MARYLAND CIVIL AND ENVIRONMENTAL ENGINEERING | **FALL 2022**

CIVIL REMARKS

Greener and Cleaner

UMD Civil and Environmental Engineers Help Foster Sustainable, Equitable Development

DEAR FRIENDS,

As I begin my tenure as chair of the University of Maryland's (UMD) civil and environmental engineering (CEE) department, it is with a sense of excitement about the road ahead. This is a department with well-established strengths, and also one that embraces transformation. I am deeply honored to have been given the opportunity to work with the dedicated faculty who are the drivers of institutional success. Together, we will accomplish great things! I would also like to express my deepest gratitude and appreciation to Professor Alba Torrents, who has served ably as interim chair of the department during the search process.

CEE at UMD is known for expertise in many different areas, from transportation engineering to water resource management and disaster resilience. This issue of *Civil Remarks* focuses on a particular area of impactful research at the department, namely research that works to address sustainability challenges, especially within the context of climate change. These are not abstract problems of concern only to denizens of the ivory tower: their impact is tangible, affecting everything from sanitation to the ways we get around.

CEE Assistant Professor Guangbin Lin, for instance, is helping to tackle the environmental impacts of burgeoning food waste, with research that explores methods of converting such waste into clean energy—thus simultaneously addressing the problems of overclogged landfills and the need for eco-friendlier fuels.

The RISE Lab, under the direction of Dr. Michelle Bensi, is conducting research to identify and prioritize sources of uncertainty and the incorporation of new probabilistic risk assessment tools with applications that include energy, flooding, and the impact of COVID-19 on marginalized communities. Dr. Bensi has secured significant support from the Nuclear Regulatory Commission, the Department of Energy, and the National Science Foundation.

We also highlight the work of Professors Ahmet Aydilek and Allen Davis, who have been conducting rigorous research designed to assess the effectiveness of "green infrastructure" techniques, including use of filter strips, green roofs, and vegetated swales, in mitigating the hazards posed by highway runoff. Professor Davis, in addition, is among this year's recipients of UMD's Distinguished Scholar-Teacher Award, a prestigious recognition given by the university in honor of excellence in research and pedagogy.

We hope you find this snapshot of ongoing research at our department both informative and inspiring, and that you will also enjoy the other news stories and features contained in this issue, including our student and alumni spotlights. They convey the energy of a department that attracts those with a vision—and with the determination to apply engineering skills to making vision a reality.

Best regards,

Nii Attoh-Okine
PROFESSOR AND CHAIR
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

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CIVILREMARKS

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Please send letters to the editor and alumni notes to ceenewsletter@umd.edu.

Greener and Cleaner

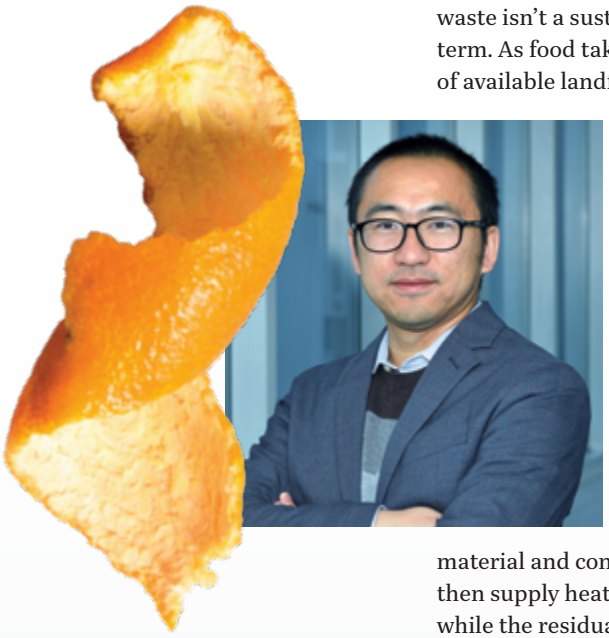
WITH CLIMATE CHANGE, ENVIRONMENTAL DESTRUCTION, AND RESOURCE DEPLETION RAISING SERIOUS CONCERNS ABOUT THE LONG-TERM SUSTAINABILITY OF HUMAN SOCIETIES, ENGINEERS HAVE A CRITICAL ROLE TO PLAY. AT UMD'S CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT, RESEARCHERS ARE HELPING TO DEVELOP PRACTICAL SOLUTIONS THAT COULD HELP BRING ABOUT A GREENER FUTURE. IN THIS ISSUE OF CIVIL REMARKS, WE HIGHLIGHT SOME OF THE TRANSFORMATIVE WORK BEING DONE BY RESEARCHERS AT THE DEPARTMENT.

Assistant Professor Guangbin Li is working to finesse methods of converting food waste into fuel into biogas, thus addressing two problems at once: the need to relieve our cluttered landfills and the need for clean energy. Meanwhile, Professor Bilal Ayyub is collaborating with ASCE and NOAA to help promote climate-resilient approaches to design and construction, while Assistant Professor Michelle (Shelby) Bensi utilizes advanced probabilistic risk assessment tools to ensure the resilience of critical infrastructure. Finally, Professors Ahmet Aydilek and Allen P. Davis are conducting rigorous research into the efficacy of "green infrastructure" solutions designed to mitigate the environmental hazards presented by highways and other forms of transportation infrastructure.

(CONT. ON PAGE 2)

An Eco-Friendly Alternative for Food Disposal

AMERICANS DISCARD ABOUT 103 MILLION TONS OF FOOD ANNUALLY, ACCORDING TO THE ENVIRONMENTAL PROTECTION AGENCY (EPA), AND MUCH OF THAT TOSSED-OUT FOOD ENDS UP IN LANDFILLS. INDEED, FOOD WASTE ACCOUNTS FOR NEARLY A QUARTER OF ALL LANDFILL USE IN THE UNITED STATES. THE MOUNTING ENVIRONMENTAL HAZARD HAS PROMPTED GUANGBIN LI, ASSISTANT PROFESSOR OF CIVIL AND ENVIRONMENTAL ENGINEERING, TO EXPLORE POSSIBLE ALTERNATIVE METHODS OF MANAGING WASTE.



"Relying on landfills to store food waste isn't a sustainable solution over the long term."

As Li explains, relying on landfills to store food waste isn't a sustainable solution over the long term. As food takes up larger and larger swaths of available landfill, there's less room for other types of waste. Even more troublingly, the food waste rots in the landfill and emits both odorous and greenhouse gases, thus contributing to environmental health problems and global warming.

Instead of shipping it off to a landfill, the waste can instead be sent to an anaerobic digestion reactor, where bacteria are used to break down the organic material and convert it into biogas, which can then supply heat, electricity, and vehicle fuel, while the residual solids and liquids left over after digestion are rich in nutrients and organic matter and can be reused as fertilizer or soil amendments. Organic components from the waste can also be used as a sustainable carbon source by wastewater treatment facilities to promote biological nutrient removal processes, such as via denitrification and phosphorus-accumulating organisms.

"The goal is to transition away from landfill management to something that is more beneficial to society," Li said. "We take food waste out of the traditional solid waste management system, and we put it into a reactor and convert it into a renewable energy source and a carbon source, and then we can use it for different purposes."

There's a hitch, though. Food waste often comes mixed in with grease and other substances that must be removed or converted to easily biodegradable compounds before the waste can be converted. Li and his students are currently tackling this phase of the process.

"We are starting with providing a pretreatment process designed to break down difficult organic fractions into easier organic fractions, so that when they enter the anaerobic digestion facility, they can be converted more quickly and easily," Li explained. "Because we remove these challenging substances during the pretreatment process, the subsequent anaerobic digestion can take place more quickly and easily."

The team's work could ultimately foster widespread adoption of alternative methods of food waste management. The EPA and the United States Department of Agriculture (USDA) have long expressed concern about the mounting pile-up of food waste, and both agencies are encouraging states and localities to pursue other avenues. The potential benefits, after all, are multiple—biogas as a source of clean energy, carbon for wastewater treatment, and a reduced threat to the climate.

It could also mitigate problems of environmental justice associated with building new landfills, Li said. Because more affluent communities resist being chosen as the site for a new landfill, such facilities tend to be built in lower-income areas whose residents lack the political power to raise an objection.

"No one wants one built in their neighborhood," he said. "It's important to increase the lifespan of existing landfills, while also reining in greenhouse gases."

Li heads the Nutrient-Energy-Smart (N.E.S.) Lab, working with students to develop and implement innovative solutions for protecting the environment. He joined the Maryland Engineering faculty in 2019.

UMD Professor Bilal Ayyub moderated a NOAA session, "Building Better Together: Partnerships to Advance Climate Resilience," at the UN Climate Change Conference (COP26) in Glasgow, in coordination with the US Department of State.

Advancing Climate-Smart Construction

UMD'S BILAL AYYUB WORKS TO TRANSFORM INFRASTRUCTURE ENGINEERING PRACTICES TO TAKE INTO ACCOUNT THE RISKS POSED BY CLIMATE CHANGE.

PHOTO: THAI NGUYEN

The world is changing. Practices that ensured bridge or building safety a hundred years ago won't necessarily hold steady today, given more frequent weather events, rising sea levels, and other hazards. The largest and most influential national organization in civil engineering—the American Society of Civil Engineers (ASCE) has been working to move the profession to the leading edge of needed change.

In 2018, for example, it released a Manual of Practice on climate-resilient design, with UMD Professor Bilal Ayyub as the editor. Now ASCE has joined forces with NOAA to help advance climate-smart engineering, with Ayyub again playing a key role. Ayyub, who directs the UMD Center for Technology and Systems Management, is facilitating a series of exchanges between NOAA and ASCE.

Their purpose: to define the needs of the engineering and standard-setting community, while also clarifying the extent to which NOAA can provide the data and future weather and climate projections that are needed to update and refine codes and standards.

Awareness of the importance of climate resilience is growing among the community involved in siting, design, and construction of the built environment, Ayyub said. Yet challenges remain.

"Chief among these is the well-documented gap between current understanding of the evolution of the probability of weather and climate extremes and engineering practice," he said.

Added CTSM associate director Dan Walker: "The lack of appropriate incorporation of information about future weather and climate in the various standards and associated building codes is a significant challenge, even for the well-informed civil engineer."

The partnership kicked off in conjunction with the 26th United Nations Climate Change Conference of the Parties (COP26) in Glasgow, held in late 2021. Ayyub moderated, and NOAA hosted, a virtual panel discussion at COP26 titled "Building Better Together: Partnerships to Advance Climate Resilience."

> "Society wants and needs solutions to the world's grand challenges like climate change; engineers will play a central role in every solution."

UMD's RISE Lab Fosters Advances in Hazard Assessment

With extreme weather events increasing in frequency or severity, ensuring that nuclear power plants and other facilities and infrastructure are climate-resilient depends on being able to accurately quantify the risks these systems face. UMD Assistant Professor Michelle (Shelby) Bensi and her team at the UMD Risk-Informed Solutions in Engineering (RISE) Laboratory apply advanced probabilistic risk assessment tools, including the utilization of statistics and machine learning, to a wide spectrum of potential risks, including earthquakes, inland flooding, precipitation, storm surge, and compound hazards. An important part of their work is the development of a common framework that can be used across different hazard types. Notes Bensi: "There's currently a great deal of compartmentalization, with little interaction among experts on different hazard types. Since catastrophic events often involve more than one kind of hazard, we need to collaborate."

3MT

THE UNIVERSITY OF MARYLAND GRADUATE SCHOOL RECENTLY ANNOUNCED SIX CAMPUS-WIDE WINNERS OF THE 2022 THREE-MINUTE THESIS COMPETITION (3MT), AN INTERNATIONAL COMPETITION WHERE STUDENTS ARE CHALLENGED TO EXPLAIN THEIR RESEARCH IN JUST THREE MINUTES. AMANDA O'SHAUGHNESSY, A CIVIL AND ENVIRONMENTAL ENGINEERING (CEE) MASTER'S STUDENT, WAS NAMED A WINNER OF THE 3MT COMPETITION FOR HER RESEARCH ON TRANSPORTATION EMBANKMENTS. HER ADVISORS ARE CEE PROFESSORS AHMET AYDILEK AND ALLEN P. DAVIS.

O'Shaughnessy's presentation, titled, *When Roads Want to be Dams: Looking to Dam Safety to Regulate Transportation Embankments*, emphasizes the significance of being able to develop engineering solutions to address transportation systems.

"In civil engineering, the research we are doing impacts everyone," said O'Shaughnessy. "From the road you drive on to the water quality in the Chesapeake Bay, it's important to make sure that engineering is done using the newest, best practices, and communication is the only way to ensure that happens."

Indeed, O'Shaughnessy's 3MT demonstrates the importance of using best practices when developing transportation embankments. She explains that when roads cross rivers or streams, a culvert is placed into a transportation embankment to allow for the passing of water. Engineers use past weather data to determine how much water each culvert needs to be able to pass.

However, many existing culverts are not able to handle the rising amounts of water due to climate change and increased precipitation. In these cases, transportation embankments may consequently act as dams to hold back the pooling water. Though, if these water forces are too strong, they could cause embankment breakage and road damage. This damage is similar to a dam breakage and have led to several cases of roads failing.

"There is a new player in the game when it comes to dam safety: transportation embankments," says O'Shaughnessy.

UMD civil and engineering M.S. student Liang Liang (now graduated) takes a core sample of soil and compost from a Vegetative Compost Blanket (VCB) during a pre-installation assessment on MD Route 32 near its intersection with Interstate 95 in Howard County, Maryland. VCBs are being studied as a Stormwater Control Measure (SCM) with the potential to reduce and clean polluted highway stormwater runoff.

PHOTO BY ERICA FORGIONE

Realizing the Promise of Green Infrastructure

RESEARCH BY UMD CIVIL AND ENVIRONMENTAL PROFESSORS AHMET AYDILEK AND ALLEN P. DAVIS CENTERS ON REINING IN STORMWATER-RELATED HAZARDS THROUGH THE USE OF VEGETATION AND COMPOST.

Interest in "green infrastructure" solutions—including bioretention, vegetated swales and filter strips, stormwater wetlands, and green roofs—has burgeoned in recent years because of their potential to rein in stormwater volume and reduce the flow of pollutants.

With water quality and the survival of marine species in estuaries like Maryland's Chesapeake Bay at stake, the urgency is high. The nation's busy transportation infrastructure generates toxic compounds such as heavy metals; these seep into stormwater along with fertilizers, herbicides, insecticides, PCBs and other pollutants.

Green infrastructure "not only provides stormwater benefits but may offer other benefits that can be quantified as well, including ecological habitats, social benefits from green space,

O'Shaughnessy is conducting research to find engineering solutions to this challenge, including using dam safety elements to regulate transportation embankments. First, O'Shaughnessy gained an overall picture of how states currently deal with embankments and stormwater. Her approach included a policy review to demonstrate that embankment breakage is a hazard, analyze culvert designs, and determine how different states define what a dam is. She also performed a literature review and found that impounded water hasn't been heavily considered when designing transportation embankments.

After her initial research, O'Shaughnessy used geotechnical modeling to look at water levels, seepage, and water pressure to see what would happen to embankments in worst-case scenarios. She wanted to see if aspects of dam safety should be applied to transportation embankments and if so, what could be applied.

"This project has helped me think about the broader impacts of the research. How do we tackle the problem of updating our infrastructure? How do we make sure it's safe given the changing climate? We want to make sure these systems are safe because we use them every day," she said.

O'Shaughnessy used her presentation skills in the 3MT competition to communicate her groundbreaking research on transportation regulation to a wider audience.

and reduction in heat island effects," notes Professor Allen Davis of UMD's civil and engineering department. Davis and a fellow UMD faculty member, Ahmet Aydilek, have teamed up to lead a series of studies aimed at yielding greater insight and recommending specific approaches.

Though the prospects are appealing, green approaches to highway infrastructure must be implemented with care, lest they inadvertently cause harm instead of good. For example, while compost and biochars can be used to promote growth of vegetation, it can also cause leaching of nutrients. "Research on best practices is needed," Aydilek said. "Environmental, geotechnical, and other properties must be considered for beneficial use of these materials."

Assisted by many graduate and undergraduate students, the two researchers have honed in on several specific questions associated with these emerging approaches. In two studies funded by the Maryland Department of Transportation—State Highway Administration, for example, they compared different compost types—specifically, biosolids and greenwaste—to determine the respective benefits in terms of vegetation growth and reduction in nutrient runoff.

Other projects undertaken by the team have focused on the factors—such as water infiltration and retention—that affect vegetation growth, and on quantifying improvements in vegetative establishment, stormwater volume reduction, and roadside soil quality as a result of using compost, biochars, and soil amendments. One of Aydilek's and Davis's newest projects centers on the beneficial use of sediment dredged from Baltimore Harbor as a form of green infrastructure, in ways similar to the use of compost.

Although much of their work centers on Maryland, the team also conducts research funded by other state agencies, including in Iowa and Minnesota, and has partnered with researchers at other state universities. In one project, for example, Aydilek and Davis are collaborating with Prof. Bora Cetin of Michigan State University to evaluate proprietary soil amendments for the Minnesota Department of Transportation. The study includes field tests at the MnRoad facility—one of the largest outdoor pavement research laboratories in the world.

Collaborators closer to home include Gary Felton of the UMD Department of Environmental Science and Technology (ENST), John Lea-Cox of the UMD Department of Plant Sciences and Landscape Architecture, and Andrew Ristvey of UMD Department of Extension.

New Challenges Changing Field

CIVIL AND ENVIRONMENTAL ENGINEERS HAVE CONTRIBUTIONS TO MAKE IN SECURING INFRASTRUCTURE, ADAPTING TO CLIMATE CHANGE, AND ADDRESSING PROBLEMS OF EQUITY AND INJUSTICE, SAYS THE NEW UMD CHAIR OF CIVIL AND ENVIRONMENTAL ENGINEERING, NII O. ATTOH-OKINE.

PHOTO: ALAN P. SANTOS

Dr. Nii O. Attoh-Okine became the A. James Clark School of Engineering's new chair for civil and environmental engineering on September 1, 2022. A Fellow of the American Society of Civil Engineers (ASCE), he previously held joint appointments at the University of Delaware (UD) in civil and environmental engineering and in electrical and computer engineering. He also served as academic director of UD's Interim Cybersecurity Initiative.

Attoh-Okine's research expertise is in resilient infrastructure, with a strong focus on cybersecurity and digital technologies applied to transportation and civil infrastructure. An internationally-recognized expert on railway engineering, he also leads research on digital twins, cybersecurity, and blockchain technologies applied to civil engineering. He is a member of the National Academy of Science, Engineering and Medicine committee on Safe Transportation of Liquefied Natural Gas by Railroad Tank Car. In recognition of his leadership across multiple fields, he was selected as one of only 18 international speakers chosen to attend the G20 Ministerial Meeting held in Japan in 2019.

Attoh-Okine is a founding associate editor of the ASCE/ASME *Journal of Risk and Uncertainty Management in Engineering Systems* and has served as an associate editor of *Journal of Infrastructure Systems*, *Journal of Computing*, *Journal of Bridge Engineering*, and *Journal of Pipeline Systems Engineering and Practice*. He has authored two books, "Resilience Engineering: Models and Analysis and Big Data" and "Differential Privacy in Railway Track Engineering." He earned his Diplom Ingineur from the Rostov Institute of Civil Engineering in Rostov-on-Don, Russia and his Ph.D. from the University of Kansas.

WHAT DO YOU SEE AS THE DISTINCTIVE STRENGTHS OF THE CEE DEPARTMENT AT UMD?

The civil and environmental engineering department at UMD provides a strong undergraduate and graduate education that prepares engineers and researchers to address pressing issues and provide solutions for the nation's aging infrastructure. The department is home to nationally and internationally-known transportation centers, including the Maryland Transportation Institute (MTI) and the Center for Advanced Transportation Technology (CATT), as well as the Center for Disaster Resilience, which supports research on critical issues arising from climate change. The department has a strong tradition in the areas of environmental engineering and water resources, with faculty addressing several of the National Academy of Engineering's Grand Challenges for Engineering. The well-known Project Management program provides training for both private industry and government.

The diversity of the student body is impressive. The department has strong support from the A. James Clark School of Engineering and UMD administration. Such support makes the department an appealing place for faculty, helps meet the needs of students, and sustains academic excellence.

WHAT ARE SOME OF YOUR MAIN OBJECTIVES AS THE NEW CHAIR?

As a new chair, my unwavering objective is to serve our students, faculty and staff, Maryland Engineering, and UMD as a whole, providing the guidance, resources and connections needed to

nurture both collective and individual success for all. I am working with departmental faculty and staff to enroll promising students and boost enrollments both at the undergraduate and graduate levels. I'm also working with the department to find new avenues of success and enhance existing strengths, and to create new structures and strategies to enhance the decision-making needs of students, faculty, and staff.

Furthermore, I aim to devote some of my time to work that addresses the infrastructure needs of low-income state residents, tackling head-on the issue of infrastructure deserts. I will work with other department chairs to create new joint initiatives—for example, working with Mechanical Engineering in the area of structural health monitoring/sensors, and with Materials Science on construction material research. I will work with different stakeholders in Maryland to initiate the development of a construction and engineering management program, and to develop an international railway research program and education center, among other initiatives. Civil and Environmental Engineering will soon be moving to a new facility on campus, and we also have the opportunity to utilize the recently-opened IDEA Factory. I will work to maximize the potential of these new facilities.

We also want to explore opportunities that link engineering with other fields. Together with the School of Business, I plan to explore the possibility of developing a unique graduate program in innovation with an emphasis on civil and environmental engineering.

I also intend to strengthen the international footprints of the department through a variety of avenues, including Engineering Without Borders, our study abroad programs, and international research collaboration.

Teamwork is the key to achieving these objectives. My leadership style is people-centered, team-oriented, and participatory, while my management philosophy is to lead rather than manage.

WHAT DO YOU SEE AS SOME OF THE MAJOR EMERGING TRENDS IN THE CEE FIELD? HOW IS THE FIELD CHANGING?

Students today are very aware of issues that impact their future—how global warming, for instance, may affect their lives personally as well as infrastructure, social equity and justice, and the economy. Digitalization and automation have also brought significant changes. Artificial Intelligence and its subfield of machine learning, as well as the ever-changing nature of cyberattacks on critical infrastructure—all these developments have transformed the landscape of training for future civil engineers. Multi-disciplinary approaches, as well as student involvement in internships, have further dictated a shift in delivering some of our civil engineering courses and programs. Although the traditional civil engineering curriculum is very relevant, a new mindset is needed. For example, modernizing the water quality system will require us to develop digitized industrial control systems, which, although efficient, can also create cybersecurity nightmares. We need to train students who can adapt to the changing nature of our society.

YOU BRING EXTENSIVE EXPERIENCE IN THE AREA OF RESILIENT INFRASTRUCTURE, WITH AN EMPHASIS ON CYBERSECURITY. WHAT ARE SOME OF THE MOST IMPORTANT FACTORS THAT ENGINEERS SHOULD TAKE INTO CONSIDERATION AS THEY STRIVE TO ENSURE RESILIENCE?

Cyber-resilience has become critical to infrastructure maintenance and rehabilitation, even at the design stage. Sensors are now ubiquitous in infrastructure monitoring, and the communication and sharing of sensor information can be vulnerable to cyber-attacks. Most critical infrastructure systems are interconnected, and the vulnerability of one system will have a major influence on the others. The use of digital twins is becoming important in many areas of infrastructure, including smart city applications, autonomous vehicles, and pipeline transport systems. The major characteristic of these emerging techniques is the reliance on sensor data. Digital twins, which are computational models of real-world systems, can be applied to help monitor, control, and optimize these systems. Supply chains and traceability, as well as maintenance and sharing of critical infrastructure data, are becoming important for protecting society's assets.

Leveraging blockchain technology can also help address the security challenge. Blockchain has enormous applications across civil and environmental engineering, including in wastewater treatment, railway safety, and detection of inferior construction materials. These applications will help improve the cyber-resilience of our critical infrastructure.

FOR STUDENTS WHO MIGHT BE CONSIDERING CEE AS A MAJOR, WHAT DO YOU SEE AS THE BIGGEST DRAW? WHAT ARE SOME OF THE MOST EXCITING ASPECTS OF WORKING IN THIS FIELD?

Students who come to UMD to study civil and environmental engineering can look forward to the highest quality of education, provided by world-class faculty, in a department in which student well-being is a major focus. Our updated curriculum, along with the opportunities for interdisciplinary study, provides our students with a competitive advantage. We will continue to encourage hands-on projects and encourage students to translate their ideas into invention and entrepreneurship.

At the same time, we wish to foster a global perspective among our students, as well as social consciousness and the desire to apply their knowledge to societal problems, such as infrastructure deserts within Maryland. We are very hopeful that our students, taking advantage of our facilities, laboratories, and the IDEA Factory, will provide something unique. In addition to internships, we continue to develop mentorship opportunities in which students are connected with professional engineers.

HOW CAN CIVIL AND ENVIRONMENTAL ENGINEERS BEST ADDRESS THE GRAND CHALLENGES OF OUR TIME?

Several of the Grand Challenges relate directly to civil and environmental engineering. Restoring and Improving Urban Infrastructure involves the improvement of transportation systems, development of smart cities, and resilience of urban infrastructure systems—all areas that the department is already involved with through MTI and CDR. We also have faculty working on research that relates to other Challenges, such as Managing the Nitrogen Cycle and the Development of Efficient Carbon Sequestration Methods.

OUTSIDE OF YOUR PROFESSIONAL LIFE, WHAT ARE SOME OF YOUR INTERESTS?

Among other interests, I collect paintings from young and upcoming painters from West Africa, play chess, and am a fan of Brazilian Capoeira, which I have spent some time practicing in Salvador-Bahia, Brazil. Finally, I speak Russian and am an avid reader of Russian literature.

Niemeier Appointed Center for Disaster Resilience Director

A NATIONAL ACADEMY OF ENGINEERING MEMBER AND CLARK DISTINGUISHED CHAIR AT UMD, NIEMEIER WILL LEAD A RESEARCH HUB DEDICATED TO SUPPORTING COMMUNITIES IN ADAPTING TO NATURAL HAZARDS WITHIN THE CONTEXT OF CLIMATE CHANGE.

Deb Niemeier, Clark Distinguished Chair at UMD, has been named director of the Center for Disaster Resilience (CDR), a research hub with a focus on better understanding and addressing the risks posed by natural hazards, including extreme weather. This appointment brings together her deep interest in equity and social justice and better understanding the effects of climate change in the built environment.

Based in the UMD civil and environmental engineering department, CDR assists communities, governments, and individuals in overhauling their approach to disaster management. With hurricanes and other severe weather events increasing in frequency, achieving greater resilience has become a critical priority.

"I WANT TO EXPAND THE REACH OF THE CDR, BRINGING IN VOICES OF THE COMMUNITY, MORE INTERDISCIPLINARY PERSPECTIVES AND DEVELOPING CROSS-CUTTING RESEARCH THEMES."

PHOTO: AL SANTOS

"From fires to sea level rise to increased intensity and frequency of weather events, every city in the world is going to have to adjust," she said. "These adjustments are not just about how we build infrastructure. The issues will include approaches to resilience, disaster management, equity, how to manage local finance, and learning when and how to shore up infrastructure, and when to leave. Researchers at UMD, and especially in civil and environmental engineering, have the skills and expertise to advance scholarship and practice in these areas. The Center can help with generating this new knowledge and moving information to local governments where it can help."

"I want to expand the reach of the CDR, bringing in voices of the community, more interdisciplinary perspectives and developing cross-cutting research themes," Niemeier said.

A National Academy of Engineering (NAE) member, Niemeier joined the UMD civil and environmental engineering faculty in 2019. She was named to the first in a series of distinguished chairs endowed by the Clark Foundation as part of a $219.5 million gift to UMD—the largest in the school's history and one of the largest investments in the history of American public higher education.

Her work has helped spur policy and regulatory changes through groundbreaking research in the areas of vehicle emissions, air quality, affordable housing, and infrastructure funding. More recently, she has focused on aspects of the built environment that give rise to structural inequality, particularly within the context of climate change. She recently received the 2022 Perry McCarty AEESP Founders' Award for her exceptional and tireless leadership in research, education, and service.

CDR brings together an interdisciplinary group of faculty affiliates whose combined expertise provides an important resource for risk analysis, policymaking, and environmental protection efforts. CDR experts have testified before the U.S. Congress on resilience-related issues and are consulted regularly by policy analysts, lawmakers and regulators, and agencies at the local, state, and federal levels. Affiliates of the center include faculty from civil and environmental engineering, mechanical engineering, and fire protection engineering, as well as from the School of Architecture, Planning and Preservation and other schools, departments, and centers at UMD.

PHOTO: STEPHANIE CORDLE

UMD LEADS NEW BUILD AMERICA CENTER

The Build America Center, a national Center of Transportation Excellence led by UMD in partnership with the Federal Highway Administration and the Build America Bureau, celebrated its official launch in April with a double-header event that included an opening ceremony and symposium. U.S. Under Secretary for Transportation Policy Carlos Monje (pictured) delivered a video keynote. Directed by UMD Professor Qingbin Cui, the Center will provide technical assistance to state and local governments as they implement the Bipartisan Infrastructure Law passed in November 2021. Georgia Tech, Purdue, Stanford, and Virginia Tech are regional leads.

CIRILLO NAMED INTERIM DIRECTOR OF MARYLAND TRANSPORTATION INSTITUTE

UMD CIVIL AND ENVIRONMENTAL ENGINEERING PROFESSOR CINZIA CIRILLO HAS BEEN APPOINTED INTERIM DIRECTOR OF THE MARYLAND TRANSPORTATION INSTITUTE, A UMD-BASED HUB THAT BRINGS TOGETHER RESEARCHERS FROM MULTIPLE FIELDS TO TACKLE TODAY'S MOST PRESSING TRANSPORTATION CHALLENGES.

An expert on travel behavior and a strong proponent of interdisciplinary collaboration, Cirillo's work spans areas such as discrete choice analysis, advanced transportation demand modeling, large-scale model systems, value of time studies, data collection and analytics, survey design, transportation and energy, new technology vehicles, and environmental impacts. She is currently the associate chair of graduate programs at the UMD CEE department.

According to Cirillo, her primary aim as chair will be to maintain MTI's high level of service to the transportation community. "Our goal is continued excellence in research, education, and projects," she said.

MTI supports the state of Maryland, federal agencies, and national and international companies by providing a wellspring of expertise to tackle transportation priorities, Cirillo noted. "Decision makers and stakeholders identify critical issues in the transportation system, and then we provide the research capabilities needed to address the challenges," she said.

These challenges include everything from reducing congestion and boosting the use of public transit to reducing pedestrian and bicyclist fatalities—all examples of research areas that MTI has tackled in recent months.

The institute embraces a data-driven approach, leveraging unique capabilities that include access


PHOTO: AL SANTOS

to real-time mobile device data as well as the Regional Integrated Transportation Information System (RITIS), housed at the Center for Advanced Transportation Technology Laboratory.

Seed grants awarded by MTI have covered topics ranging from electric scooter mobility to the effects of eliminating fares on a city bus system. The latter project is being led by Cirillo in collaboration with Anna Alberini, a professor in the UMD Department of Agricultural and Resource Economics.

MTI also hosts the Build America Center, established as a resource to help decision-makers implement innovative highway project finance and delivery methods, including public-private partnerships (P3). Established in collaboration with the Federal Highway Administration and the Build America Bureau, the Center commenced its activities in April 2022.

In 2020, MTI made national headlines by standing up a COVID-19 Impact Analysis Platform that pulled in mobile device data in order to glean real-time insights into mobility behavior during the pandemic, compliance with social distancing guidelines, economic impacts, and other variables. These data-gathering capabilities continue to be utilized by MTI researchers on a wide range of projects, including a revamp of the U.S. National Household Travel Survey.

"We have people working on transportation problems everywhere on campus, including in economics, statistics, computer science, the iSchool, engineering, architecture, and public health," Cirillo said. "Because transportation intersects with so many other societal and human considerations, progress in the field increasingly requires collaboration across disciplines."

"But bringing people together from several departments is not easy," she added. "You need a structure to do this, and MTI provides such a structure. It is well-positioned to advance collaboration across multiple fields."

Reilly Wins NSF CAREER Award

UMD RESEARCHER WILL STUDY "MORAL HAZARD" BUILT INTO EXISTING PUBLIC ASSISTANCE FRAMEWORK.

When communities are hit by a disaster, their primary conduit for federal aid is the Federal Emergency Management Agency (FEMA)'s Public Assistance (PA) program, which provides funding that can be used to rebuild damaged infrastructure.

But the PA program is set up in a way that often incentivizes unwise decision-making by communities, says Allison Reilly, assistant professor of civil and environmental engineering at UMD. Reilly has been awarded an NSF CAREER Award that will support research intended to guide policy reform in this area.

"The federal government is mandated to provide funding for recovery regardless of any action or lack of action taken by local and state governments prior to a disaster," Reilly said.

PHOTO: AL SANTOS

Cable Retires After Distinguished Career at UMD

John Cable, who founded UMD's Project Management Center for Excellence and helped make it a leader in the world of online education, stepped down this summer after nearly a quarter century of service to the university community.

A mid-career professional and part-time UMD graduate student at the time, Cable was tapped in 1999 to stand up a successor to the civil and environmental engineering department's construction management program. Cable set to work immediately, launching a graduate program in project management, two undergraduate minors, and ultimately the Center for Excellence in Project Management. Meanwhile, the internet was opening up exciting new possibilities for pedagogy and delivery. Recognizing the potential of virtual learning, Cable oversaw the Center's launch of a wildly successful EdX certificate program in Agile Project Management, to be followed by a succession of additional programs, covering a full range of Project Management learning objectives.

Along the way, Cable contributed his personal expertise and love of teaching, serving as the instructor for courses such as Project Management Fundamentals and Managing Projects in a Dynamic Environment, as well as widely sought-after seminars and workshops. He has also been a prolific writer on Project Management-related topics.

A licensed architect and general contractor with over 40 years experience, Cable's activities have included planning, design, and construction of buildings; building energy conservation research; management consulting; and teaching. Prior to launching his career in academia, John created and managed a design/build firm specializing in renovation and new construction of residential, commercial, and retail properties and directed energy conservation research in buildings for the U.S. Department of Energy.

"So there's little incentive to prepare for it."

As a result, federal resources are often sapped with no benefit to long-term resilience. Communities may often fail to discourage development in hazard-prone areas; after all, property taxes will flow in, and federal aid is mandated in case of catastrophe. "There are many examples of development being pushed in areas that are known to flood frequently or that are otherwise risky," she said. "There's no penalty for making risky decisions about where to build."

More evidentiary support is needed in order to guide policy reform, however, and that's what Reilly's research aims to provide.

With more than $500,000 in NSF support over the five-year grant, Reilly will use statistical models to examine how local capacity influences the level of PA that is awarded and how that impacts risk in the built environment. In addition, she will conduct a thorough evaluation of local decision-making processes in response to federal disaster policy using interviews and document analysis. The data she gathers will then be incorporated into simulation models that can be used to test projected policy reforms. To validate the models, Reilly will conduct a series of workshops involving policymakers, researchers, and engineering practitioners.

In addition to supporting research, educational initiatives are an important component of the NSF's CAREER program. To help aspiring engineers become more familiar with the broader social impact of engineering decisions, Reilly will develop engineering civics modules and incorporate them into the classes she teaches. Ultimately, a full-fledged course, "Data Analysis for Civic Impact," is planned.

The NSF award, considered one of the most prestigious available to early-career faculty, is intended to support emerging academic leaders as they chart their longer-term research trajectories. Reilly is among several Maryland Engineering faculty who have received this award, including fellow CEE Assistant Professor Shelby Bensi and mechanical engineering Associate Professor Katrina Groth.

Yang Joins UMD Faculty

Dr. Xianfeng "Terry" Yang has joined the civil and environmental engineering faculty at UMD as assistant professor (Transportation Engineering). His research areas include traffic operations with connected automated vehicles, machine learning for smart mobility, emergency evacuation, and transportation equity.

Yang is a 2021 recipient of an NSF CAREER award and has published over 120 peer-reviewed articles in journals and conferences. His research has received funding from the National Science Foundation (NSF), the US Department of Transportation (USDOT), the Department of Energy (DOE), the Federal Highway Administration (FHWA), and the Utah Department of Transportation (UDOT). Since 2017, his research has attracted over $7.5M in grants. He is currently an editorial board member of *Transportation Research, Part C*, Associate Editor of *ASCE Journal of Urban Planning and Development*, Associate Editor of *IEEE OJ-Intelligent Transportation Systems*, and Handling Editor of *TRB Transportation Research Record*. He is chair of the INFORMS JST ITS committee and secretary of the ASCE Artificial Intelligence committee. He is the member of two TRB committees, Traffic Signal Systems (ACP25) and Disaster Response, Emergency Evacuations, and Business Continuity (AMR20). He is also the paper review coordinator of AMR20 and ACP25.

BRUBAKER PROMOTED TO FULL PROFESSOR WITH TENURE

The UMD civil and environmental engineering department congratulates Kaye Brubaker on her promotion to the rank of full professor. An expert on hydrology and hydroclimatology, computer modeling, remotely sensed data, geographic information systems, and space-time random field theory, Brubaker directs the Maryland Water Resources Research Center at UMD.

FACULTY ACHIEVEMENTS & RECOGNITION

NATASHA ANDRADE, associate chair for undergraduate programs and senior lecturer, **has received the 2022 Dean's Award for professional track faculty at UMD**. in a letter announcing the award, Maryland Engineering's Dean Samuel Graham, Jr. cited Andrade's strong commitment to teaching and mentoring students, as well as her research on engineering education, which has been presented at the American Society for Engineering Education Conference and featured in the American Society of Civil Engineers (ASCE) in its magazine.

Professor **BILAL AYYUB**, who directs the Center for Technology and Systems Management (CTSM) at UMD, has **joined the National Academies' Board on Environmental Change and Society**. Also in 2022, AYYUB and his co-authors received the **2022 Editor's Award for Best Paper** for work published in the *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering*.

Associate Professor **DIMITRIOS GOULIAS** was **awarded a new two-year research project, "Performance of Ultra-Thin Bonded Wearing Course During Winter Events."** The project, sponsored by the Maryland State Highway Administration (MD SHA) and the Federal Highway Administration (FHWA), addresses structural and climatic effects on roadways with regard to safety and accident prevention. Goulias also **provided an invited keynote speaker presentation** at the 58th Annual Paving Conference in March, in which he discussed the development of a new balanced mix design methodology for asphalt surfaced roadways. His keynote presentation provided insights from his two-year research sponsored by FHWA and MD SHA.

Associate Professor **BIRTHE KJELLERUP** received **funding from the Chesapeake Bay Trust** to carry out research aimed at better understanding barriers to restoration project implementation.

An education proposal by Assistant Professor **GUANGBIN LI**, Senior Faculty Specialist **MARYA ANDERSON** and Associate Chair for Undergraduate Programs **NATASHA ANDRADE** was **selected for an award by the Association of Environmental Engineering and Science Professors (AEESP)**. The funded project will tackle the challenges currently faced by STEM teachers and students at K-12 schools and programs in Maryland due to the COVID pandemic.

Professor **DAVID LOVELL** was **awarded a new project from NASA**, via a subcontract to Intelligent Automation, Inc. The title of the project is "LINUS: An Intelligent Digital Assistant for UAM Operators," and its purpose is to use aviation domain knowledge and natural language processing to build a computerized assistant to help with the scheduling, flight planning, dispatching, and operational aspects of uncrewed aerial traffic.

Professor **MIROSLAW SKIBNIEWSKI** was invited to **present the 2022 Tishman Distinguished Lecture** in the Department of Civil and Environmental Engineering at the University of Michigan, Ann Arbor. Skibniewski has also been **invited to deliver keynote presentations at several conferences**, including the International Society for Intelligent Construction International Conference on Trends in Construction in the Post-Digital Era (Portugal), the European Conference on Product and Process Modeling (Norway) the International Project and Construction Management Conference (Turkey), and the Construction Applications of Virtual Reality Conference (Korea).

Skibniewski is **editor-in-chief of the international research journal** *Automation in Construction*, which achieved the highest Impact Factor value (10.517) among all 139 Civil Engineering journals worldwide listed in Clarivate/Institution for Scientific Information's Journal Citation Reports. The Impact Factor measures the number of citations received in a given year by papers published by a journal within the preceding two years.

A multidisciplinary research team led by Assistant Professor **XIANFENG "TERRY" YANG** has received **a nearly $300,000 grant from the National Science Foundation** to develop a stochastic simulation platform that can evaluate the capabilities of AVs' automated driving systems. The motivation is to produce a reliable tool that can model stochastic vehicle behaviors, study vehicle dynamics, and predict potential AV safety risks under adverse driving conditions in winter.

RACISM AND THE PANDEMIC: Measuring the Effects

AN INTERDISCIPLINARY TEAM OF GRADUATE STUDENT RESEARCHERS SHOWED HOW DEEPLY-EMBEDDED INEQUITIES HAVE DRIVEN HIGHER COVID-19 DEATH RATES IN LOUISIANA.

UMD graduate students Kristen Croft (civil and environmental engineering), Nora Hamovit (biology), and Guangxiao Hu (geographical sciences) may work in very different fields, but it was their combined efforts that yielded groundbreaking new research that tracks the connection between structural racism and higher COVID-19 mortality rates in Louisiana parishes.

The three collaborated as part of the UMD Global STEWARDS (STEM Training at the Nexus of Energy, WAter Reuse and FooD Systems) training fellowship program, which is funded by the National Science Foundation (NSF) and directed by Professor Amy R. Sapkota of the School of Public Health.


Kristen Croft


Nora Hamovit


Guangxiao Hu

Mentored by UMD Clark Distinguished Chair Deb Niemeier and UMD Associate Professor of Kinesiology Jennifer D. Roberts, the students identified the spatial distribution of social and environmental stressors across Louisiana parishes and used hotspot analyses to develop aggregate stressors. They then tracked the correlations among stressors, cumulative health risks, COVID-19 mortality rates, and the size of Black populations across Louisiana. The results suggest that COVID-19 mortality rates initially spiked in Black communities with high population densities and moderate levels of aggregate stress. Over time, the rates also increased in less densely populated Black communities with higher levels of aggregate stress.

The results of their work were published in the *Proceedings of the National Academy of Sciences* on Monday, June 27.

"We find that Black communities in Louisiana parishes with both higher and lower population densities experience higher levels of stressors leading to greater COVID-19 mortality rates," the researchers wrote. "Our work using the COVID-19 pandemic, particularly as observed in Louisiana, makes clear that communities with high levels of social, economic, and environmental racism are significantly more vulnerable to a public health crisis."

Each team member contributed specific skill sets to the endeavor. Croft played a critical role in defining the research topic and utilized her background in stormwater research to pinpoint specific variables that could have a bearing on health. Hamovit performed the initial data analysis that yielded stressor index calculations, which Hu then utilized for hotspot analysis. "Because my PhD research involves large and complex data sets, I brought a strength of data organization and analysis to our team," Hamovit said.

"As a human geographer, my main focus was on the spatial disparities of structural racism and inequities and their effects on COVID-19 mortalities," Hu said. "Using hotspot analysis, we identified two groups of parishes with high or low population densities located at different regions of Louisiana. Our research provides policy makers with very useful insights about the disproportionate burden of Black communities and the nonstationary distribution of this disproportion across Louisiana."

Allen P. Davis, professor of civil and environmental engineering, is a co-PI for the UMD STEWARDS program, which aims to bring together graduate students from a wide variety of backgrounds to work on collaborative projects. "Each student brings their own area of expertise to the table, resulting in synergy," Davis said. "That kind of synergy is something you might not get in other disciplinary studies."

"WE FIND THAT BLACK COMMUNITIES IN LOUISIANA PARISHES WITH BOTH HIGHER AND LOWER POPULATION DENSITIES EXPERIENCE HIGHER LEVELS OF STRESSORS LEADING TO GREATER COVID-19 MORTALITY RATES."

CEE DEPARTMENT LAUNCHES CIVIL EMPOWERMENT SEMINAR SERIES

With generous support from WRA, the department launched its new Civil Empowerment Seminar Series in Fall 2021. Organized by the department's Diversity, Equity, and Inclusion Committee, which is chaired by Associate Professor Birthe Kjellerup, the new series featured two speakers during the 2021-22 school year.

NNENIA CAMPBELL, research associate at the Natural Hazards Center and deputy director of the Bill Anderson Fund, presented the inaugural seminar in October, discussing the need to improve disaster communications for marginalized communities.

In April, SANDRA BEGAY of Sandia National Laboratories shared perspectives on the engineering field as it relates to a Navajo traditional philosophy known as Walking in Beauty, which supports being in harmony with all aspects of life.

GRADUATE STUDENT SPOTLIGHT

Nneoma Maxine Ugwu

NNEOMA HAS ALWAYS BEEN PASSIONATE ABOUT TRANSPORTATION RESEARCH, AND AT UMD, SHE'S ABLE TO PURSUE HER PASSION BY RESEARCHING TRANSPORTATION INFRASTRUCTURE EQUITY.

Nneoma Maxine Ugwu recently finished the first year of her Ph.D. research in the CEE department, and she's always been passionate about transportation. Originally from Nigeria, Ugwu attended attended the University of Massachusetts Dartmouth before choosing the University of Maryland (UMD) for her graduate education. Ugwu chose to come to UMD specifically because of its location and the diversity of its campus, and because of the work of her current advisor, professor and director for the Center for Disaster Resilience (CDR), Deb Niemeier.

"I've always had a passion for transportation and for coming up with solutions to critical problems," Ugwu said. "I came to UMD to advance my transportation education to a higher level."

For her master's thesis, Ugwu researched the impact of COVID-19 on travel demand and traffic congestion in the state of Maryland, and used models to investigate the economic, environmental, and safety benefits of teleworking. She was accepted for a poster presentation to showcase her research at the Transportation Research Board (TRB) 2022 Conference. Now, Ugwu is using her research to assess equity regarding electric vehicles (EV) and EV charging stations.

"A lot of my research interests are in equity and inclusiveness," states Ugwu.

At the start of her research, Ugwu performed a literature review to understand EV adoption by minorities and low-income households. She then looked at government and private EV adoption incentives and policies. Most EV users are men with comparatively high household incomes, and most EV charging stations are located in higher-income areas. This combination places additional barriers to EV use and ownership on people from lower socioeconomic backgrounds. However, due to increasing state mandates, EVs are becoming a popular option for lower-emission transportation.

"I'M TRYING TO PREVENT FUTURE INEQUALITY ISSUES AND MAKE SURE THAT EVERYONE HAS ACCESS TO THIS INFRASTRUCTURE."

"I'm trying to prevent future inequality issues and make sure that everyone has access to this infrastructure. The world is moving toward cleaner air and cleaner energy, and I want to make sure that everyone is being carried along through this transition," Ugwu said.

Ugwu found that at UMD, she has the chance to pursue her research passions. Ugwu came from a civil engineering background but didn't grow up seeing much diversity in the field. Now, Ugwu sees the push toward diversity and wants to increase opportunities for both women and Black engineers in any way she can. Ugwu is a part of Women in Engineering (WIE), the Maryland Transportation Institute (MTI), the Intelligent Transportation Society of America and the Institute of Transportation Engineers (ITS-ITE) UMD Student Chapter, the Women in Transportation Seminar, and more. Overall, Nneoma hopes to elevate diverse voices in engineering while completing compelling research on transportation trends.

"So far, it's been an amazing journey with multiple opportunities and I'm always happy when I can give back to the community through my work," said Ugwu.

GRADUATE STUDENT AWARDS

Bechtel Graduate Award: **YOUNG JOO KIM**

Clark Doctoral Fellowship: **MEIGAN MCMANUS AND AMIR RIYAHI**

Graduate School Summer Research Fellowship: **MARIA RODRIGUEZ AND MOFENG YANG**

Graduate School Three Minute Thesis Competition: **AMANDA O'SHAUGHNESSY**

Harkins Group Fellowship: **XINYA LIU**

Rattan L. Khosa '71 Graduate Scholarship: **YIFAN ZHU**

MS Research Award: **AMANDA O'SHAUGHNESSY**

Lieutenant General John W. Morris II Graduate Fellowship: **LAVAN TEJA BURRA AND ABDOLMAJID ERFANI**

UNDERGRADUATE STUDENT SPOTLIGHT

Haroon Farrukh

UMD GRADUATE KEEPS AN EYE ON ENGINEERING'S BROADER PURPOSE.

By Isabella Lucy Kolar

Engineering may be a highly technical profession, but its human and societal dimensions are ultimately what give it value, according to UMD civil and environmental engineering graduate Haroon Farrukh, who received his B.S. in May after an undergraduate career marked by high academic achievement and dedicated involvement in CEE organizations, programs, and activities.

"We've lost contact with [the societal aspect], but it's the most important thing. We impact people's day-to-day lives," he said.

Indeed, Farrukh decided on CEE—after initially studying chemical engineering—because he felt it would provide him greater opportunities to help solve societal problems through engineering. He subsequently worked with Professor Kaye Brubaker on a project that measured the effects of climate change on hydrology in Maryland, and later with Clark Distinguished Chair and CDR Director Deb Niemeier on an investigation of zoning policies in Lubbock, Texas and how these policies impact Black communities.

Farrukh has also served as the Undergraduate Representative on the CEE department's Diversity, Equity, and Inclusion Committee. In this capacity, he hosted the inaugural DEI Civil Empowerment Seminars, featuring Nnenia Campbell of the University of Colorado and Sandra Begay of Sandia National Laboratories, respectively. As undergraduate representative, he also worked to create a student DEI club for CEE. In recognition of his efforts, Farrukh received the department's first DEI Service Award.

In addition, he has been involved in Engineers Without Borders, and served as Mix Design Lead for ASCE's Concrete Canoe team, as well as the UMD ASCE branch's webmaster. While at UMD, he was a member of the Chi Epsilon Honor Society and a ClarkLEADER for Clark Communities—all while maintaining a strong GPA.

Farrukh now works for the engineering firm Stantec. He appreciates that the organization "values all backgrounds," he says, as well as the opportunities for travel it provides. His job entails working with government agencies, doing hydraulics modeling and flood mapping. He believes his research with Dr. Brubaker has helped prepare him for this, as have the Ground Water Hydrology and Hydrologic Engineering courses she teaches.

"WE'VE LOST CONTACT WITH [THE SOCIETAL ASPECT], BUT IT'S THE MOST IMPORTANT THING. WE IMPACT PEOPLE'S DAY-TO-DAY LIVES."

Eventually, Farrukh hopes to attend graduate school and earn his master's degree in public policy. He believes this will help him in future project management work by teaching him more about engaging with communities. In this way, he hopes to make contributions that will benefit people and communities for years to come.

"It's important to know how to interact with people and communities," he said. "Our whole field is ultimately about helping people."

UNDERGRADUATE STUDENT AWARDS

ASCE Outstanding Senior: **LILIA YOUSEFIAN**

CEE DEI Service Award: **HAROON FARRUKH**

CEE Outstanding Senior: **AASHINI PATEL**

CEE Outstanding Junior: **HARRY HALL**

Chair's Award: **GERALD BROWN**

Chi Epsilon: **SHIVANI PATEL**

Robert L. Morris Award for Environmental Leadership: **MIRANDA PIERCE**

DONOR SPOTLIGHT

Scott and Carole Greenhaus

SCOTT AND CAROLE GREENHAUS ESTABLISHED THE MARYLAND PROMISE SCHOLARSHIP AT UMD TO PROVIDE NEED-BASED SCHOLARSHIPS TO UNDERGRADUATE STUDENTS WHO ARE RESIDENTS OF THE DMV AREA.

Scott Greenhaus (B.S. '82, MBA '86) started gaining hands-on job experience while he was still an undergraduate student in the UMD CEE department. Though there wasn't the plethora of internship openings one might see today, Greenhaus was able to take part in the cooperative engineering internship program, where he joined Structural Group Inc. as a student worker. Suddenly, the theory he was learning in his coursework had real-world applications, and that tangible connection fueled Greenhaus's future in engineering. Now, as the Executive Vice President and Chief Risk Officer for Structural Group Inc., Greenhaus is finding way to give the next generation of engineers the same educational opportunities.

Carole and Scott Greenhaus with Testudo

In 2018, Scott and his wife Carole established the Scott and Carole Greenhaus Maryland Promise Scholarship, under the auspices of the Clark Challenge for the Maryland Promise Program. The fund provides need-based scholarships for CEE students who are residents of Maryland or the District of Columbia. Greenhaus appreciates the need for education, continuing research, and job experience without the accompanying financial burden. He thinks that all students should have the chance to make a difference and set new trends in the field of engineering.

"I feel very fortunate that I was in the right place at the right time. I was able to make the most of the opportunities presented to me by the University of Maryland," said Greenhaus. "It's important that we find a way for everyone who wants to be a part of the big adventure of engineering to get an opportunity to do so."

Greenhaus and his company also contribute to student success through their well-established internship program, where a diverse population of engineering students have the opportunity to attain job experience. Through the internship program and from his position on the Board of Visitors for CEE and for the A. James Clark School of Engineering, Greenhaus is able to directly witness student success.

"I see these students talking about their research, and they're so confident and capable. It gives me hope for the future," Greenhaus said.

Likewise, Greenhaus is impacting the future of engineering through his work at Structural Group Inc. by establishing a workplace culture of safety and innovation. The company has remained ahead of the curve in thinking about the modern problems of structural repair and resiliency. With climate change and longevity in mind, Greenhaus and Structural Group developed methods of construction and repair in an effort to build stronger, longer lasting structures.

"Civil engineering may not be as flashy as other engineering disciplines, but it's how we build the houses we live in, the roads we drive on, our airports—and really, everything that makes life go," said Greenhaus. "For somebody considering how to make the world better, the difference that a civil engineer can make is really significant."

REMEMBERING

Matthew Witzcak

In the annals of civil and environmental engineering at Maryland, Matthew WItczak occupies a place of special significance. Witczak, who died in January 2021, built many of the foundations for UMD's CEE program as it exists today, including much of its geotechnical and pavement curriculum.

A UMD faculty member from 1973 to 1999, Witczak served as department chair from 1983 to 1987, and also served for many years as graduate student advisor. A scholarship in his honor, the Dr. Matthew W, Witczak Graduate Award, was established with an initial endowment by Bill Wainger and Kenneth Bell. It is awarded annually to an incoming graduate student with a focus on geotechnical engineering and pavement design.

Charles Schwartz, who stepped down as CEE chair in the fall of 2021, worked closely with Witczak for many years. He describes Witczak as "one of the true pioneers of modern pavement engineering."

"Matt was an engaging but demanding teacher, a prolific researcher, and a much-sought consultant for both highway and airfield pavement problems," Schwartz said.

His professional achievements were both numerous and impactful. Witczak led the team that developed a groundbreaking airfield pavement management system for the Port Authority of New York and New Jersey, with implementation at John F. Kennedy, La Guardia, and Newark International airports.

He also headed the development of a new mechanistic-empirical pavement design procedure to replace the decades-old empirical AASHTO methodology. Most state highway agencies in the United States today utilize the results of this multimillion-dollar, multi-year project. His consulting work, meanwhile, took him to the roads of Brittany to assess road damage caused by cleanup traffic after the Amoco Cadiz oil tanker spill, to military airfields on Diego Garcia in the Indian Ocean to strengthen runways used by B-52 bombers, and to countless other project locations throughout the United States and beyond.

The book Principles of Pavement Design, co-authored by Witczak and Eldon Yoder, is considered seminal in the field, laying down key elements of mechanistic pavement design and continuing today as a valuable reference tool for the pavement engineering community. "His research work on the constitutive modeling and behavior of asphalt mixtures has impacted paving engineering profoundly, and continuous to influence performance prediction modeling today," said Dimitrios Goulias, associate professor of civil and environmental engineering at UMD.

After retiring from UMD, he moved to Arizona State University (ASU) where he served on the faculty until his final retirement in 2011. At both UMD and ASU, Witczak mentored "a veritable army of graduate students, many of whom have gone on to become leaders in the field in their own right," Schwartz said. In addition to the graduate award at UMD, endowed scholarships were also established in his name at Arizona State.

Witczak is survived by his wife Claudia, his children Steve, Karen, Kenny, and Mindy, and numerous grandchildren.

> **Matt was an engaging but demanding teacher, a prolific researcher, and a much-sought consultant for both highway and airfield pavement problems.**
>
> CHARLES SCHWARTZ,
> *PROFESSOR EMERITUS, UMD CIVIL AND ENVIRONMENTAL ENGINEERING*

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THE UMD AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) CONCRETE CANOE AND STEEL BRIDGE TEAMS

both competed last spring in the Mid-Atlantic East Regional Symposium. The Concrete Canoe team, as the name suggests, endeavors to design, build, and race a canoe made entirely of concrete. The Steel Bridge team (pictured) designs and constructs a bridge that is rated using real-world guidelines, including materials, labor costs, and construction speed. Both teams made a strong showing at the Symposium, with Concrete Canoe beating the competition to land a second place finish.

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