more interested in that area of civil engineering." ▪

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).

NEIL DEANS
(BSCE 1993)

As a regional leader at Kimley-Horn, Deans oversees business growth across the Southeast. He is responsible for the region's overall performance, recruiting efforts, client relations and business practices. Deans is passionate about passing on the culture of opportunities that were afforded him and providing an environment of professional growth and success to his partners in the firm.

ROSEMARY CYRIAC
(Ph.D. 2018)

Cyriac, P.E., serves as a senior engineer at Atkins, where she works in Hydrologic and Hydraulic Modeling using 1D and 2D HEC-RAS, assists in coastal modeling projects and contributes to automating geospatial workflows via new Python tools. She has been involved with the American Society for Civil Engineering and the Coasts, Oceans, Ports and Rivers Institute.

JOHN FEARRINGTON
(BSCE 2012)

Fearrington serves as a project engineer at Smith Gardner Inc. in Raleigh, North Carolina. He manages various solid waste facility construction projects such as Subtitle D cell construction, permanent and temporary closures, landfill gas collection and control systems installations, and composting facility development. He also assists public and private clients in developing solar and composting facilities. Fearrington is involved with the American Society of Civil Engineers and the Solid Waste Association of North America. He was recently named to *Waste360*'s 40 Under 40 list.

SEPI SAIDI
(BSCE 1993)

A native of Iran, Saidi founded Raleigh, North Carolina-based Sepi in 2001 after more than 16 years of experience in transportation engineering design and management. The firm has grown to more than 250 employees. Sepi is frequently ranked among the fastest-growing companies in the U.S. by *Inc.* magazine. Saidi is a member of the American Council of Engineering Companies and has received numerous professional awards including *Triangle Business Journal*'s Business Person of the Year; North Carolina Business Hall of Fame Laureate, Junior Achievement of Central Carolinas; and *Triangle Business Journal*'s Top 20 CEOs of the Year.

CARLOS ZULUAGA SANTA
(MSCE 2016, Ph.D. 2018)

Zuluaga Santa works as a project engineer II in the senior living division at Harkins Builders Inc. He is in charge of the management and field operations of several trade partners. He has been involved with the Construction Management Association of America, the American Society of Civil Engineers and the Construction Progress Coalition. As a graduate student, he received the David W. Johnston Fellowship Endowment for Leadership and Excellence in Construction Research.

ALUMNI **BRIEFS**

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.

Bill Hunt (BSCE 1994) was recognized with the H. Rooney Malcom Stormwater Professional of the Year Award by American Public Works Association N.C. Chapter's Stormwater Management Division. The award recognizes a stormwater professional with exceptional leadership, innovation, agency service, customer service, community service and contribution to their profession related to the stormwater field. Hunt is a William Neal Reynolds Distinguished University Professor and extension specialist in the Department of Biological and Agricultural Engineering at NC State.

Street Lee (BSCE 1983) was named CEO of McKim & Creed Inc. Lee, who has an MBA from the University of Florida, has been with the company for more than 35 years, climbing the ladder from entry-level engineer to his most recent position, president of engineering.

Anna Lynch (ME 2008) was recognized among the 2021 *Triangle Business Journal* CEOs of the Year. The awards honor outstanding C-level executives for their work throughout North Carolina's Triangle area. Lynch is CEO of Raleigh, North Carolina-based Lynch Mykins. Last year, Lynch Mykins received *Triangle Business Journal's* Fast 50 Growth Award and Largest Engineering Firm and was selected by *Business North Carolina* magazine as a Small Business of the Year.

Chris McGee (BSCE 1993) was named city manager of Havelock, North Carolina. McGee, who most recently worked as the Raleigh Department of Transportation's assistant director, has more than 30 years of experience in transportation, public works, planning, budgeting, maintenance, operations and asset management, including 20 years of service with the N.C. Department of Transportation and two years in the private sector.

Mojtaba Noghabaei (Ph.D. 2021) joined Jacobs Engineering Group as a digital delivery lead. Noghabaei worked under Dr. Kevin Han and focused on visual and behavioral data analysis in immersive virtual environments for enhancing construction safety, planning and control.

Loonie Poole (BSCE 1959) received an NC State 2021 College of Engineering Distinguished Alumni Award. Poole founded and served as president of Waste Industries from 1970-86. He was CEO from 1987 through 2002 and chairman from 1987 through 2008. In 2008, he received the NC State Watauga Medal and was named Outstanding Engineer of the Year by the NC Society of Engineers in 2018. He is also a founding member of the Environmental Research and Education Foundation.

Willy Stewart (BSCE 1981, MSCE 1983) was recognized among the 2021 *Triangle Business Journal* CEOs of the Year. Stewart 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. ▪

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 that remain connected to the department and to each other. We also want to keep your contact info current so we can keep you up to date on department events. Send your information to **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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@NCStateCCEE
go.ncsu.edu/cceelinked

How Your Support Makes A Difference

Top photo: Visitors watch a student lab demonstration during last semester's Fitts-Woolard Hall Dedication Ceremony.

Bottom photo: U.S. Environmental Protection Agency Administrator Michael Regan, N.C. Gov. Roy Cooper and other federal and local officials visited Fitts-Woolard Hall for a tour of CCEE's environmental labs and to discuss ongoing research in the department and around the university on per- and polyfluoroalkyl substances.

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 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 will 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. ▪

2021 CORPORATE DONORS

The firms listed here have provided endowments or made contributions from mid-August 2021 through the end of December 2021. Many on the list have supported multiple activities in the department. We would like to extend our sincere appreciation.

AECOM

American Institute of Steel Construction

CDM Smith

CT Wilson Construction

Dewberry

Exxon Mobil Corporation

Fluor Enterprises, Inc.

HDR Engineering, Inc.

Highfill Infrastructure Engineering

IQ Contracting, LLC

Kimley-Horn & Associates, Inc.

LHC Structural Engineers

Lysaght & Associates

McKim & Creed

Mead & Hunt, Inc.

MI Engineering PLLC

National Christian Foundation

Pope Custom Homes, Inc.

Quality Lightning Protection, Inc.

Scalene Design

SEPI Engineering & Construction

Shelco, Inc.

Simpson Engineers & Assoc

Smith Gardner, Inc.

Stantec Consulting Services, Inc.

SteelFab Inc.

SteelFab of Virginia

Stewart Engineering

Structural Engineers Association of NC Triangle Chapter

T.A. Loving Company

Tindall Corporation

Wetherill Engineering, Inc.

WSP USA Administration, Inc.

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

E. Downey Brill Jr.

Former Department Head E. Downey Brill Jr. initiates program to establish named endowed graduate awards

Graduate students make essential contributions to our department's teaching and research. Graduate program development requires a strong commitment to recruit and offer competitive financial assistance to top students from around the world. A new program, initiated by former CCEE Head Dr. **E. Downey Brill Jr.**, will establish endowed graduate awards and enable CCEE to offer multiyear supplemental assistance to graduate students.

Brill was a faculty member at the University of Illinois Urbana-Champaign for 15 years before moving to NC State, where he served as the head of CCEE from 1988 to 2005. He retired from the department in 2019. One of his priorities as head was to further develop the department's program of graduate education and research.

Current Head Dr. **Morton Barlaz** has worked with Brill over the past two years to create a program with a goal of establishing $1 million in endowments to honor faculty and donors. CCEE has garnered commitments of $720,000 in just the past five months to establish awards honoring Drs. **Robert C. Borden**, Downey Brill, **Jon Liebman** and **Harvey Wahls**. Brill also plans to establish an award honoring CCEE professor Dr. **Jim Nau**, who is planning to retire this year. Ultimately, the endowment will allow CCEE to make 15 to 20 awards annually.

"As usual, Downey's plan to provide matching funds worked and incentivized Dr. **Roy Borden** and me to support an award in his name to recognize all that he did for me during my formative years and all that he has done for the department," Barlaz said.

CCEE hopes to establish additional named endowed awards recognizing other faculty and donors. There is now an opportunity for additional donors to establish such named endowments with a $25,000 or greater contribution payable over as many as five years. Each endowment fund will meet the $50,000 minimum using a one-to-one matching dollar commitment from Downey and Anne Brill. As many as three additional endowments are possible given the Brills' commitment of up to an additional $75,000 in matching funds. This matching commitment is also available for additional contributions to any of the endowments that have been established. Additional contributions will increase the number and dollar amount of awards that can be made to students.

"Anne and I are delighted to join Harvey Wahls in supporting an award for him; he served as director of graduate programs for many years and helped enormously in building all aspects of our program," Brill said. "We are also pleased to join **Bob and Ann Borden** in supporting an award for Bob, an outstanding faculty member who worked with graduate students on groundwater remediation research. Finally, we take special pleasure in helping fund the award for Jon Liebman, who was my thesis advisor as well as mentor and colleague for many years at the University of Illinois."

"This program provides the department with tremendous flexibility in recruiting nationally competitive graduate students and will serve the department well for decades to come," said Dr. **Ranji Ranjithan**, director of graduate programs.

Individuals may contribute in support of one of the existing endowments using the following links:

go.ncsu.edu/wahls
go.ncsu.edu/brill
go.ncsu.edu/liebman
go.ncsu.edu/rcborden

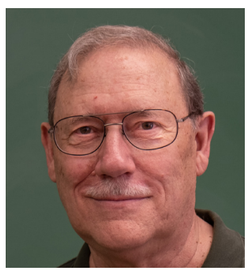
Please contact Lindsay Smith (LKsmith4@ncsu.edu) if you would like more information and are interested in contributing to this initiative, including contributing to establishing the endowment honoring Jim Nau.

Named endowments

DR. ROBERT C. BORDEN

Borden joined NC State as an assistant professor in 1986 and rose to the rank of professor before retiring in 2013. During his 27 years at NC State, he taught courses in hydraulics, hydrology and groundwater contaminant transport, as well as senior design courses in water resources and environmental engineering. He served as primary advisor and mentor to 51 master's and 14 doctoral students. The primary focus of his research has been on the fate, transport and remediation of organic and inorganic pollutants in the subsurface. This included laboratory studies to better understand the governing chemical and biological processes, fieldwork to document these processes under in-situ conditions, and model development to mathematically describe the interactions of physical, chemical and biological processes on the natural and enhanced degradation of a wide variety of pollutants.

Results of Borden's work have been shared with the scientific and professional community through journal articles, book chapters and symposium proceedings, as well as hundreds of conference presentations, short courses and webinars. To accelerate transfer of current research to the user community, he founded ENVIRO.wiki and served as the initial editor-in-chief. Borden has received multiple awards for his research and extension activities including the 2013 NC State Alumni Association Outstanding Extension and Outreach Award and the 2012 Brown and Caldwell Lifetime Achievement award for contributions toward the science and practice of subsurface remediation. The technologies that Borden developed have cleaned up thousands of contaminated hazardous waste sites around the world and continue to be the foremost technologies for groundwater remediation.



DR. E. DOWNEY BRILL JR.

Brill completed his undergraduate degree at Cornell University and earned a Ph.D. in environmental engineering at Johns Hopkins University. He started his academic career at the University of Illinois Urbana-Champaign, where he rose to the rank of professor in 1982. He joined NC State as the civil engineering department head in 1988, serving in the role until 2005. He also served as director of the Center for Transportation and the Environment from 2005-16 and interim director of the Institute for Transportation Research and Education from 2016-18 before retiring in 2019. Brill has been a member of NC State's operations research faculty since 2002. He has more than four decades of experience in carrying out and leading interdisciplinary work. His core research expertise is in the development of optimization models and their application to civil and environmental engineering systems.

From 1985-91, Brill was a member of the U.S. Army Science Board. He has served on the editorial boards of Water Resources Research and Engineering Optimization and has received several research and teaching awards, including the ASCE Huber Prize, Croes Medal, 2011 Environmental and Water Resources Institute Best Research-Oriented Paper, the Department of Army Patriotic Civilian Service Award and the Institute of Transportation Engineers Outstanding Contribution to the Transportation Profession Award.

As department head, Brill guided development of the department's thriving graduate research and education programs and established an administrative structure that continues to serve the department well. The department established the first distance-education master's degree in the College of Engineering under his leadership. He generously dedicated his time and experience to the department and was a valued mentor to many.

DR. HARVEY E. AND MARGARET (MARGY) W. WAHLS

After earning a B.S., M.S. and Ph.D. at Northwestern University (where he also met Margy), Wahls served on the faculty at NC State for 37 years, leading the graduate program for 26 years and serving as associate head for graduate programs for 13 years until retiring in 1997. Wahls also provided university-wide leadership through service to the College of Engineering and Graduate School. As a geotechnical engineering teacher, his courses included a sequence of graduate courses that served as a foundation for generations of practitioners and researchers, and he was recognized by several awards, including being selected for the NC State Academy of Outstanding Teachers. His research in geotechnical engineering provided opportunities for numerous Ph.D. and M.S. students who went on to have major impacts in practice, professional societies and academia.

As a leading engineer, recognized with the Outstanding Civil Engineer Award from the NC Section of American Society of Civil Engineers (ASCE), Wahls served on technical committees of ASCE and the Transportation Research Board and developed manuals of practice, including guidance for bridge foundations. His professional services included chairing two ASCE Specialty Conferences, In Situ Measurement of Soil Properties and Geotechnical Practice in Dam Rehabilitation, held at NC State. His services to the Geo-Institute of ASCE included membership on the Board of Governors and representing the U.S. as the international secretary. He also served as the U.S. Delegate to Administrative Council meetings of the International Society for Soil Mechanics and Geotechnical Engineering.

DR. JON C. LIEBMAN

Following an undergraduate degree at the University of Colorado, five years of service in the U.S. Navy and graduate degrees from Cornell University, Liebman served on the faculty at Johns Hopkins University and then at the University of Illinois at Urbana-Champaign until 1996, where he was head of the Department of Civil Engineering from 1978-84. He received prestigious education awards for both superb classroom teaching and pioneering educational innovations. His decades-long research defined and developed the field of environmental systems analysis; his work featured scholarship at the highest level along with a strong graduate-education component. His former Ph.D. students include successful professionals and faculty and administrators at universities around the world. As a leader and mentor, perhaps his greatest attribute is his well-developed sense of what an academic institution should be and how to maintain and improve it as decisions are made and policies and procedures are developed. As department head, he demonstrated a collegial style of leadership that allowed the potential of a broad range of faculty to be realized. His career as an educator, researcher and administrator is not only extraordinarily distinguished but also a model for others.

His contributions to NC State are indirect since he set foot on campus only once, but they have had an enormous impact on the department over several decades. Many of the important elements of developing the undergraduate and graduate programs, the computing infrastructure and systems program, and the administrative structure, policies and practices have been modeled after his initiatives or based on innumerable conversations. Many impacts have been subtle, often coming up in a discussion about a challenging issue starting with "What did Jon do or what would Jon do?" ▪

DEPARTMENT **ADVISORY BOARD**

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

Jennifer Brandenburg
BSCEC 1986
AgileAssets

Glenda Gibson
BSCE 1987
Mott MacDonald

Skeet Gray
BSCEC 1983, MSCE 1993
Eagle Engineering Inc.

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
Lennar

Street Lee
BSCE 1983
McKim & Creed

Will Letchworth
BSCE 2002, MSCE 2004
WSP U.S.A.

Chad Link
BSCEC 1996
Crowder Construction Company

Mark McIntire
BSENE 1995, MSCE 1997
Duke Energy Corporation

Tonya Mills
BSCE / BSENE 1994
Tri Properties Inc.

Mike Munn
BSCEC 1995
McAdams

Lisa Patterson
BSCE 1989, MCE 1990
Hazen and Sawyer

Dan Pleasant
BSCE 1972, MCE 1973
Dewberry

Sandra Stepney
BSCE 1983
Simpson Engineers & Associates

Gray Talley, *Past Chair*
BSCEC 1998
Shelco Inc.

Steve Thomas
BSCE 1984, MSCE 1986
Sepi Engineering

Stephanie Vereen
MSCE 2002, Ph.D. CE 2013
Balfour Beatty

Mike Wayts, *Vice Chair*
Freese and Nichols Inc.

INVESTING IN THE DEPARTMENT

We invite you to invest in the future of the department. Your gift will help us take CCEE to a new level of excellence. You can choose an annual gift, an endowed gift or a one-time gift. Outright gifts of cash can be made by simply writing a check payable to:

NC State Engineering Foundation
Campus Box 7901
Raleigh, NC 27695-7901

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

If you prefer to make your donation online, you can use your credit card with our online feature at **www.engr.ncsu.edu/alumni-and-giving/ways-to-give**. Drop down menus will allow you the chance to specify that you want your gift to be directed to our department.

For more information contact:
Lindsay Smith,
Senior Director of Development
Phone: **919.515.7738**
Email: **lksmith4@ncsu.edu**

Ziccarelli brings construction and structural expertise to CCEE

Before embarking on his academic journey as an assistant professor in the Structural Engineering and Mechanics group this January, Dr. **Andrew Ziccarelli** had quite a physical journey to embark on — one that took him all the way across the country and through several disciplines.

Ziccarelli, who earned a B.S. in civil engineering with an emphasis in structures from the University of Notre Dame in 2011, made the long trek — 2,815.8 miles to be precise — from Stanford University in California to NC State after earning his M.S. in 2014 and Ph.D. in structural engineering in 2021. Along the way, he's built up his expertise — studying wind loadings in Chicago, then earthquake loadings in California, and now branching out into new materials at NC State.

Growing up outside of Chicago, Ziccarelli spent most of his life in the Midwest, having worked in the structural design and construction industry in Chicago for about five years prior to starting on his Ph.D. While in the Windy City, he had a hand in designing apartment buildings, shopping centers and parking garages, and also worked on several major structural renovations.

His research focuses on advancing the state-of-the-art in nonlinear structural analysis, with the goal of increasing the resilience of our built environment in the face of natural hazards. In his doctoral research, he developed and tested new computational models to simulate the fracture of steel building components subjected to large-scale earthquakes, which involved both analytical work and extensive experimental testing — something he intends to continue at NC State. Most of his research will involve studying the behavior of steel structures at extreme limit states, and he plans to branch out to other materials over the next few years.

Two of the main driving factors for his decision to work at NC State were the CCEE faculty members and the research facilities.

"During my interview, all of the faculty members that I met with were exceptionally friendly, and the culture within the department is very collaborative and supportive. The department provides tremendous support for new faculty, and I truly felt that NC State would give me the best opportunity to build my academic career. As far as the facilities go, Fitts-Woolard Hall is, of course, a state-of-the-art facility for teaching and research. I am also very excited to pursue large-scale research in the Constructed Facilities Lab."

Ziccarelli started his teaching career in January with CE 225 (Mechanics of Solids), an undergraduate course that he said provides an important foundation for more advanced CE courses.

Ziccarelli said he was very excited for the opportunity to move to North Carolina.

"Everyone that I spoke with prior to moving had tremendously positive things to say about living in North Carolina, especially here in Raleigh. We (me, my wife and our two kids) are very excited to be so close to so much natural beauty, with the ocean only a few hours to the east and the mountains to the west. We love that the area is so family-friendly, with great schools and activities for our kids, and the fact that there are three world-class universities right in our backyard. Everyone has been so friendly and welcoming!" ▪

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
Transportation Systems, *Assistant Professor*

Morton Barlaz
Environmental, *Distinguished University Professor* and *Department Head*

John Baugh
Computing And Systems / Transportation Systems, *Professor*

Emily Berglund
Water Resources / Computing and Systems, *Professor*

Ashly Cabas Mijares
Geotechnical, *Assistant Professor*

Douglas Call
Environmental, *Associate Professor*

Cassie Castorena
Transportation Materials, *Associate Professor*

Francis De Los Reyes III
Environmental, *Professor* and *University Faculty Scholar*

Joseph Decarolis
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Casey Dietrich
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Joel Ducoste
Environmental, *Professor* and *Assistant Dean For Faculty Advancement*

Chris Frey
Environmental, *Glenn E. Futrell Distinguished University Professor*

Mohammed Gabr
Geotechnical, *Distinguished Professor of Civil Engineering And Construction*

Fernando Garcia Menendez
Environmental / Computing and Systems, *Assistant Professor*

Andrew Grieshop
Environmental, *Associate Professor*

Murthy Guddati
Structures / Computing and Systems / Materials, *Professor*

Abhinav Gupta
Structures, *Professor*

Ali Hajbabaie
Transportation Systems / Computing and Systems, *Assistant Professor*

Kevin Han
Construction / Computing and Systems, *Assistant Professor*

Angela Harris
Environmental, *Assistant Professor*

Tasnim Hassan
Structures / Materials, *Professor*

Marc Hoit
Structures, *Professor* and *Vice Chancellor for Information Technology*

Edward Jaselskis
Construction, *E. I. Clancy Distinguished Professor*

Jeremiah Johnson
Environmental, *Associate Professor*

Richard Kim
Transportation Materials, *Jimmy D. Clark Distinguished University Professor*

Meagan Kittle Autry
Teaching Assistant Professor and *Director of Graduate Professional Development*

Detlef Knappe
Environmental, *S. James Ellen Distinguished Professor*

Mervyn Kowalsky
Structures, *Christopher W. Clark Distinguished Professor*

James Levis
Environmental, *Research Assistant Professor*

George List
Transportation Systems, *Professor*

Gregory Lucier
Structures, *Research Associate Professor* and *Constructed Facilities Laboratory Manager*

Kumar Mahinthakumar
Computing and Systems, *Professor*

Jonathan Miller
Teaching Assistant Professor

Brina Montoya
Geotechnical / Materials, *Associate Professor*

Jim Nau
Structures, *Professor*

Roberto Nunez,
Construction, *Lecturer* and *Senior Construction Extension Specialist*

Dan Obenour
Water Resources / Computing and Systems, *Associate Professor*

Margery Overton
Coastal, *Professor* and *Vice Provost for Academic Strategy*

Jason Patrick
Structures / Materials, *Assistant Professor*

Mohammad Pour-Ghaz
Structures / Materials, *Associate Professor*

Giorgio Proestos
Structures, *Assistant Professor*

Ranji Ranjithan
Environmental / Computing and Systems, *Professor* and *Associate Head for Graduate Programs*

William Rasdorf
Construction, *Professor*

Elizabeth Sciaudone
Coastal, *Research Assistant Professor*

Rudolf Seracino
Structures, *Professor* and *Associate Head for Undergraduate Programs*

Shane Underwood
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Steven Welton
Structures, *Teaching Professor*

Billy Williams
Transportation Systems, *Professor* and *Director of ITRE*

Andrew Ziccarelli
Structures, *Assistant Professor*

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