NC STATE Engineering

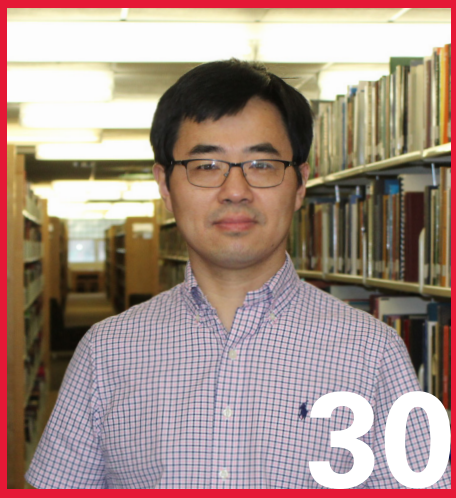
CCEE NEWS

DEPARTMENT OF CIVIL, CONSTRUCTION, AND ENVIRONMENTAL ENGINEERING

YOUTUBERS RHETT & LINK EXPLORE FITTS-WOOLARD HALL 18

FALL 2023

IN THIS ISSUE



DEPARTMENT NEWS

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ALUMNI AND DEVELOPMENT NEWS

ABOUT THE COVER

LA-based comedy duo and NC State alumni Rhett McLaughlin (BSCE '00) and Link Neal (BSIE '01) toured Fitts-Woolard Hall, including CCEE's Traffic Controls and Sensor Lab, while on campus as commencement speakers for the CCEE and Edward P. Fitts Department of Industrial and Systems Engineering graduation ceremonies on May 5.

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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.

Jackie MacDonald Gibson

LETTER FROM THE DEPARTMENT HEAD

It is with mixed emotions that we bring you the latest news and updates from CCEE in this edition of our newsletter. While there is much good news to share about our dynamic community of learners, scholars and practitioners, we must begin on a somber note.

We are deeply saddened to report the loss of one of the department's most brilliant minds and longtime advocates, **Dr. Paul Zia**. Dr. Zia's enduring legacy is a testament to his 35 years of dedicated service on the NC State faculty, including eight years as CCEE department head. Even in his emeritus years, he remained actively engaged as a Distinguished University Professor of Civil Engineering and Alumni Distinguished Graduate Professor until his passing.

To honor his memory and remarkable contributions, CCEE is working to establish an endowment in Dr. Zia's name. This endowment will support the activities of the Constructed Facilities Lab, a 20,000-foot facility that Dr. Zia helped found in 1996, known for its unique capabilities in large-scale structural stress-testing. We are more than 75% of the way to reaching our goal of raising $1 million for this endowment. If you can contribute to this cause, please contact me directly via email at **jmacdon@ncsu.edu** or by phone at **919.515.2266**.

Despite this irreplaceable loss to our community, we invite you to enjoy the highlights from the past few months within the department. This newsletter offers a glimpse into the vibrant activities and accomplishments that continue to shape CCEE, building upon the extraordinary legacy of Dr. Zia and those who preceded him.

A particular highlight from the past six months was the return of one of our most renowned alumni, **Rhett McLaughlin** (BSCE 2000), the co-host of one of the internet's most popular talk shows, *Good Mythical Morning*. Speaking at our May 2023 graduation ceremony, McLaughlin shared how the skills in problem formulation, logic and teamwork that he honed as a CCEE student have been invaluable to his success in the entertainment industry — improbable as the transition from engineering to entertainment may seem. The graduation speech (watch here: **go.ncsu.edu/rhettspeech**) already has nearly 100,000 views on YouTube. You can learn more about his nontraditional journey and his experiences at NC State in an interview with CCEE (watch here: **go.ncsu.edu/rhettinterview**).

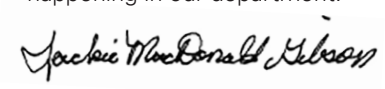
This newsletter also showcases the inspiring achievements of our students and faculty:

- Ph.D. student **Hemant Kumar** and Professor **Sankar Arumugam** developed a computer model that forecasts crop yield, helping farmers and government water resource managers make informed decisions about crop selection and irrigation techniques in the face of a changing climate (**page 2**).
- Professor **Joel Ducoste** joined the American Association for the Advancement of Science Empowering Career Pathways Multidisciplinary Working Group, working to improve access to the STEMM workforce and help people navigate STEMM careers (**page 10**).
- The NC State student chapter of the American Society of Civil Engineers (ASCE) competed in the 2023 Student Steel Bridge Competition National Finals at University of California, San Diego, after placing first in the 2023 ASCE Carolinas Student Symposium competition earlier this year (**page 28**).

This newsletter also highlights the six new faculty members that joined CCEE this year (**page 36**). Their expertise covers a vast spectrum of topics in civil, construction, and environmental industries, including mechanics and materials, computing and systems, transportation, construction, and coastal engineering. We are excited for them to join the department and the rest of the dedicated and talented faculty who are central to our continued success.

We invite you to explore these stories of achievement, innovation and resilience within the CCEE community. If you haven't visited us recently in Fitts-Woolard Hall, we encourage you to do so and share in the excitement that fills our community every day.

Thank you for your ongoing support and connection to CCEE. I look forward to keeping you informed about the exceptional work happening in our department.



Jackie MacDonald Gibson
CCEE Department Head

How can we **predict crop yields in the face of climate change?**

CCEE researchers have developed a computer model that forecasts yields for four key crops in the southeastern United States: cotton, corn, sorghum and soybeans. The tool is designed to help farmers and government water resource managers make informed decisions about crop selection and irrigation techniques in the face of a changing climate.

"Due to climate change, seasonal rainfall amounts in the Southeast are expected to fluctuate significantly from what we've seen in the past," said CCEE Ph.D. student **Hemant Kumar**, first author of a paper on the work.

"For example, we are likely to see more periods of drought, as well as more periods of heavy rainfall during summers. Our model draws on climate, groundwater and agricultural data to do two things: help water managers make efficient use of the available water resources on a county-by-county basis; and help farmers in individual counties identify ways to maximize their crop yields by efficiently utilizing water and energy. We found that using deficit irrigation strategies, rather than conventional irrigation techniques, increased profits by reducing the pumped water amount by 14% (245,000 acre-feet) annually."

The new tool, which the researchers call the regional hydroeconomic optimization modeling framework (RHEO), draws on a host of data. The model incorporates long-term and seasonal rainfall forecasts; groundwater level data from the U.S. Geological Survey; soil characteristics for each county; the water consumption of each crop; the cost of irrigation on a county-level basis; crop price data from the U.S. Department of Agriculture; and crop production budget data from other agricultural researchers.

"All of this data is fed into RHEO, which then predicts the yield per unit area for each crop on a county-level basis," Kumar said. "For example, it would forecast how many bushels of corn, soy, sorghum or cotton you could grow per acre in a given county. It would also forecast what your irrigation costs would be for each of those crops and, taking those things into account, predict which crop and irrigation strategy would be most profitable and environmentally sustainable."

In their paper, the researchers demonstrated the utility of the model by applying it to 31 years' worth of historical data from 21 counties in southwestern Georgia.

"We found that RHEO was able to predict variability in each of our four target crops, as well as identify irrigation strategies that would reduce related costs," Kumar said. "Ultimately, this proof-of-concept work demonstrates that RHEO could be used to reduce energy consumption associated with pumping groundwater, improve water efficiency and boost crop yield."

The researchers noted that the RHEO model is currently calibrated for the 21 counties that were used for the proof-of-concept demonstration. Applying the tool to other parts of the Southeast would require them to use data relevant to each region.

"However, we are open to working with water managers and agriculture industry groups to make RHEO available to stakeholders across the Southeast," Kumar said. "We think the work is important, and would love to see people put this tool to use.

"Climate change increases the unpredictability associated with agriculture, but we're optimistic that this tool will help growers and water resource managers deal with that increased uncertainty."

The paper, "Understanding the Food-Energy-Water Nexus in Mixed Irrigation Regimes Using a Regional Hydroeconomic Optimization Modeling Framework," is published open access in the journal *Water Resources Research*. The paper was co-authored by CCEE Professor **Sankar Arumugam** and Tingju Zhu of Zhejiang University.

The work was done with support from the National Science Foundation, under grant number 1805293, and from a U.S. Geological Survey Southeast Climate Adaptation Science Center graduate fellowship.

This story was originally published in NC State News. ▪

How can we **capture the economic benefit of restoring urban streams?**

Associate Professor **Daniel Obenour**, Teaching Assistant Professor **Jonathan Miller** and an interdisciplinary team of researchers have developed a suite of tools to estimate the total economic value of improving water quality in urban streams. The work can assist federal and state agencies charged with developing environmental regulations affecting urban ecosystems across the Piedmont Region of the United States, which stretches from Maryland to Alabama.

"Urban streams are ubiquitous and face a number of stressors from rapid economic development," said Roger von Haefen, NC State professor of agricultural and resource economics and corresponding author of a paper on the work. "But there have not been well-established tools to help agencies assess the benefits of regulations aimed at improving the water quality of these streams. Our work here provides a robust set of tools that allow us to assess both use and non-use benefits associated with improved water quality in urban streams."

"Use" benefits arise from how people directly interact with urban streams. For example, attractive streams can increase property values of nearby homes, whereas polluted streams may diminish property values. "Non-use" benefits capture existence and bequest values, or what people are willing to pay to protect natural resources in their natural state for the benefit of future generations.

To capture the broad range of potential benefits, the researchers developed an "ecological production function framework" that translates observable, biophysical measures of water quality into ecological outcomes that people perceive and value. For example, a biotic index is a scale that uses the diversity of species in a waterbody to assess a stream's overall ecosystem health, which is an ecological output that the public values.

Specifically, the framework draws on existing water quality monitoring data and uses computational modeling to predict water quality changes related to various regulatory interventions. The framework then leverages expert assessments of how these water quality changes translate into ecological endpoints and the public values. A stated preference survey of area residents is then used to quantify the public's willingness to pay for these outcomes — and, by extension, for improvements in stream water quality.

The researchers demonstrated the utility of the new benefit estimation tools by looking at the Upper Neuse River Basin in Durham and Wake counties, North Carolina.

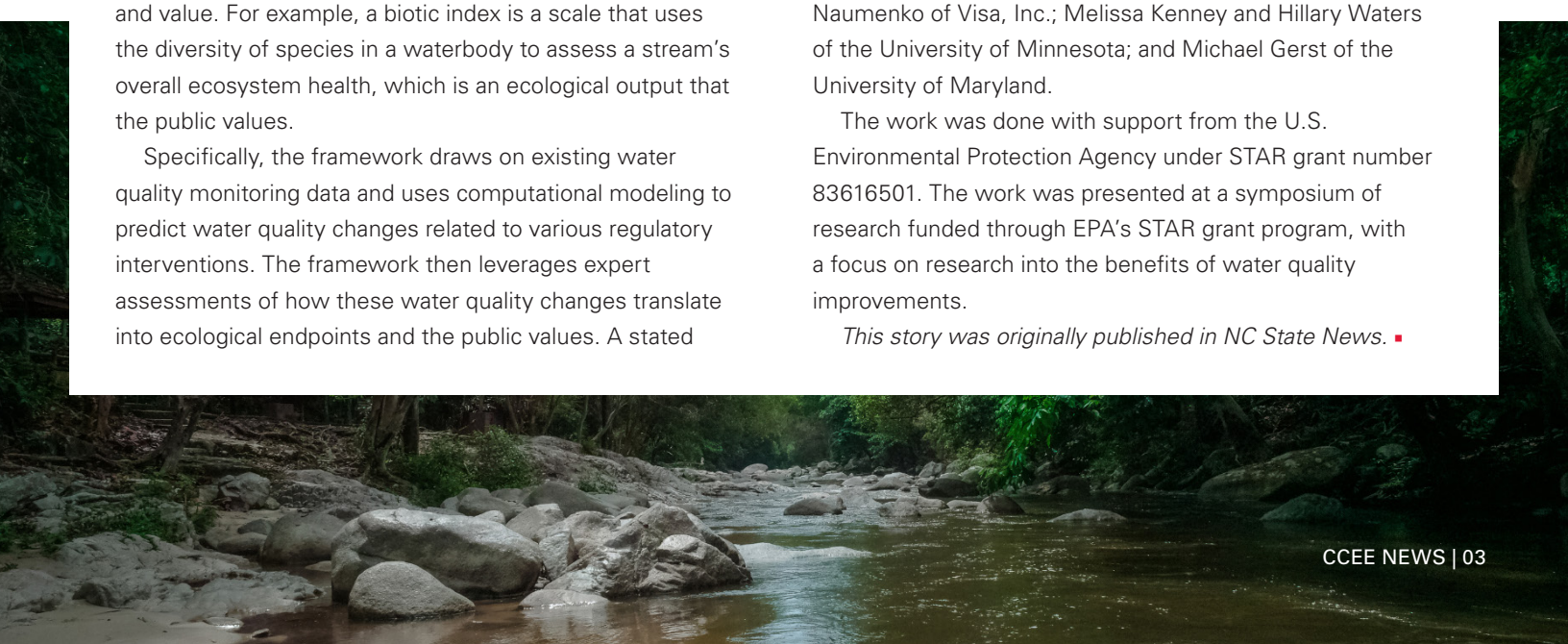
The researchers found that residents of the area containing the Upper Neuse River Basin would be willing to pay an average of $127 per household per year — approximately $54 million in total — for water quality improvements derived from increasing tree cover along stream banks by 25% and decreasing runoff from impervious surfaces, such as streets and parking lots.

"It was rewarding to work in a multidisciplinary team that allowed us to connect water quality models to monetary benefits of stream improvements," Miller said. "Water quality in streams is highly variable and difficult to predict. We used hierarchical statistical models to determine important watershed characteristics across the NC Piedmont (lack of canopy in stream buffers, impervious cover, upstream wastewater treatment plants, etc.) and predicted stream water quality (nutrient levels, turbidity, biotic levels and fecal coliform) under different future stream rehabilitation scenarios."

The paper, "Estimating the Benefits of Stream Water Quality Improvements in Urbanizing Watersheds: An Ecological Production Function Approach," was published in the *Proceedings of the National Academy of Sciences*. The paper was co-authored by CCEE's Obenour and Miller; George Van Houtven of RTI International; Alexandra Naumenko of Visa, Inc.; Melissa Kenney and Hillary Waters of the University of Minnesota; and Michael Gerst of the University of Maryland.

The work was done with support from the U.S. Environmental Protection Agency under STAR grant number 83616501. The work was presented at a symposium of research funded through EPA's STAR grant program, with a focus on research into the benefits of water quality improvements.

This story was originally published in NC State News. ▪



HOW CAN WE IMPROVE TRAVEL TIME THROUGH INTERSECTIONS?

A new study finds that "connected" vehicles, which share data with each other wirelessly, significantly improve travel time through intersections — but automated vehicles can actually slow down travel time through intersections if they are not connected to each other. The culprit? Safety.

"There are two significant reasons that people are interested in automated vehicles: improving passenger safety and reducing travel time," said Associate Professor **Ali Hajbabaie**, first author of a paper on the work.

"There is a lot of research showing that automated vehicles can improve safety. But our research here — which relies on computational modeling — suggests that if we want to also improve travel time, an increase in automated vehicles isn't enough; we need vehicles that are capable of communicating with each other and with the traffic-control systems that manage traffic flow at intersections."

For the study, the researchers used a computational model that simulates traffic conditions. The researchers accounted for four types of vehicles: human-driven vehicles (HVs); connected vehicles (CVs) — which are driven by humans, but share information with other connected vehicles and with the control system that manages traffic lights; automated vehicles (AVs); and connected automated vehicles (CAVs).

"Because of their programming, AVs are assumed to move more cautiously compared to human drivers," Hajbabaie said. "Their safety stems, in part, from their being programmed to drive conservatively. CVs and CAVs are designed to receive information about the future state of traffic lights and adjust their speeds to avoid stopping at intersections. As a result, the movement of CVs and CAVs is expected to be smoother — and have a lower number of stops — than HVs and AVs."

The researchers ran 57 traffic simulations to assess the impact of a host of variables on travel time through an intersection. For example, the researchers looked at how traffic would be affected by various combinations of HVs, AVs, CVs and CAVs.

One clear takeaway was that the higher the percentage of CVs and CAVs, the greater the intersection capacity. In other words, when more vehicles on the road were connected, more vehicles could flow through the intersection more quickly. Higher capacity also means that, on average, you have fewer vehicles sitting in line at a red light.

"However, we found that higher percentages of AVs — which are not connected — actually slows travel times through intersections," Hajbabaie said. "This is because those AVs are programmed to drive conservatively in order to reduce the risk of collisions. Our findings underscore the importance of incorporating connectivity into both vehicles and traffic-control systems.

"This study was conducted using a computational model, which is a limiting factor," Hajbabaie said. "However, it's difficult and expensive to assemble a mixed fleet of HVs, AVs, CVs and CAVs in a connected traffic-control system. Field tests involving human drivers can also raise safety concerns, making these modeling studies particularly important; we want to identify potential problems now, and not when real lives are at stake."

The paper, "Effects of Connectivity and Automation on Saturation Headway and Capacity at Signalized Intersections," is published in the journal *Transportation Research Record*. The paper was co-authored by Assistant Professor **Eleni Bardaka**; and by **Mehrdad Tajalli**, a recent Ph.D. graduate.

This research was done with support from the North Carolina Department of Transportation.

A version of this story first appeared in NC State News. ▪

NEW **RESEARCH PROJECTS**

In the first half of 2023, CCEE launched new research projects with funding from federal and state agencies, foundations and industry sponsors. This support will enable CCEE faculty members, their research teams and their collaborators to address problems in infrastructure and the environment in North Carolina and around the world.

FEDERAL GRANTS

Katherine Anarde, assistant professor, received funding from the National Oceanic and Atmospheric Administration's Climate Adaptation Partnerships Program to study chronic flood risk in underserved coastal communities in North Carolina and Hawaii. The project will incorporate community workshops, measurements of flooding and flood models to identify key vulnerabilities and impacts. This project — in collaboration with community partners the Carolina Collaborative on Climate, Health, and Equity and the Pacific Regional Integrated Sciences and Assessments team — will further our understanding of chronic flood risks and bolster involvement of partner communities in the adaptation decision-making process.

Anarde and **Casey Dietrich**, associate professor, received funding from the Department of Homeland Security Coastal Resilience Center to evaluate coastal flood reduction strategies in Carolina Beach, North Carolina. Anarde and Dietrich have partnered with environmental social scientist Miyuki Hino (University of North Carolina at Chapel Hill) and town officials in Carolina Beach, to develop and perform a survey of town residents' preferences for different flood-reduction strategies. A flooding model will be used to test preferred flood-mitigation strategies under future climate change scenarios.

Doug Call, associate professor, is leading a new project funded by the National Science Foundation's Science and Technologies for Phosphorus Sustainability Center that focuses on improving phosphorus removal at wastewater treatment facilities. Along with Amy Grunden (Department of Biological Sciences), Jacob Jones (Department of Materials Science and Engineering) and Paul Westerhoff (Arizona State University), the team will create new microorganisms that can continuously take up phosphorus from wastewater and store it inside themselves in the form of polymeric chains. They will also develop methods to extract the phosphorus from the cells for downstream industrial processes and products.

Jason Patrick, assistant professor, received funding from the U.S. Air Force Office of Scientific Research to lead an interdisciplinary research project aimed at developing multifunctional fiber-reinforced polymer (FRP) composites with synchronous self-sensing and self-healing capabilities. The new "opto-vascular" platform will combine microvascular networks, similar to blood vessels in living organisms, for autonomous liquid photo-chemistry transport to internal cracks, with optical fiber conduits for light-based polymerization (healing) and in situ structural health monitoring of damage / repair (sensing). The structural materials could eliminate costly inspection and maintenance while improving performance, reliability and extending useful lifetime, benefiting the economy and environment while providing enhanced tactical capabilities.

NEW **RESEARCH PROJECTS**

Moe Pourghaz, professor; **Detlef Knappe**, S. James Ellen Distinguished Professor; and **Shane Underwood**, professor, were awarded a project by the Strategic Environmental Research and Development Program under the U.S. Department of Defense. Other investigators include Jennifer Guelfo (Texas Tech University) and Charles Schaefer (CDM Smith). The goal is to gain insight into per- and polyfluoroalkyl substances (PFAS) leaching from aqueous film-forming foam impacted portland cement concrete (PCC) and asphalt concrete (AC), to enhance the management of these materials, understand potential PFAS transformations during PCC and AC recycling, and develop PFAS transport models that can effectively translate standardized leaching test data into real-world field-leaching scenarios.

Pourghaz is participating in a large team, called Reinforced Concrete Repair by Evolving Visualized Internal Vascular Ecosystem, led by Mija Hubler (University of Colorado Boulder). This work is funded by the Defense Advanced Research Projects Agency under the Bio-Inspired Restoration of Aged Concrete Edifices program, which aims to infuse concrete structures with biological self-repair technologies to prolong substrate lifespan.

Jackie MacDonald Gibson, professor and department head, received funding from the National Institute of Environmental Health Sciences to advance understanding and mitigating methods for volatile organic contaminants (VOCs) with a focus on post-industrial urban centers. She will collaborate to characterize risks to communities from VOCs at Superfund and other hazardous waste sites. Evidence suggests that exposure to VOCs is an important determinant of maternal-offspring health. VOCs emanating from landfills, brownfields and Superfund sites can contaminate shallow soils and groundwater below residential, commercial and industrial properties, leading to exposures via vapor intrusion. Led by Wayne State University, the team will use Detroit as a study site. MacDonald Gibson is supporting the project by developing novel approaches for reconstructing and predicting vapor intrusion risks by integrating traditional mechanistic models of VOC transport through the subsurface with data-driven, machine-learned Bayesian network models. Publicly available tools will be created for at-risk communities to predict risks at the household scale.

MacDonald Gibson is collaborating with investigators at Indiana University, North Carolina Agricultural & Technical State University and RTI International on a project funded by the U.S. Department of Housing and Urban Development to improve models for predicting houses where children are at risk from exposure to lead (Pb). Currently, state and local agencies typically rely on children's blood Pb tests and/or house age to prioritize homes for Pb hazard interventions. However, this approach has critical limitations, especially its reliance on children as sentinels of Pb exposure. The project will use machine-learning techniques to address the need for proactive methods to prevent the damage from childhood Pb exposure, creating a web-based app and mapper — Pb Reduction In Critical Homes — for precision matching of Pb interventions to households, equipping state and local agencies with actionable tools for prioritizing neighborhoods and households for potential participation in federal and/or state Pb hazard remediation programs.

Ashly Cabas, assistant professor, and **Brina Montoya**, professor, received funding from the U.S. Geological Survey to develop a liquefaction-induced ground failure prediction model that incorporates relevant geomorphic, such as surficial geologic, variables. Geomorphic variables capture the surface processes and environments that impact liquefaction-prone sediments, and they can often be assessed from publicly available remote-sensing data. Liquefaction-induced lateral spreading occurs when loss of shear strength makes soil act as a liquid, causing ground failures such as surface cracks and landslides. These liquefaction-induced lateral deformations represent a major geohazard in earthquake-prone regions leading to significant human and economic losses. Current predictive models only focus on geotechnical (i.e., subsurface characterization) and

seismological considerations (i.e., ground motion intensity), and do not explicitly account for geologic features that can control lateral ground deformations, even though geologic conditions play a crucial role in liquefaction occurrence, severity and spatial extent.

the Sloan Foundation to support the Open Energy Outlook (OEO) initiative. The OEO project is building an open-source energy system modeling platform to investigate decarbonization and other transitions in our energy industry. The funding will support the creation of a consortium of engaged stakeholders, with a goal of increasing the exposure, functionality and reach of the tool.

FOUNDATIONS AND INSTITUTES

Anderson R. de Queiroz, associate professor, and **Mohammed Gabr**, Distinguished Professor, received funding from the North Carolina Renewable Ocean Energy Program (NCROEP) to explore the techno-economic feasibility of co-located wind and wave energy devices considering mooring analysis and energy systems integration. The proposed scope aims to investigate the mooring fragility of such wind-wave co-located systems during operating conditions. The team will build upon models for mooring fragility and energy systems planning that account for offshore resources in North Carolina.

de Queiroz and Chris Vermillion (University of Michigan), received funding from the NCROEP to build and enhance an integrated portfolio optimization framework that unifies solutions of resource, technical performance, transmission and cost model sub-problems into a unique and comprehensive tool to support marine renewable energy analysis. The goal is to create a tool that can guide informed decision-making in the sector and contribute to the broader sustainable energy transition and the development of the blue economy, an economic system to conserve marine and freshwater environments.

Jeremiah Johnson, associate professor, with Paulina Jaramillo (Carnegie Mellon University) received funding from

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Daniel Obenour, associate professor; **Emily Berglund**, professor; and graduate student **Kingston Armstrong** received funding from the North Carolina Department of Environmental Quality to provide guidance on modeling dissolved oxygen in eastern North Carolina streams and swamp waters. Water-quality modeling is a critical tool for evaluating the impacts of municipal and industrial discharges to surface waters, ensuring that oxygen levels remain sufficient to support healthy aquatic ecosystems. Recommendations will include suggested model types, model configurations, data requirements and performance standards.

Pourghaz; **Gregory Lucier**, associate research professor; and Amin Akhnoukh (East Carolina University) were granted a project by the North Carolina Department of Transportation (NCDOT) to develop a novel test method for the detection of Alkali Silica Reactivity (ASR) in aggregates. ASR is a significant deterioration mechanism that affects concrete infrastructure. The researchers seek to create rapid and reliable test methods to screen aggregates for potential ASR-related issues.

Cassie Castorena, professor, received funding from NCDOT to evaluate recycled binder availability under laboratory-simulated plant conditions. Recycled binder

availability indicates the proportion of total asphalt in a given recycled asphalt material source that is available to blend with virgin materials as opposed to functioning as black rock. Current asphalt mixture design procedures assume complete recycled binder availability, which may yield suboptimal pavement performance. The project will evaluate the performance implications of addressing partial recycled binder availability when specifying virgin asphalt binders and maximum recycled material contents. The results will inform improved specifications for asphalt mixtures.

Shane Underwood, professor, will collaborate with researchers at the University of North Carolina at Charlotte and Sandhills Community College to improve pavement resilience to extreme events for NCDOT. When hurricanes strike, many pavements are damaged, causing substantial short- and long-term impacts to overall mobility and requiring substantial time and economic resources to correct. The project will help NCDOT reduce these impacts by developing a design feature selection and repair strategy decision tree that considers the specific features, planned needs, sustainability considerations and possible stressors at a given pavement site.

Underwood and **Castorena** received funding from NCDOT to evaluate the surface texture, friction and safety of alternative road-surface materials. When roadways have surfaces with low texture or friction, the skid resistance can be low and lead to high crash rates. To solve this issue, transportation agencies often use high-friction surfaces, but it is not clear which texture type provides the highest benefit and best longevity. The researchers will evaluate this issue by conducting field experiments to evaluate the surface characteristics of these alternative surfaces and laboratory experiments to evaluate their long-term performance.

Lucier and **Rudolf (Rudi) Seracino**, professor, received funding from NCDOT to evaluate the behavior of bridge beams repaired using prestressed fiber-reinforced polymers. Currently, deteriorated bridges must be load-posted or closed, causing traffic delays. Easily applied repairs can keep a bridge open without a load-posting until a replacement can be designed, bid and constructed. The researchers will study 40-year-old beams that were retrofitted two years ago. The beams were salvaged from a bridge replacement project in Sampson County, North Carolina, and will be transported to NC State's Constructed Facilities Laboratory where they will be studied experimentally with results compared to analytical models.

Montoya and **Gabr**, along with Celso Castro-Bolinaga (Department of Biological and Agricultural Engineering) and Aleja Ortiz (Colby College), received funding from NCDOT to enhance bridge scour assessments by linking geotechnical, erodibility and hydraulic data. The alternative approach developed through the project will use site-specific data from geotechnical investigations to better inform erodibility parameters. A temporal assessment of the hydraulic shear stresses based on base flood recurrence periods will also be developed. The research results will provide guidance for assessing scour magnitude of various hydraulic structures located at sites consisting of a range of soil types, including clays, and in turn lead to foundation systems with improved, reliable performance.

Andrew Grieshop, professor, and **Tongchuan Wei**, research assistant professor, received funding from NCDOT to quantify and assess air pollutant emissions from North Carolina ferry vessels. The researchers will identify and recommend opportunities to reduce air pollutant emissions from ferry vessels, thus improving air quality in North Carolina. The findings will help with planning and operations to mitigate air pollutant emissions and also for seeking grants to procure funding for vessel modifications or upgrades.

Eleni Bardaka, assistant professor, received funding from NCDOT to study how microtransit systems are used and experienced across different neighborhoods and

geographies as well as their benefits to diverse populations. The study will focus on microtransit systems currently operating in North Carolina and will involve surveying microtransit users to understand their needs, preferences, and changes in their travel characteristics after microtransit became a transportation option in their community.

INDUSTRY / NONPROFIT / FOUNDATION

Seracino and **Giorgio T. Proestos**, assistant professor, received funding from the American Concrete Institute's (ACI) Concrete Research Council to conduct large-scale tests of concrete deep beams reinforced with FRP bars, and to develop design recommendations that can be incorporated into codes. The research focuses on how beams utilizing FRP reinforcement perform when subjected to extreme loads. The results will be incorporated into the ACI 440.11 design code.

MacDonald Gibson is partnering with RTI International to quantify the burden of disease attributable to ambient air pollution, indoor air pollution and climate change in the United Arab Emirates (UAE). The estimates will update a previous simulation model constructed by MacDonald Gibson to estimate the environmental burden of disease in the UAE in 2008. The project also involves engaging international experts to develop a research agenda for advancing knowledge on how to prevent adverse health effects of indoor air pollution in the UAE.

Andy Ziccarelli, assistant professor, received funding from the American Institute of Steel Construction (AISC) to perform a detailed computational study focusing on the local buckling response of steel members under seismic loading. Local buckling is a critical failure mode in steel members which can dramatically impact the safety and stability of structures during earthquakes. The results of the study will support revised design limitations in the AISC Seismic Provisions.

Alex Albert, associate professor, received funding from the Construction Safety Research Alliance to advance the science of safety training. The effort will focus on understanding how safety training interventions can be designed to maximize work-related safety performance in the context of the construction industry. The findings are expected to enhance the design and delivery of safety training interventions that target the construction workforce.

Cabas will lead a study supported by Pacific Gas & Electric on the attenuation properties of seismic waves. Current models of energy dissipation are oversimplified and cannot capture systematic contributions of local soil and rock conditions. Investigations of multiscale and multiphysics attenuation models will shape the integration of more traditional geotechnical attenuation models with geology. The study will also include an investigation of the trade-off between seismic wave amplification and attenuation as a result of the properties of sedimentary columns, the exploration of borehole array sites with good subsurface characterization, and the use of numerical modeling to evaluate contributions from different attenuation mechanisms in the field scale (such as scattering and anelasticity) and how they are captured by new attenuation parameters in earthquake ground motion modeling. ▪

How Do We Create New Career Paths for **THE STEMM WORKFORCE?**

Global challenges, from climate change to the COVID pandemic, underscore the importance of research in the fields of science, technology, engineering, mathematics and medicine (STEMM). But how do we cultivate a workforce that supports efforts in those fields?

The American Association for the Advancement of Science (AAAS) has established a new interdisciplinary team focused on improving access to the STEMM workforce and helping people navigate STEMM careers. The team, called the AAAS Empowering Career Pathways Multidisciplinary Working Group, will present its findings at the AAAS conference being held in Denver, in February 2024.

To learn more about the working group, and what it is trying to accomplish, we talked with CCEE Professor **Joel Ducoste** — a member of the working group and associate dean for faculty advancement in NC State's College of Engineering.

What exactly is the AAAS Empowering Career Pathways Multidisciplinary Working Group (MWG)? What is it trying to accomplish?

Joel Ducoste: AAAS MWGs are AAAS's way to leverage the strengths of a multidisciplinary group of experts to provide strategies for how to make progress on a range of topics that are important to the constituencies that AAAS serves. AAAS hopes that these MWGs will address timely and high-impact issues, with the goal of developing actionable steps to enact change in science, technology, engineering, mathematics and medicine.

The Empowering Career Pathways in STEMM MWG (ECP MWG) will help address major issues that have presented barriers to individuals entering STEMM careers, as well as challenges associated with retaining talent:

- Exclusionary practices that limit entry points or access into STEMM careers
- Disincentives for individuals wanting to make career changes
- Unrealistic goals for success in STEMM professions
- Disconnects between formal training or education and on-the-job competencies.

Why did the AAAS convene the group?

Ducoste: I think they are interested in providing access along multiple pathways to a STEMM career. If we do this correctly, we will make lifelong learning truly a reality, with easy access and accumulation of knowledge that will allow anyone with desire and training to make an impact in STEMM. I also believe it is about providing access to those who, through no fault of their own, are not provided the opportunity to receive the training needed to enter a STEMM discipline (K-12 school access, family support, racism/sexism/isms, bias, etc.). The world can no longer afford to exclude potentially capable people who are trained in data analysis to discover or solve problems that have been identified in our grand challenges of engineering or are part of the United Nations' sustainable development goals. We are at a tipping point of just creating marginal or incremental solutions. We need radically novel innovations that can only be achieved when you have a vast array of lived experiences at the table.

The ECP MWG is charged with evaluating opportunities for change within the scientific enterprise to support diverse career growth and achievement, including:

- Creating new and flexible entry points and intersections for STEMM careers
- Challenging traditional benchmarks for success
- Changing material and non-material incentives for recruiting and retaining talent
- Cultivating and respecting the whole person by supporting professional and personal development.

The group is tasked with addressing an enormous challenge. Are there particular elements you hope the group will focus on?

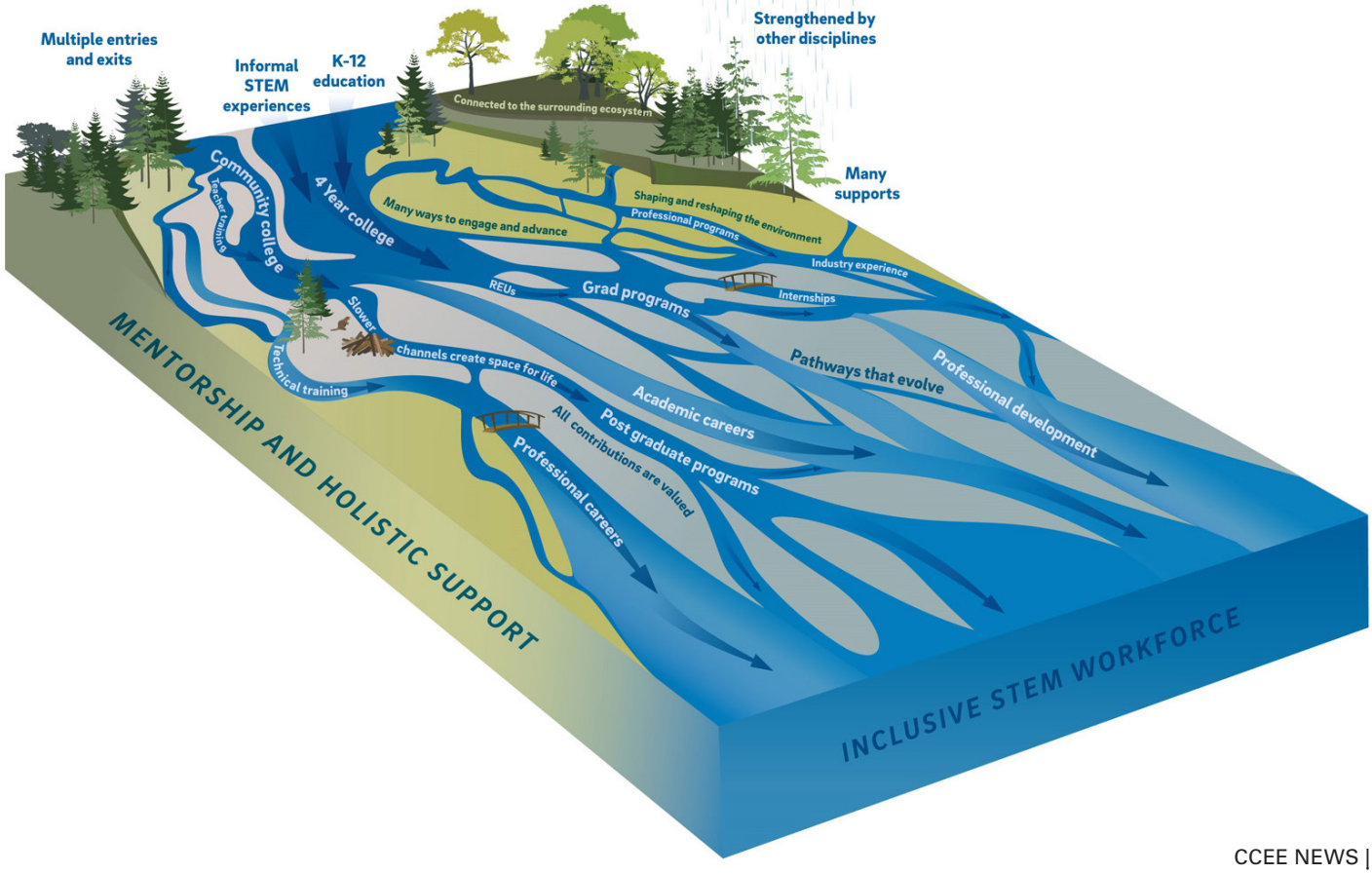
Ducoste: In thinking about this real ability to enter the STEMM field at any point along a timeline and with any starting conditions, one needs a platform that helps keep track of an individual and track a person's educational

attainment. Now, you may say we have that in the form of a high school diploma or college transcript (for post-secondary education). However, these are limiting. Beyond the high-school level, it requires that people sign up for a two- or four-year degree granting institution. Such enrollment would generate a single transcript, which documents all the training that has been attained at that institution. It is limiting because of the time requirement and overall cost. Although I have achieved my professional STEM engineering career by going to undergraduate and graduate institutions, that pathway may not be possible for many people due to varying initial conditions that do not allow someone to begin immediately after high school — or because the cost is prohibitive to perform all the educational requirements in a continuous fashion back to back. So how can we help someone who has the desire, grit and potential to enter a STEMM field and provide a platform that would collect evidence of his or her knowledge attainment?

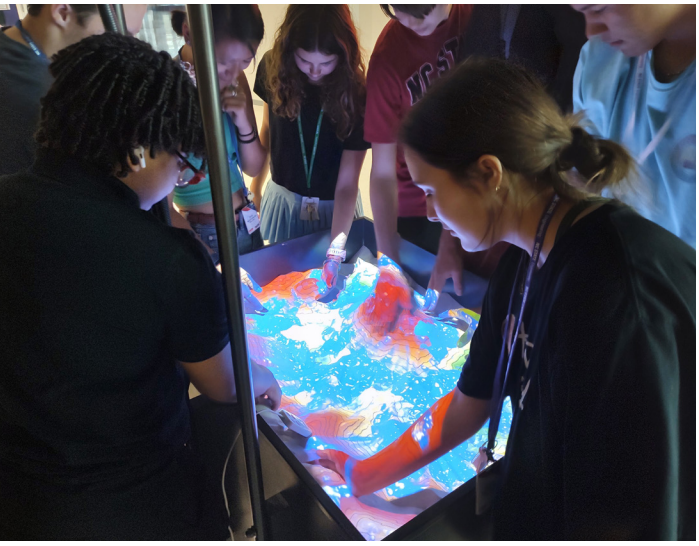
One way to have STEMM accessible to all and have multiple pathways is to utilize block-chain technology to track an individual's educational and training history. You may have heard of block-chains as they pertain to currency (also known as cryptocurrency). But as a formal definition, block-chains refer to a digital ledger that can be shared by those that are granted access to it for monetary transactions (in the case of cryptocurrency). I believe it is based on some kind of distributed ledger technology that is encrypted. I really do not know much more about the technology behind it. But if it is designed to protect an individual's digital fortune, the same type of technology could be used to create something along the lines of a digital transcript — we could call it a block-script.

A block-script would collect all the educational and training opportunities whether it be through degrees, certificate programs, individual courses taken as a non-degree student at any institution, courses taken at employers, etc. Therefore, it does not matter if a person was fortunate enough to begin their STEMM career in the traditional sense or took a different path of educational attainment that collected individual courses or training opportunities from a number of different sources. Anyone could attain the skills necessary to contribute to a STEMM field and have a point of reference that any future employer could review to determine the suitability of the applicant for the specific job they are trying to pursue. It will not be easy, and there are many questions about this technology as an approach for documenting an individual's record of education and training. Such challenges include credentialing, willingness of universities to participate and cybersecurity.

This story was originally published in NC State News.



Picture This



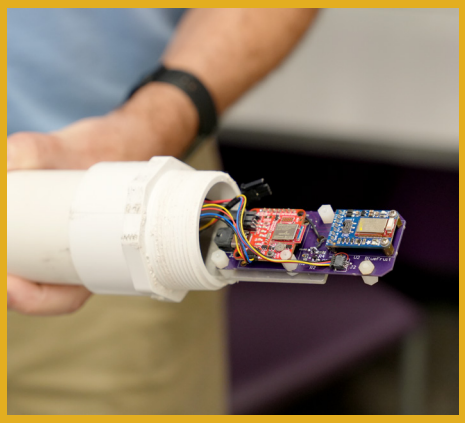
From Fitts-Woolard Hall labs to the mountains of western North Carolina to the lush shores of Ireland, CCEE faculty members and students spent the summer conducting research, bonding through external activities, hosting workshops and studying abroad. Check out these photos of some of their activities.

Twenty-four high school students participated in CCEE's weeklong summer camp workshop last June, experiencing life on campus and exploring different engineering fields. The 11th- and 12th-grade high school students participated in engineering activities such as constructing small-scale wooden towers, figuring out how to build a water purifier using basic soil components and optimizing structures with computer simulations. Students also toured Fitts-Woolard Hall, exploring lab spaces, classrooms and the Constructed Facilities Lab, where they got to see large-scale testing. The campers had the opportunity to work in the Student Projects Lab, the Hydraulics Teaching Lab and the computer lab. Civil engineering company VHB also hosted campers at its Centennial Campus location and demonstrated the ways civil engineering graduates work together on projects to make sure all the aspects of design and planning are integrated to complete a project. ▪

Distinguished University Professor **Mort Barlaz** has led an annual weekend camping and rafting trip for interested CCEE students for more than 10 years. This year, 14 environmental, water resources and coastal engineering students and friends and family joined Barlaz for an outing to Almond, North Carolina, to raft down the Nantahala River in early August. The group camped at Turkey Creek campground and enjoyed a picnic lunch. ▪

Picture This

CCEE was selected as an inaugural School of Excellence (SoE) by the Academy of Pavement Scientists and Engineers (APSE). The initiative aims to offer unique learning opportunities for the pavement science and engineering (PS&E) community in multidisciplinary areas. APSE was created in 2017 to promote recognition of pavement engineering and the application of scientific principles to solve critical issues in the field. The organization also aims to align education, research and professional practice with new and emerging knowledge in design, materials, analysis, modeling, management and sustainability to address challenges faced by pavement professionals. As an SoE, CCEE hosted a five-day short course on "Multiscale Modeling of Asphalt Materials and Pavements Using Viscoelastic Continuum Damage Theory" in Fitts-Woolard Hall from June 19-23. There were about 32 participants from across the world. ▪



Students and researchers gathered in Fitts-Woolard Hall's Incubator Lab to build a new round of sensors for the Sunny Day Flooding Project, with a goal of measuring, modeling and understanding the impacts of chronic shallow flooding in coastal North Carolina communities. The sensors measure the capacity of storm drains and the extent of flooding along roadways. Real-time water level data from the sensors are displayed online at **go.ncsu.edu/sunny**. The data will validate a coupled hydrodynamic and hydrologic model of flooding in the town, which will then be used to simulate future flood risk and potential adaptation strategies. Email alerts are also triggered when water levels approach the roadway, which allows for proactive implementation of flood warning measures by town staff. ▪

Thirteen CCEE students traveled nearly 3,600 miles from May 24 to June 29 to study abroad in the lush Emerald Isle, also known as Ireland. Headquartered in Dublin, the CCEE Summer Study Abroad Program gave students the opportunity to see infrastructure from a different perspective while exploring Ireland and broadening their cultural exposure. In addition to taking CCEE courses CE 301: Civil Engineering Surveying and Geomatics and CE 383: Hydrology and Urban Water Systems on the University of College Dublin campus, students had the opportunity to visit Irish hotspots including the Cliffs of Moher, the Howth Cliffs, the Giant's Causeway, and the towns of Belfast and Derry. The trip was overseen by Professor **William Rasdorf** and Teaching Assistant Professor **Jonathan Miller**.

Undergraduate students gain firsthand experience in **research through RISE program**

For some CCEE undergraduate students, summer break is the perfect time to explore doctoral programs firsthand through the department's Research Internship Summer Experience (RISE) program.

As part of the program, which was initiated in 2015 by Director of Graduate Programs and Professor **Ranji Ranjithan**, 16 CCEE participants were paired with research mentors including faculty, graduate students and post-doctoral researchers. Students also participated in weekly sessions on research and professional development and bonded through social activities organized by graduate students.

At the end of the eight-week program, RISE students presented their research findings at the annual NC State Undergraduate Research and Creativity Summer Symposium. Here's a look at the research students engaged in this summer through RISE.

Rhodenischelah Limage, an environmental engineering student at Bucknell University, spent her summer on NC State's campus working alongside CCEE Ph.D. candidate **Nancy Ingabire Abayo** and Professor **Brina Montoya**. Limage assisted with a laboratory testing program to assess the effect of the angle of inclination of soil deposits' shear strength under undrained loading conditions. This was to mimic how natural fluvial deposits, which are inclined, behave under dynamic loading such as earthquakes and indirectly assess the liquefaction susceptibility such as the potential for sand that is saturated, behaving as a liquid from strong shaking. The findings from this work contribute to the understanding of liquefaction-induced deformations such as lateral spreading.

"One of my major interests in environmental engineering is climate change and human impacts of building things and new incoming infrastructure," Limage said. "How can we make sure it's not negatively impacting the environment? This research sort of goes hand-in-hand with that because the infrastructure that is being built in certain areas is being broken down by things like earthquakes. So how can we better build these buildings to ensure they withstand deformations? It's given me possible insight on what I can do."

Jack Voight, an environmental engineering student mentored by Associate Professor **Casey Dietrich** and CCEE graduate students **Jenero Knowles** and **Tomás Cuevas López**, helped research how coastal flooding risks will increase with sea-level rise. As part of the study, they analyzed the risks at Naval Station Norfolk (NSN), a prominent coastal infrastructure that has experienced flooding during recent storms — such as Hurricane Irene in 2011 — and that experiences the fastest rate of sea level rise on the U.S. Atlantic coast. Coastal flooding was simulated with a widely used storm-surge model paired with a parametric hurricane vortex model, and scenarios included present-day and future projections for sea levels in the region. Results will be analyzed against National Oceanic and Atmospheric Administration observations to validate the model, and then inundation areas will be counted to quantify changes. The research provides valuable information regarding future flood plans and methodology to prepare coastal communities for inundation hazards.

"RISE has given me an opportunity to do research and dive into some topics that I don't really get a chance to work on during the normal school year," Voight said. "It seemed like a good opportunity to stay in Raleigh this summer and work on something I'm passionate about. This program has allowed me to dive full force into coastal engineering and get real experience in what it's like to do research."

Jon Pallotto, an environmental engineering student mentored by Professor **Andrew Grieshop** and graduate student **Stephanie Parsons**, helped evaluate inexpensive air-sensors for an exposure assessment study in the Chitwan Valley in Nepal. Air pollution exposures pose the greatest health risk to global communities, with the majority of air-related maladies associated with exposure to particles smaller than 2.5μm (PM2.5). New low-cost air-sensors can be invaluable for large scale data collection, however, the reliability of these inexpensive air-quality sensors needs to be evaluated. The goal of the study is to determine the reliability and useability of three low-cost sensors (Atmotube, MicroPEM, Purple Air) to test methods for use in a pilot study

on ambient personal PM2.5 exposure in rapidly urbanizing Nepal. Further analysis will explore PM2.5 diurnal trends, site comparisons, seasonal variations, and variations among sensor types, with continuing research where adolescents wear these monitors.

"I've always been pretty passionate about protecting the environment, and air quality is a very big component of that," Pallotto said. "I would say it's one of the biggest factors of public health engineering. It's one of the most influential factors that we will deal with in our everyday life. Every breath you're taking is impacted by the air quality around you. I think the RISE program is a great way to make impactful change while you're in school."

To watch video interviews with RISE program participants, head to CCEE's YouTube channel at **go.ncsu.edu/cceeyoutube**.

RHODENISCHELAH LIMAGE

JON PALLOTTO

JACK VOIGHT

YouTubers **Rhett & Link** spend a mythical measure with CCEE and ISE

More than two decades after their own graduations from NC State, LA-based comedy duo **Rhett McLaughlin**, BSCE '00, and Link Neal, BSIE '01, returned to their old stomping grounds to send off the latest class of engineering students as commencement speakers for the Department of Civil, Construction, and Environmental Engineering and Edward P. Fitts Department of Industrial and Systems Engineering (ISE) Spring 2023 graduation ceremonies on May 5.

McLaughlin and Neal are known for hosting one of the most-watched daily talk shows on the internet, *Good Mythical Morning*; their narrative series *Rhett & Link's Buddy System*; and the award-winning weekly podcast *Ear Biscuits*, as well as their comedic songs, sketches and viral low-budget local commercials. Their YouTube channels have a combined subscriber base of more than 25 million people with more than 7 billion total views, and the two have been featured on and in *The Tonight Show with Jimmy Fallon, The Conan O'Brien Show, Vanity Fair, Wired, USA Today* and *The Wall Street Journal*.

McLaughlin delivered the baccalaureate address for the CCEE graduation, speaking on the importance of living in the moment and finding gratitude in lived experiences, even in the face of disappointment.

"You are going to experience disappointment at various stages in your life," McLaughlin said. "You're going to get to something — whether it goes right or whether it goes wrong — you're going to get there and you're going to be disappointed. And when you feel that disappointment, realize that it's a gift. The disappointment is a gift that you can take and use to chip away at your very human attachment to specific desired outcomes. Never stop chipping away at that attachment. You'll probably never completely sever it, but you've got to keep trying."

He said that he and Neal purposely avoided attending each other's commencement speeches in order to listen to the other's address on an episode of their Ear Biscuits podcast (**go.ncsu.edu/earbiscuits**).

Before the CCEE graduation ceremony, McLaughlin

From left to right: Rhett McLaughlin, CCEE Department Head Jackie MacDonald Gibson, ISE Department Head Julie Swann and Link Neal.

To watch video interviews with McLaughlin and his full CCEE commencement speech, head to CCEE's YouTube channel at **go.ncsu.edu/cceeyoutube**.

sat down with CCEE to discuss his experience as a civil engineering student, his fond memories of NC State and how his degree plays into his entertainment career.

"On the surface, it doesn't seem like things translate, right? When you have a very technical degree and then you move into a very creative career. But the way we think about — not just the way we build teams and build systems to create the content that we have — but even in the way we think about writing and comedy and a lot of the time, a setup and a punchline are like an equation and an answer. … The main way that it applies is that we've always been about efficiency, because we are running a business."

After the graduation ceremonies, McLaughlin and Neal toured Fitts-Woolard Hall, the new home to the CCEE and ISE departments. They finished the day with a small social gathering of engineering students and faculty at Raleigh Founded on NC State's Centennial Campus. ▪

AWARDS & HONORS

Nancy Ingabire Abayo

Diyuan Wang

S M Jamil Uddin

Ph.D. students **Nancy Ingabire Abayo**, advised by Assistant Professor **Ashly Cabas** and Professor **Brina Montoya**; **Diyuan Wang**, advised by Professors **Joel Ducoste** and **Francis de los Reyes**; and recent Ph.D. graduate **S M Jamil Uddin**, advised by Associate Professor **Alex Albert**, won 2022-23 **Outstanding Teaching Assistant Awards** from the NC State Graduate Student Association's Teaching Effectiveness Committee. The awards are the primary university-level recognition for exceptional contributions made by graduate teaching assistants to the educational excellence of the university.

Abayo was also awarded a **Margaret McNamara Education Grant**. The nonprofit organization awards education grants to women scholars from developing countries and has named 531 grantees from 79 countries since 1981.

Abayo also won second place in the **Geo-Congress 2023 Geo-Poster competition**. Her poster was called "Exploring the Effect of Soil Deposition and Fabric on Undrained Soil Behavior."

Sam Valmassoi and Paul Acuna

Ph.D. candidate **Paul Acuna**, advised by Professor **Rudi Seracino**, Associate Research Professor **Greg Lucier** and Lecturer **Roberto Nuñez**; and civil engineering student **Sam Valmassoi** were awarded fellowships from the American Concrete Institute Foundation. Acuna received the foundation's **Barbara S. and W. Calvin McCall Carolinas Fellowship**, and Valmassoi was tapped for the **JoAnne K. & Cecil L. Jones Carolinas Fellowship**. Fellowship recipients received a $10,000 educational stipend, paid travel expenses and attendance fees to two ACI conventions and assistance in finding an industry mentor.

Assistant Professor **Ashly Cabas** was selected as a 2023 **Charles E. Via, Jr. Department of Civil and Environmental Engineering Outstanding Young Alumni** at Virginia Tech University. Cabas earned her M.S. in civil engineering in 2011 and Ph.D. in civil engineering in 2016 from Virginia Tech.

Ashly Cabas

Aiden Carpenter

Construction engineering student **Aidan Carpenter** was among 50 students from 31 North Carolina counties named as **Goodnight Scholars Program Class of 2027 Scholarship** recipients. The Goodnight Scholarship is valued at $23,000 per year for up to four years ($92,000) for traditional students.

Lan Cheng

Postdoctoral Research Scholar **Lan Cheng** won first place in the **Fresh Ideas poster award contest** at the American Water Works Association (AWWA)'s Annual Conference and Exposition. Her poster was titled "Compare and combine: PFAS removal by granular activated carbon adsorption and anion exchange."

Tre'Vaughn Cox

Civil engineering students **Tre'Vaughn Cox**, **Caleb Aaron Hill** and **Alysha Jarvis** were selected for the **Goodnight Scholars Transfer Class of 2026**. A total of 50 students were chosen from 21 North Carolina counties. The Goodnight Scholarship is valued at $23,000 per year for up to three years ($69,000) for transfer students.

Caleb Aaron Hill

Ph.D. students **Hezhou (Jenny) Ding** and **Ethan Samuel Quinn**, both advised by Associate Professor **Doug Call**, won **poster awards at the 2023 Association of Environmental Engineering and Science Professors (AEESP) Research and Education Conference**. Quinn's poster was titled "Physical and chemical changes of activated carbon in response to oxidative chemical treatments and their influence on electron exchange behavior,"

Alysha Jarvis

AWARDS & HONORS

Hezhou Ding and Ethan Samuel Quinn

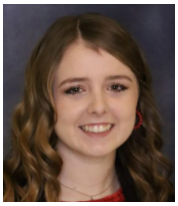
and Ding's was called "A metagenomics meta-analysis to elucidate organic phosphorus biotransformation pathways in anaerobic digesters."

Joel Ducoste

Professor and Associate Dean for Faculty Advancement **Joel Ducoste** was inducted into the **AEESP Fellows**. AEESP Fellows are selected based on their accomplishments in environmental engineering and science research, teaching and professional service, with emphasis on service within the AEESP.

Kelly Flanagan

Ph.D. candidate and adjunct lecturer **Kelly Flanagan**, advised by Distinguished Professor of Civil Engineering and Construction **Mo Gabr**, was awarded the **9th Lizzi Scholarship from the The International Society for Micropiles**. The award included travel and accommodations expenses for attendance at the 15th International Workshop on Micropiles in Vail, Colorado; complimentary workshop registration; and a selection of micropile publications.



Kaitlyn Gainey

Civil engineering student **Kaitlyn Gainey** was one of 30 first-year students named **Caldwell Fellows** by NC State. Caldwell Fellows are selected for demonstrating an aptitude for servant-leadership development.

Ph.D. student **Cassie Gann-Phillips** won **first place in the Geo-Congress 2023 Geo-Poster competition** for her poster "Developing a Geology-based Shear Wave Velocity Model for the U.S. Atlantic and Gulf Coastal Plains."

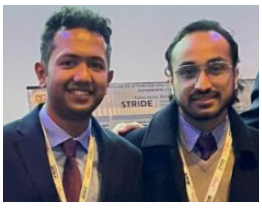
Ariana Paul, left, with Lorenzo-Velázquez and Gann-Phillips

Gann-Phillips, Ph.D. student **Cristina Lorenzo-Velázquez**, and undergraduate student **Ariana Paul** earned **third place in the Geo-Congress 2023 Geo-Video competition**, where students produce a short video on any topic related to geotechnical education and practice. Their video was titled "Site Conditions and the Amplification of Seismic Waves."

Lorenzo-Velázquez also received an honorable mention for the **2023-24 Earthquake Engineering Research Institute** (EERI) / **Federal Emergency Management Agency National Earthquake Hazards Reduction Program Graduate Fellowship**. She received a registration grant to attend the 2024 EERI Annual Meeting.

Jessica Gorski

Master's student **Jessica Gorski** received the **College of Engineering Master Scholar of the Year** award in the research category. Her research area is coastal engineering, with a focus on predicting storm-driven erosion of beaches and dunes. Gorski's research sought to improve process-based forecasting of coastal erosion during storms, which is a challenging task as erosion happens at small scales but forecasts need to cover long stretches of the coast to be useful to the affected communities.



Abdullah Al Farabi, Subid Ghimire

Ph.D. students **Subid Ghimire**, advised by Assistant Professor **Eleni Bardaka**, and **Abdullah Al Farabi**, advised by Associate Professor **Ali Hajbabaie**, won **second and third place, respectively, in the Southeastern Transportation Research, Innovation, Development and Education Center 2023 Poster Showcase & Competition**. Ghimire's poster was called "Spatial & Temporal Characteristics of Microtransit Trips: A Case Study of Wilson," and Al Farabi's poster was titled "Integrated Corridor Management by Cooperative Traffic Signal & Ramp Metering Control."

Jackie MacDonald Gibson

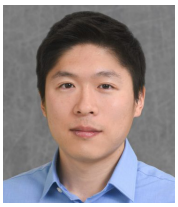
Department Head and Professor **Jackie MacDonald Gibson** was appointed to the **North Carolina Environmental Management Commission** by Gov. Roy Cooper. The commission is responsible for adopting rules for the protection of

AWARDS & HONORS

the state's air and water resources. Cooper said MacDonald Gibson was selected for her special training and scientific expertise in hydrology and water pollution control.


Millie Gilmartin

Assistant Director of Finance **Millie Gilmartin** won a 2023 **NC State College of Engineering Award for Excellence** in the Customer Service category. She received an engraved plaque, eight hours of paid leave and a cash award.


Kevin Han

Associate Professor **Kevin Han** was named an **Edward I. Weisiger Distinguished Scholar** by NC State. Han first joined CCEE in 2016 as an assistant professor and received tenure in 2022.


Angela Harris

NC State announced Assistant Professor **Angela Harris** among its 2022-23 class of **Goodnight Early Career Innovators**. This program recognizes and rewards promising NC State early-career faculty whose scholarship is in STEM or STEM education. The 25 faculty selected will receive $22,000 for each of the next three years to support their scholarship and research endeavors.


Jeremiah Johnson

Associate Professor **Jeremiah Johnson** was selected as a university-level recipient of the NC State 2022-23 **Outstanding Teacher Award** and became a member of the Academy of Outstanding Teachers. Johnson joined CCEE in 2017 as an associate professor and as part of the faculty cluster focusing on Sustainable Energy Systems and Policy. He teaches courses related to sustainable engineering, life cycle assessment and energy systems analysis.


Detlef Knappe

S. James Ellen Distinguished Professor **Detlef Knappe** received the **Borchardt-Glysson Water Treatment Innovation Prize** from University of Michigan. The prize recognizes accomplishments in the water or wastewater treatment fields that have been nationally and internationally recognized.

A paper published by **Knappe** and former graduate students **Elisa Arévalo**, **Viking Edeback** and **Allison Spinelli** (alongside co-authors from University of Colorado Boulder and Colorado School of Mines) received a **best paper award at the AWWA's Annual Conference and Exposition**. The paper is titled "Granular activated carbon adsorption of perfluoroalkyl acids from ground and surface water."


Brina Montoya

Professor **Brina Montoya** and Post-Doctoral Scholar **Pegah Ghasemi** were awarded the **American Society of Civil Engineering's 2023 Collingwood Prize** for the paper "Field Implementation of Microbially Induced Calcium Carbonate Precipitation for Surface Erosion Reduction of a Coastal Plain Sandy Slope." The paper was published in the *Journal of Geotechnical and Geoenvironmental Engineering* in July 2022.

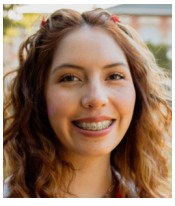

Pegah Ghasemi


Arjun Karthik Pandiarajan

Environmental engineering student **Arjun Karthik Pandiarajan** was among 40 students named to the 28th class of NC State **Park Scholars**. The Park Scholarships program selects students based on accomplishments and potential in scholarship, leadership, service and character. The program provides a four-year scholarship valued at approximately $117,000 for in-state students and approximately $215,000 for out-of-state students.


Manny Valbuena Peña

NC State Social Innovation and Entrepreneurship named environmental engineering student **Manny Valbuena Peña** and environmental engineering master's student **Vie Villafuerte** to its 2023-24 cohort of **Social Innovation Fellows** (SIF). The SIF program is a yearlong, team-based learning experience that enables NC State's social entrepreneurs and innovators to consider more fully their impact on humanity and the planet.


Vie Villafuerte

AWARDS & HONORS

Adam Schmidt

Ph.D. student **Adam Schmidt** was selected as a 2022-23 **Dwight David Eisenhower Graduate Fellow** by the U.S. Department of Transportation's U.S. Federal Highway Administration. He previously received the award for the 2021-22 academic year. The program awards fellowships to students pursuing degrees in transportation-related disciplines.

Savanna Smith

Ph.D. student **Savanna Smith**, advised by Glenn E. and Phyllis J. Futrell Distinguished Professor #2 **Francis de los Reyes**, was among six graduate students named **North Carolina Water Resources Research Institute Fellows**. Smith's project, titled "Development of an anaerobic digestion minimal microbial community and community resistance and resilience in response to perturbations," was funded by the NC Urban Water Consortium.

Emily Floess

Smith and Ph.D. student **Emily Floess**, advised by Associate Professor **Andy Grieshop**, were named to **NC State's Global One Health Academy's first cohort of Global One Health Fellows**. Six fellows were chosen out of more than 80 applicants across eight colleges. Each fellow received one year of support, including a $30,000 stipend, insurance coverage and tuition / fee remission.

Professor **Moe Pourghaz** and Distinguished Professor **Mohammed Gabr** and **Francisco Játiva** (Ph.D. 2022) and **Payam Hosseini** (Ph.D. 2022) were awarded the **2022 Best Paper Award from the ASCE Journal of Advances in Civil Engineering Materials** for their paper titled "Effects of MgSO4 on Calcium-Silicate-Hydrate," which was published in Volume 10, Issue 1, in 2021.

Alec Spano

Civil engineering student **Alec Spano** was selected for an **American Institute of Steel Construction (AISC) Education Foundation Scholarship**. He will be recognized in a future issue of AISC's magazine *Modern Steel Construction*. The purpose of the scholarship is to assist qualified students, and to encourage creativity, interest and proficiency in the fabricated structural steel construction industry.

Henry Ssembatya

Ph.D. student **Henry Ssembatya** was selected to join the 2023 **Kenan Institute for Engineering, Technology & Science Climate Leaders Program**. The program is designed to build strong partnerships among students, faculty mentors and internship hosts while working together to develop solutions for mitigating and adapting to climate change impacts. Ssembatya is advised by Jordan Kern from the Edward P. Fitts Department of Industrial and Systems Engineering.

Jack Turicek

Ph.D. student **Jack Turicek**, advised by Assistant Professor **Jason Patrick**, was selected for a 2023 **National Science Foundation (NSF) Graduate Research Fellowship**. The fellowship recognizes outstanding graduate students who are pursuing research-based master's and doctoral degrees in NSF-supported science, technology, engineering and mathematics disciplines. The main research the fellowship will support is Turicek's work on developing a synthetic material that replicates biological materials found in nature.

Elias Zauscher

Ph.D. student **Elias Zauscher**, advised by Professor **Emily Berglund**, was selected for the Spring 2023 **Richard L. Blanton Outstanding Capstone Award** from NC State's University Honors Program (UHP). This award recognizes exceptional work by UHP students and encourages the highest levels of undergraduate scholarship and research at NC State.

Zauscher also won first place in the **Undergraduate Student Technical Paper Competition** at the World Environmental and Water Resources Congress. The project is titled "Modeling Water Use Changes in a Hybrid Water System with Micro-Trading."▪

GRAD STUDENT SPOTLIGHT

Our research and teaching are only possible with the assistance of our nearly 300 graduate students. We shine a spotlight on a few students.

WILLIAM LUPTON

William Lupton is a third-year master of civil engineering student with a concentration in structures. He grew up in New Bern, North Carolina, and is advised by Professor **Mervyn Kowalsky**. Lupton is a hybrid student who started as a distance education student.

What influenced you to go into engineering?

LUPTON (L): My dad was my biggest influence to pursue engineering. He graduated from the mechanical engineering department, and I grew up watching and asking questions about what he did on a daily basis. Math and science were my favorite subjects in middle and high school, and I attended several NC State engineering camps growing up that exposed me to many of the different disciplines within engineering, so I knew engineering was for me.

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

L: NC State and the department are a great fit due to the combination of my classmates, professors and passion for engineering that I found while growing up and continuing to pull for the Wolfpack on the athletic fields. I received my bachelor's degree in civil engineering from NC State in the spring of 2021, and it was a no-brainer for me to stay at CCEE for my master's.

I attended my first NC State football game when I was 4 months old. Both of my parents went to NC State, and I have been a Wolfpack fan since I was born, so I've always known that I wanted to attend NC State.

Where do you see yourself in five years?

L: I see myself continuing to progress my career in industry working as a professional engineer. I've been able to gain full-time working experience in industry after completing my bachelor's degree while also working toward my master's degree. I hope to continue to learn from my coworkers and bosses and take on more design responsibility in the future.

GRAD STUDENT SPOTLIGHT

MICHAEL PEDRAZA

What influenced you to go into engineering?

PEDRAZA (P): Having an advanced degree has always been a goal of mine, so after 20 years in the industry, I took the plunge. Professor **Roberto Nuñez** opened my eyes to teaching by inviting me to speak to his undergraduate classes. He was a big driver in sparking my interest to come back, and I am hoping to use this to open some avenues into teaching at the college level once I obtain my degree. I am a licensed Professional Engineer and serve as a voting member on several professional committees with the American Concrete Institute and Post-tensioning Institute. My research is focused on the safety portion of CII research as we work to create a Manual of Standard Practice.

Going into engineering for a master's was an easy choice for my teaching goal. I chose a construction concentration because my undergraduate degree from NC State was a concentration in structural engineering, but I have spent my professional career in the construction realm.

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

P: NC State is a good fit because it is in Raleigh — where I live and work — and it is one of the best programs in the country. I really wanted to return to my alma mater, and thankfully the setup of the degree program is flexible enough for me to maintain my full time job.

Where did your passion for this particular focus come from?

P: I have always loved building things and have worked in the construction field for more than 20 years. My undergraduate degree focused on the design side more than construction, so I thought adding a concentration in construction would afford me the opportunity to improve personally and to position myself to better support the industry. As a manager, I have developed a passion for sharing my experience with others and helping them to become the best version of themselves. As much as I am excited to use what I learn professionally, I am inspired to use my degree to help the generations to come.

Michael Pedraza is a third-year master's student with a concentration in construction. He grew up in Goldsboro, North Carolina, and is advised by Professor **Ed Jaselskis**. Pedraza serves as a senior vice president for a concrete construction company based in Raleigh.

Where do you see yourself in five years?

P: In five years, I hope to use my degree to help my company advance and to have a teaching job to help support the growth of the next generation.

SOUMYA SHARMA

Soumya Sharma is a fifth-year Ph.D. student with a concentration in transportation systems. She grew up in Madhya Pradesh, India, and is advised by Professors **George List** and **Billy Williams**. Sharma is a member of the NC State Student Chapter of the Institute of Transportation Engineers, Women's Transportation Seminar, and previously worked as a Highway Safety Analyst for the Federal Highway Administration in conjunction with the UNC Highway Safety Research Center.

What influenced you to go into engineering?

SHARMA (S): I was always fascinated by the work of engineers and grew up in a family of engineers — my father is also a civil engineer. I like that the "final products" of civil engineers are often tangible; I find that very satisfying.

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

S: I am trying to study how emerging truck technologies such as driverless trucks, e-commerce deliveries etc. impact our transportation system. Gaining a better understanding of these impacts helps transportation engineers and planners better manage our cities and communities, while keeping up with the evolving needs of our digital world.

NC State was a great fit for me because the ongoing research projects were closely aligned to my areas of interest. I also felt that the university offered great infrastructure and resources that would help me as a Ph.D. student.

Where did your passion for this particular focus come from?

S: I got interested in the "big picture" of transportation while working on a project funded by the North Carolina Department of Transportation. I worked with a team to assess the impacts of connected and autonomous vehicles on the transportation system. This project opened me up to the world of transportation planning, and I found that there were many other aspects of technological advancements (such as e-commerce) whose impacts on transportation are still not fully understood. I found this research gap to be very motivating and based my dissertation on it.

Where do you see yourself in five years?

S: I am graduating this fall, and I have just started full time at AECOM, where I will be working as a transportation data scientist. I am excited for this new journey and look forward to helping shape communities through my work. In five years, I aspire to be in a leadership role, bridging the gap between technology advancements and infrastructure.

JETHRO SSENGONZI

What problem(s) are you trying to solve?

SSENGONZI (S): I work to improve electric grid infrastructure through the use of energy systems modeling, with particular emphasis on the implementation of renewable energy. My desire to go into engineering was driven by my fascination for how seemingly insignificant scientific principles/phenomena could be used to solve real-world problems. I particularly like solving infrastructural problems because I believe that resilient infrastructure allows people to be more effective in the workplace and have a higher quality of life.

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

S: The NC State CCEE department was a good fit for me due to the several opportunities available for interdisciplinary training and mentorship.

Where do you see yourself in five years?

S: In the future, I see myself working in some capacity as a research scientist or analyst on energy systems problems. ▪

Jethro Ssengonzi is a fourth-year civil engineering Ph.D. student with a concentration in computing and systems. He was named to the 2022 cohort of Energy Data Analytics Ph.D. Student Fellows at Duke University. Ssengonzi's research involves energy systems modeling with a focus on understanding the benefit of renewable energy sources to current and future regional electric grid reliability. His work addresses innovative infrastructure development to improve societal quality of life and efficiency in the workplace. He grew up in Cary, North Carolina, and is advised by Associate Professor **Jeremiah Johnson**.

STUDENT GROUPS

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

American Society of Civil Engineers (ASCE)

The NC State student chapter of the American Society of Civil Engineers (ASCE) traveled to University of California, San Diego, to compete in the 2023 Student Steel Bridge Competition National Finals after placing first in the 2023 ASCE Carolinas Student Symposium competition in April.

As part of the competition, teams were challenged to construct a prefabricated steel bridge in under 45 minutes with construction constraints such as a river that cannot be crossed, no members or tools touching the floor, and only six builders. Bridges were also load-tested, weighed, and judged on aesthetics.

The team included **Alec Spano**, **Anthony Rurka**, **Eric Skinner**, **Hunter Bowman**, **Jada Williams**, **Jordan Key**, **Cecilia Sánchez**, **Nick Angel**, **Allison Wray** and **Adam McLaine**. **Spano**, **Rurka**, **Skinner**, **Key**, **Sánchez** and **Angel** served as the builders.

Though more than 150 schools across the country participated in regional Steel Bridge Competitions, only 44 were invited to compete in the National Finals.

"It has been an amazing journey to watch our team grow not only in participation but in understanding," said **Hunter Bowman**, who served as the team's graduate advisor. "This year has been incredibly rewarding in all aspects, from design, to regionals, and finally to nationals. Everyone on the team has contributed to an environment with exceptional camaraderie. I cannot wait to see what new innovations and ideas we bring to the table for next year."

The NC State student chapter of ASCE at the 2023 ASCE Carolinas Student Symposium, top, and the 2023 Steel Bridge Competition National Finals, bottom

ASCE, American Concrete Institute (ACI), Earthquake Engineering Research Institute (EERI)

Walking across NC State's Brickyard anytime between March 26-31, you might have noticed a bizarre scene. Dozens of mini wooden shacks were spread across the brick walkway, adorned with spray-painted images of Mr. Wuf, nature scenes, greek lettering, student group names and more.

The unique annual event is called Shack-A-Thon, a fundraiser for Habitat for Humanity that challenges student organizations to build shacks and inhabit the shacks for 24 hours a day from March 27-31. Students even sleep in the shacks overnight.

This year, NC State's student chapters of ASCE, ACI and EERI were among dozens of student organizations that joined forces using construction and civil engineering skills to build a shack dubbed the "Civil Shack." The team sold homemade brownies and concrete coasters from the shack throughout the week to help raise money for Habitat for Humanity.

"Having the opportunity to lead this service project alongside ACI has allowed us to collectively expose our student members to the importance of service and giving back to the community through applying our engineering skills," said **Zoe Smith**, a civil engineering student who served as the team's Shack-A-thon leader. "Additionally, this project allowed us to revive the Civil Shack, where we

Member of the NC State student chapters of ASCE, ACI and EERI with the "Civil Shack"

could further develop a sense of community within the CCEE department."

A strong theme for the CCEE team in the shack construction process was sustainability. At the end of the week, the students deconstructed the shack in order to save the materials to use for next year's event.

American Concrete Institute (ACI)

Civil, construction and environmental engineers are known for creating big things — the infrastructure that surrounds us every day from skyscrapers to hospitals to wastewater systems to miles-long rail lines. But engineers are also known for tackling big challenges in little packages — in this case, a bowling ball.

Members of the NC State student chapter of ACI traveled to San Francisco in April to compete in the Student Fiber-Reinforced Concrete Bowling Ball Competition at the ACI Concrete Convention.

The teams were challenged to demonstrate the behavior of fiber reinforcement within concrete to gain experience in forming and fabricating a fiber-reinforced concrete element, and to encourage creativity in engineering design predictions and analysis testing.

Thirty-three teams from the United States, Canada, Mexico, Ecuador, Peru, Guatemala, Taiwan, the Philippines, India and Puerto Rico submitted projects for judging in this year's competition.

Teams were judged in two categories — bowling ball design prediction and bowling ball analysis test.

The NC State team, which included **Eleni Nakos**, **Josie Fisher**, **Andres Aguilar-Alvarez**, **Cole Flowers**, **Sam Valmassoi**, **Paul Acuna**, **Dawson Payne** and **Wil McTier**, spent two months planning the lightweight concrete design, figuring out what materials would be used and how much of each material would contribute to the design. One challenge was meeting the weight requirements for the competition. The team worked hard to gather materials, and civil engineering student **Sam Valmassoi** designed the 3D printed mold. Overall, the team's bowling balls were 0.1 pound off from the average required weight, and the diameter was 0.1 mm off the 200 mm mark for diameter requirements. The team placed 11th in the analysis category and 14th in the design category.

In addition to the bowling bowl competition, the conference gave students an opportunity to network with other universities and concrete companies from across the world. There were several seminars and committee meetings at the conference to help students, faculty, researchers and companies distribute new industry knowledge and push for better and safer concrete practices. The team also took the opportunity to explore San Francisco, where they traveled to Chinatown, Alcatraz Island and the Golden Gate Bridge.

"This was my first conference with ACI, and it was one of the most impactful events for my understanding of the concrete and the construction industry," said construction engineering student **Dawson Payne**. "There were people from across the world at the conference, which helped me expand my network with fellow ACI members with various backgrounds and employers. I hope to continue to be able to attend these major conferences to consistently broaden my knowledge and network." ▪

The NC State student chapter of ACI with their fiber-reinforced concrete bowling balls

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).

MIKE SURASKY

PE, PTOE (BSCE 1996, MCE 2000)

Surasky is the chief operating officer of LJB Inc. Based in Raleigh, North Carolina, he oversees operations for the growing nationwide civil and structural engineering consulting firm. With a technical foundation in transportation, traffic and infrastructure engineering, he is dedicated to propelling the industry forward and nurturing the growth of future leaders.

FARRELL NICHOLSON

PE, MBA (BSCE 2013)

Nicholson is a project manager at Wetherill Engineering in Raleigh, North Carolina. Her technical expertise is in roadway and hydraulic design. She currently serves on the American Council of Engineering Companies of North Carolina Junior Board of Directors.

JEFF WILLIAMS
PE (BSCE 2017)

Williams is a structural engineer at WSP USA in Charlotte, North Carolina. His technical expertise includes the design and analysis of post-tensioned concrete, reinforced concrete, structural steel, aluminum, cold-formed steel, masonry, light-framed wood, heavy timber and mass timber. Williams has experience with new construction, forensic engineering analysis and building retrofits. He is also part of the Society of Professional Rope Access Technicians team, which performs structural inspections while rappelling.

HAIBO ZHAI
(Ph.D. 2008)

Zhai is a Roy & Caryl Cline Distinguished Chair in Engineering at the University of Wyoming. He was recently promoted to a full professor in environmental engineering. His research promotes a long-term vision for the role of both technology and policy to cope with complex energy, environmental and natural resource challenges. He is an internationally recognized scholar in carbon capture and sequestration and the energy-water nexus, especially under carbon constraints for climate change mitigation.

ALUMNI BRIEFS

Ian Andres (BSCE 2020) was promoted to director of business development for the Charlotte, North Carolina, division at ARCO Design / Build. He previously served as design / build manager.

Drake Brinkley (BSCE 2002) was recently appointed to the NC State Engineering Foundation Board of Directors. Brinkley works as an attorney at Ward and Smith's Greenville Office.

Walter Hammond (BSENE 1997) was named executive vice president and chief operating officer of Klaussner Home Furnishings. Hammond has more than 25 years of experience in the manufacturing sector.

Kent Jackson (BSCE Construction Option 1990) was promoted to assistant town manager/engineering director for the Town of Pittsboro, North Carolina. Jackson has more than two decades of government experience, focusing on development services, public works and transportation.

Randall Morrison (MCE 2010) was named director of Fresno, California's Capital Projects Department. Morrison has worked for the city for 19 years, most recently as assistant director of the Public Works Department.

Terry Snow (BSCE 1988) was tapped to be vice president and business unit leader, South Carolina at STV. Snow has more than 35 years of experience developing business strategy at the national, regional and local levels.

Adam Steurer (BSENE 2015) was named utilities director of Hendersonville, North Carolina's Water and Sewer Department. Steurer has served as the department's utilities engineer since 2017, designing and managing utility capital improvement projects, assisting with utility strategic planning, and supporting internal utility personnel with technical operations and maintenance activities.

Chris Tester (BSCON 2000) was named the permanent public works director for Salisbury, North Carolina. He previously served as interim director. He will manage a $9 million municipal budget and supervise nearly 100 employees who maintain city-owned roadways, cemeteries and telecommunications systems, in addition to maintaining the city's fleet of vehicles and buildings.

Bobby Walston (BSCE 1990) received the Exemplary Service Award from the National Association of State Aviation Officials. Walston, who serves as director of the North Carolina Department of Transportation's Division of Aviation, has worked in the aviation industry for 33 years.

Whit Wheeler (BSCE 1992, MSCE 1994) was named director of Raleigh Water. Wheeler, who has 28 years of experience in private engineering consultancy and the government utility industry, had served as the interim director of Raleigh Water since Jan. 1, 2022.

Meade Willis (BSCE 2007, MSCE 2009) was selected as a member of *Triad Business Journal*'s 2023 Class of 40 Under 40. Willis serves as principal of Select Engineering in Greensboro, NC.

SHARE YOUR NEWS

There are thousands of alumni of the Department of Civil, Construction, and Environmental Engineering working throughout the nation and around the globe. We invite you to provide us with updates about career accomplishments, awards or recognitions, as well as other news. We aspire to create a community of alumni who remain connected to the department and to each other. We also want to keep your contact info current so we can keep you up to date on department events. Send your information to **Taylor Wanbaugh** at **twanbau@ncsu.edu**.

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

We invite you to connect with us on social media to keep up with the latest news.

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How Your Support Makes A Difference

Top: S. James Ellen Distinguished Professor **Detlef Knappe** works with graduate and postdoctoral students in his lab.

Bottom: Assistant Professor **Katherine Anarde** works with a student in the Hydraulics Laboratory.

Photos by Marc Hall.

ENDOWED FACULTY SUPPORT

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

ENDOWED GRADUATE FELLOWSHIPS AND AWARDS

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

ENDOWED UNDERGRADUATE SCHOLARSHIPS

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

CCEE ENHANCEMENT FUND

A regular gift to the CCEE Enhancement Fund makes it possible to provide students the best possible education and extracurricular experiences. The enhancement fund allows us to respond to emerging needs and exciting challenges.

For example, in 2020 we deployed teams to the field for time sensitive monitoring of SARS-CoV-2 before external funding was available. Your support enables recruitment and retention of the best and brightest faculty and students, support for our student organizations, field trips to complement classroom instruction and opportunities for faculty and students to present at conferences. Our enhancement fund is critical to the department as we strive to continue to provide opportunities for students and faculty.

RECOGNIZING OUR CORPORATE SPONSORS

Our corporate sponsors may opt to provide support for specific research areas, enabling faculty members to pursue a new research idea. Sponsorships are also available for this newsletter, the welcome back ice cream each fall and our graduate symposia. These symposia allow students to prepare a poster to describe their research and make a presentation to the local engineering community. The activities of our student groups are also dependent on external financial support.

The **Firm of the Month** program recognizes corporate partners who have made an ongoing commitment to the department. It allows us to thank and promote our partners while educating our students about current engineering practice. Our new large monitors in Fitts-Woolard Hall provide opportunities for firms to display information highlighting notable projects and other information. The Firm of the Month program provides participating firms with name recognition for recruiting and business opportunities, demonstrates to students the ways in which they can use their degrees, and provides information on employment opportunities. ▪

2023 CORPORATE DONORS

The firms listed here have provided endowments or made contributions from January 2023 through the end of August 2023. Many on the list have supported multiple activities in the department. We would like to extend our sincere appreciation.

ARCO Design/Build SE, LLC
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Pope Custom Homes, Inc
Precision Plumbing, Inc.
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Wet Waste Management, LLC
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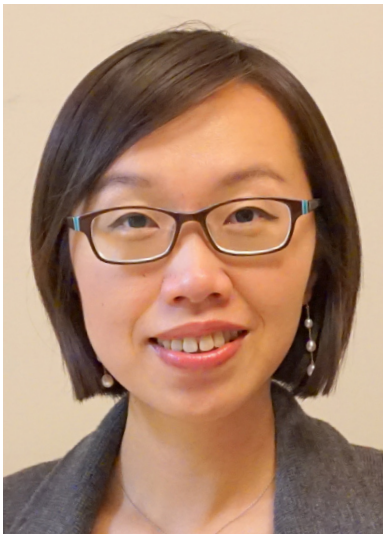
WithersRavenel, Inc.

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

CCEE NEW FACULTY MEMBERS



Danjue Chen

Danjue Chen, associate professor, received her Ph.D. from the Georgia Institute of Technology in 2012 and B.S. from Peking University in Beijing in 2007.

Chen's expertise lies in traffic science and transportation engineering. Her research interests include testing, modeling and control of connected and automated vehicles; traffic flow theory; human-cyber-physical-system of smart vehicles; and smart cities. Chen is a founding member of the Transportation Research Board subcommittee on "traffic flow modeling for connected and automated vehicles." She received the National Science Foundation CAREER award in 2020.

Jessica Kaminsky

Jessica Kaminsky, professor, received her B.S. in civil engineering from Rice University in Houston. She received her Ph.D. in civil engineering from the University of Colorado Boulder. Prior to joining CCEE, she was an associate professor at the University of Washington.

Kaminsky studies the social sustainability of infrastructure. Presently, her work is focused on the decarbonization of infrastructure. Kaminsky also studies infrastructure systems in lower and middle income contexts, with a particular interest in water, sanitation and hygiene infrastructure.

Jacelyn Rice-Boayue

Jacelyn Rice-Boayue, assistant professor, completed postdoctoral training at Duke University in Durham, North Carolina, within the Center for the Environmental Implications of Nanotechnology. During that time, she also served as a Fulbright Scholar at the International Institute of Water and Environmental Engineering in Burkina Faso, where she researched and taught courses in the water and sanitation program. She earned her B.S. in civil engineering from the University of Nevada, Las Vegas, and M.S. and Ph.D. in civil, sustainable and environmental engineering from Arizona State University in Tempe, Arizona. Prior to joining CCEE, she was an assistant professor at the University of North Carolina at Charlotte.

Her research group aims to provide new understanding and solutions to foster sustainable water resource management. Rice-Boayue's research combines modeling, analytical and social science capabilities to examine water quality, environmental health and contaminants, and environmental justice. Much of her work focuses on environmental and human health exposures to wastewater-derived emerging contaminants through model-informed surveillance and field studies.

Ange-Therese Akono

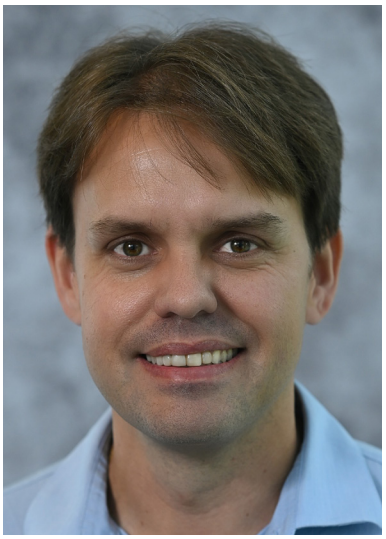
Ange-Therese Akono, associate professor, received a Diplome D'Ingenieur from the Ecole Polytechnique in Palaiseau, France. She received an M.Sc. and a Ph.D. in civil and environmental engineering from the Massachusetts Institute of Technology in Boston. Prior to joining CCEE, she held faculty appointments at University of Illinois Urbana-Champaign and Northwestern University.

Presently, she studies fracture processes in multifunctional, multiscale and multi-physics materials while focusing on small length-scales. In terms of energy science and engineering, she investigates sustainable energy resources such as unconventional resource production, geologic storage of carbon dioxide and clean energy. In terms of construction materials, she studies novel ways to reduce the carbon footprint of the cement industry by using nanomaterials, recycling concrete, or discovering low-embodied energy cement-free binders. Another topic is the study of biomaterials for bone regenerative engineering.

Akono has received several awards including the Johnson & Johnson Women in STEM 2D Award in 2022, the American Society of Civil Engineers (ASCE) Leonardo da Vinci Award in 2021, the Royal Society International Exchange Scheme Award in 2019 and the ASCE New Faces of Civil Engineering Professionals Award in 2016.

Anderson R. de Queiroz, associate professor, received his B.Sc. in 2005 and M.Sc. in 2007 in electrical engineering from Federal University of Itajubá (UNIFEI) in the state of Minas Gerais in Brazil. He has a Ph.D. in operations research from the University of Texas at Austin (2011). He is a member of the computing & systems group and NC State's Operations Research graduate program.

Prior to joining NC State, he worked as a professor at UNIFEI and at North Carolina Central University in Durham, North Carolina, as a consultant and as a researcher for more than a decade. He is interested in the synergy of data and computational innovation to inform strategic decision-making. He focuses on optimization under uncertainty, data-driven methods and predictive analytics applied to planning, operations and economics in clean and sustainable energy systems, water-energy nexus, coastal engineering and biosecurity.



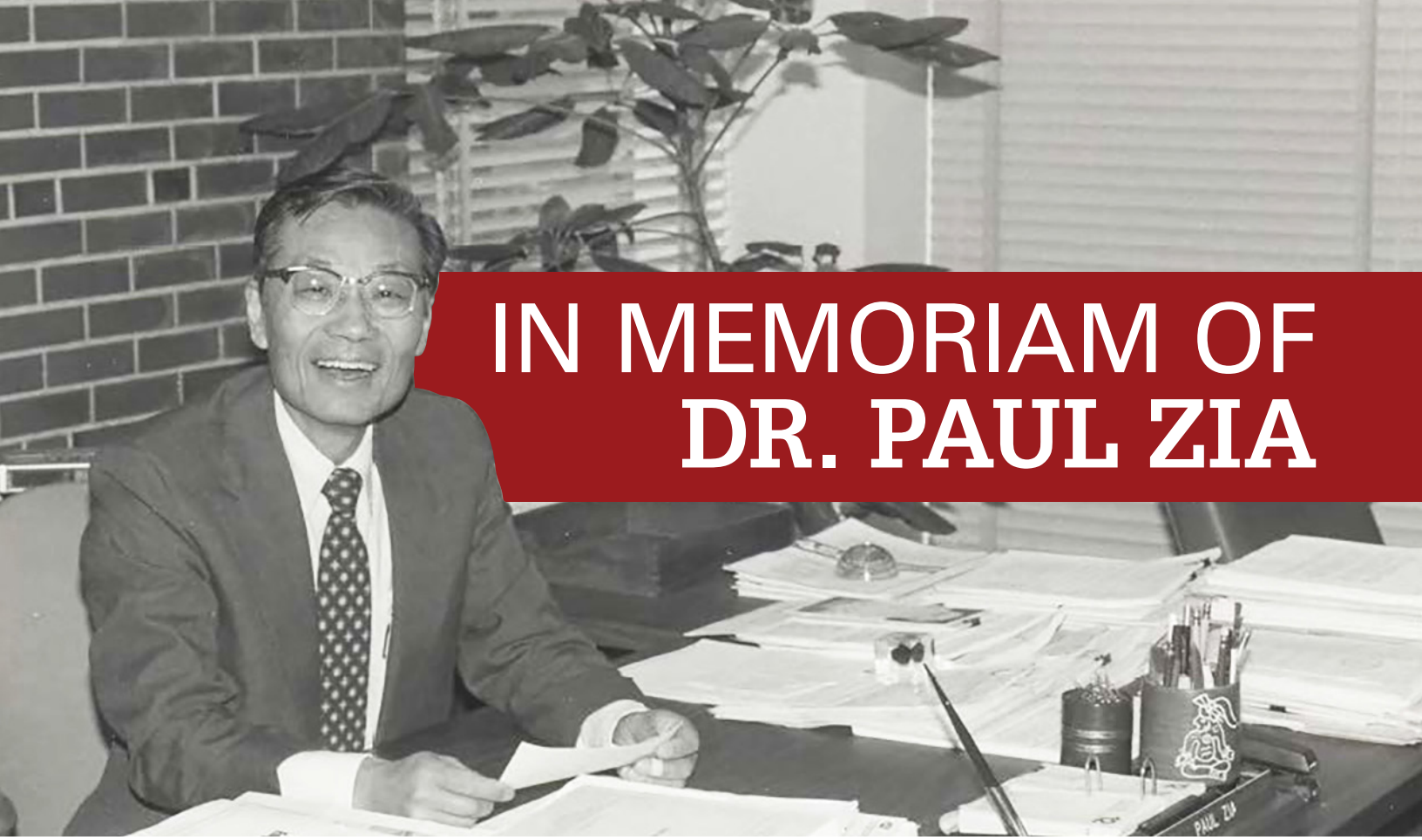
Anderson R. de Queiroz

Jorge E. San Juan

Jorge E. San Juan, assistant professor, earned a B.S. in civil engineering from the Universidad de Cartagena in Cartagena, Colombia. He then received an M.S. and Ph.D. in civil and environmental engineering from the University of Illinois Urbana-Champaign at the Ven Te Chow Hydrosystems Lab. San Juan was a postdoctoral associate at the University of Minnesota Twin Cities in the Department of Civil, Environmental, and Geoengineering at the St. Anthony Falls Lab.

His research interests focus on the physical and engineering role of coastal ecosystems altering water currents, sediment transport and the geomorphological evolution of coasts. San Juan investigates the impact of vegetation on waves and currents and its effect on sediment transport. He has recently worked on mud erosion mechanisms driven by water salinity changes.

For more in-depth profiles of each faculty member, visit ***ccee.ncsu.edu***. ▪



IN MEMORIAM OF DR. PAUL ZIA

Educator, Researcher, Practitioner and Mentor. These are all words that have been used to describe **Paul Zia**, a Distinguished University Professor Emeritus of Civil Engineering and Alumni Distinguished Graduate Professor Emeritus in the Department of Civil, Construction, and Environmental Engineering at North Carolina State University. For more than 50 years, he was engaged in teaching, research and consulting in many areas of concrete materials, reinforced and prestressed concrete structures, and construction.

Zia passed away on August 16, 2023, at 97 years old. He inspired countless students and academic peers, advising more than 60 master's and doctoral students during his tenure at NC State.

Zia's legacy extends far beyond the boundaries of the university: He made outstanding contributions to the civil engineering profession, as well as the concrete and structural engineering fields.

Zia was born in Changzhou, China, in 1926, and moved to the U.S. in 1949 after earning a B.S. in civil engineering from the National Chiao-Tung University in Shanghai. Zia joined consulting engineering firm Lakeland Engineering Associates (LEA) in Florida in 1951 as a summer intern. He earned his Master of Science degree in civil engineering from the University of Washington, returning to LEA as a full-time employee in 1953 to help launch Lakeland Engineering Associates Prestressing (LEAP), which specialized in engineering, consulting and development for the brand new prestressed concrete industry. He was one of the first professional members of the Precast/Prestressed Concrete Institute (PCI) and helped to launch the *PCI Journal* in 1956, shortly after taking a position at the University of Florida to pursue his doctorate, start academic research on prestressed concrete, and work as an engineering instructor.

Zia joined NC State as an associate professor in 1961 and helped shape CCEE into one of the top civil engineering programs in the country. He became department head in 1979 and a distinguished university professor in 1989. Even after his retirement in 1996, Zia remained extremely active in the department, He continued to visit the CFL to collaborate on projects and was engaged in research discussions in the past six months.

Zia was a registered professional engineer in North Carolina and an honorary member of both the American Concrete Institute (ACI) and the American Society of Civil Engineers (ASCE), and a Fellow of PCI. He served as chairman and member of many technical and administrative committees of these organizations, including a term as president of ACI in 1989-90. He conducted sponsored research on many aspects of prestressed and reinforced

concrete, including torsion and shear, bond and development length, loss of prestress, applications of high performance and high strength concrete, self-consolidating concrete, jointless bridge deck, and cracking in large prestressed concrete girders. His studies also included fatigue strength of cracked prestressed concrete girders, assessment of high performance concrete bridges, development of a non-destructive test method for measuring air permeability of concrete, the use of self-consolidating concrete in highway structures, and application of corrosion-resistant high-strength MMFX steel for concrete structures.

For his achievements in teaching, research and professional activities, Zia received numerous honors and awards including election to the prestigious National Academy of Engineering (1983); NC State Alcoa Foundation Distinguished Engineering Research Award (1978-80); University of Florida Distinguished Alumnus Award (1983); ASEE Lamme Medal (1986); and NC State Alexander Quarles Holladay Medal of Excellence (1993), the highest honor bestowed on a faculty member by the NC State Board of Trustees. In 1999, the National Park Service presented him the Citizen's Award for Exceptional Service in recognition of his role as an adviser and consultant for the relocation of Cape Hatteras Lighthouse. In 2004, he was honored by PCI with the Distinguished Educator of the Year Award.

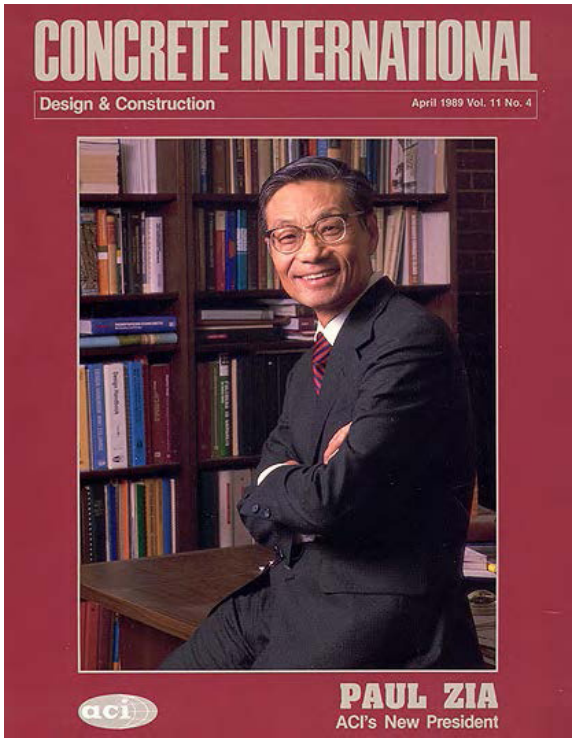
One of Zia's most-notable accomplishments was the construction and implementation of NC State's Constructed Facilities Lab (CFL), a large-scale structural engineering laboratory. The CFL enables faculty and students to perform advanced research and testing of construction materials, structural systems and processes that enhance the sustainability and economy of civil infrastructure through innovation and vision.

Sami Rizkalla, a Distinguished Professor Emeritus of Civil Engineering and Construction, said he remembers Zia discussing his dream to build a research facility for large-scale testing back when Rizkalla was his student.

"I think I left with this kind of vision he had. When I came back [to teach],it was achieved and the Constructed Facilities Lab was built."

The CFL, a joint investment by the National Science Foundation and the State of North Carolina, was established in 1996 and was one of the first facilities of its kind in the U.S.

When U.S. Secretary of Transportation Pete Buttigieg visited the CFL in 2021, he marveled at students and faculty showing infrastructure-related research and development at the facility, saying, "What we just saw at NC State is a great example of how private sector, academic and public sector interact," according to *The News & Observer*.



Alongside pioneering new research in many aspects of prestressed and reinforced concrete, Zia was also known for his warm personality, outstanding mentorship and teaching, and personal touch when it came to helping others.

"He was a very beautiful, sincere person, and very unique in terms of dealing with people and enjoying their success," Rizkalla said. "So he helped people to succeed and watched their success with joy which is, I think, a model of a professor. And he was also a model as an engineer with his technical ability. I will always have him as a model for my life, and that's how he affected my career."

"One of the best features of Dr. Zia was his ability to listen," said **Greg Lucier**, associate research professor and CFL manager, and a former student of Zia. "He didn't just assume that his vast knowledge is superior to everyone else. Most of the time it is — but he was very careful to listen to everyone and listen very sincerely and earnestly to those he was working with."

Zia always emphasized the importance of the fundamentals of engineering and to approach each problem with a sense of humanity.

"The message I can leave for future generations — I want to emphasize that I hope they will stick to the fundamentals and of course, at the same time, be aware that just technology alone is not going to be sufficient in the future," Zia said. "They have to be well-versed on the humanity side, particularly in the understanding of a global situation. The practice of civil engineering will continue to evolve."

For a longer version of this story, visit ***ccee.ncsu.edu***. ▪

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