CIVILREMARKS

CIVIL AND ENVIRONMENTAL ENGINEERING AT MARYLAND

LOOKING TO THE FUTURE

UMD civil and environmental engineers take bold steps to meet the demands of a changing world.

Chair's Message

Ancient cultures all over the world teach us of the need to keep adapting to new environments. The Greek philosopher Heraclitus summed up one of the essential paradoxes of life in this universe: "change is the only constant." Many would agree that embracing and adapting to change is a prerequisite for success in any field.

Civil and environmental engineering is no exception. Although the work we do is as essential as ever, that work is undergoing transformations in both scope and nature. The emergence of advanced computing technologies, for example, has opened up exciting new possibilities for research. More than ever before, our research engages societal and global challenges, including climate change and inequity. And why not? We have the expertise needed to adapt and to devise practical solutions.

The demographics of our field are changing as well. Today's engineering classroom is far more diverse than would have been the case even a decade ago. As engineering educators and researchers, we embrace the opportunity to create an environment that promotes open exchange of ideas, fosters an atmosphere of respect and trust, and encourages healthy conflict and debate. That's a development to be very much welcomed and embraced, not least because we are educating a generation of professionals that will be immersed in a highly diverse workplace.

At the University of Maryland (UMD), we're committed not only to embracing positive change but to harnessing it in a way that supports the long-term growth of our field. You'll read about some of our initiatives in this edition of *Civil Remarks*. Most notably, our department has adopted a new strategic plan that includes a thorough overhaul of the civil and environmental engineering curriculum, saying goodbye to ossified "silos" and replacing them with a far more agile paradigm that supports interdisciplinary research and education.

We're also intensifying our commitment to ensuring that our program offers a welcoming, supportive environment to students regardless of background. Our newly-established Diversity, Equity, and Inclusion Committee works to promote dialogue, raise awareness, and develop avenues for positive transformation, not only within the department but in the field as a whole.

Change is indeed a constant, and very often it can lead us in promising new directions. It can also be bittersweet, however. This fall, Department Chair Charles W. Schwartz retired, concluding an academic career that has earned him widespread acclaim and recognition. Schwartz has also been the guiding force behind many of the departmental changes now in progress, including our reorganization and strategic plan; the department he leaves behind will continue to be shaped by his legacy.

We also mark the retirements of Amde M. Amde, known for his contributions to structural engineering, and Gerald E. Galloway, one of the most highly regarded water resource management experts in the country. The CEE program at UMD is stronger because of their expertise and dedication.

Best regards,

Alba Torrents
INTERIM CHAIR
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
BEN DYER CENTENNIAL CHAIR IN CIVIL AND ENVIRONMENTAL ENGINEERING

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

UMD's civil and environmental engineering department is taking bold steps to position the field for continued growth and relevance in a rapidly-changing world.

LOOKING TO THE FUTURE

Civil and environmental engineering should be among the hottest majors on campus. After all, graduates enjoy an enviable spectrum of career options with rock-solid job security. Their skills are in continual demand.

Not only that, but the field's scope has expanded to include advanced computing, machine learning, sensors, autonomous systems, and other revolutionary technologies. The possibilities are more exciting than ever.

But making the case to prospective college students isn't always easy. Many simply have no idea what civil and environmental engineers do. Or their perceptions are out of date. For many, the field still calls to mind hard hats and surveying tools, even though today's civil and environmental engineers are just as likely to be running simulations on a computer or testing water samples in a lab.

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"WE HAVE AN IMAGE PROBLEM,"

said Charles W. Schwartz, who recently retired as chair of the civil and environmental engineering department at the University of Maryland (UMD). "Beyond that, we have an institutional problem: the field is structured in a way that might have made sense thirty years ago but doesn't today."

"The curriculum needs a refresh, especially at the undergraduate level," Schwartz said. "We need to be more forward-looking and incorporate emerging technologies to a greater extent than has been the case up to now. And we need to emphasize the broader contexts in which civil engineering happens."

UMD civil and environmental engineers are embracing the challenge. Starting under Schwartz's leadership—and continuing under interim chair Alba Torrents—the department has moved to reshape the field in ways that will broaden its appeal to students and better align it with 21st-century challenges and priorities. They're revamping the curriculum to make it less rigidly track-defined, while incorporating more hands-on experience and service learning, in order to foster awareness of socioeconomic impact.

Meanwhile, they're also leading a strong push for greater diversity and inclusion: changing demographics make this a prerequisite for long-term growth, and it's the right thing to do.

PHOTO: THAI NGUYEN

A CURRICULUM REVOLUTION IN PROGRESS

Civil and environmental engineering has traditionally offered a choice of adventures. A structural engineering adventure, for instance. Or a transportation engineering adventure. The palette of choices varies by location, but the underlying principle is almost always the same: decide on your adventure and stick with it.

Compartmentalization of this kind has its advantages. For one thing, it makes it easier to organize departments and plan curricula.

But it's no longer tenable. For starters, industries today depend on interdisciplinary teams, bringing together personnel who not only possess specialized knowledge but who can also communicate and collaborate in the service of a common goal. The organizations and agencies that fund academic research increasingly favor interdisciplinary projects in a way that may not have been true a few decades ago.

And up and coming researchers, as well as students, are chomping at the bit. They crave the synergy that comes with out-of-the-silo thinking. Many are interested in topics that don't easily slide into the accepted categories: data science, for example.

"The field is changing," said UMD civil and environmental engineering professor Allen P. Davis, the department's associate chair for faculty development and advancement. Davis played a key role in a strategic planning committee that has drawn up a bold, change-making trajectory for the UMD program, including major curriculum reform.

"It used to be about building bridges and buildings, about water infrastructure and transportation infrastructure, things like that," Davis said. "But now it's about so much more. Very often, it involves understanding the multi-dimensional aspects of projects—not only the materials that make up the bridges and buildings, but also how these structures affect people and the environment."

The plan drawn up by Davis and his colleagues takes aim at compartmentalization, ditching the traditional silos for a new,

more flexible paradigm. Three problem domains—environment and health, intelligent infrastructure, and transportation and mobility—replace the previous disciplinary tracks, but the point is not simply to erect gleaming new silos in place of the dusty old ones. Instead, think Venn diagram: the problem domains overlap. And all three are undergirded by a common theme of sustainability and resilience, as well as a shared set of tools: engineering mechanics, chemistry and biology, data analytics and operations research, and risk analysis. Crucially, faculty and students won't be required to work within a single problem domain; rather, they can go a la carte and choose the combination of domains that best fits their interests.

It's an approach that not only aims to inspire creative, synergistic thinking among students and researchers, but also responds to the needs of employers.

"We hear it continually from our contacts and partners in industry, including our Board of Visitors. They're looking for engineers who are more flexible, and who can apply their skills to multiple domains," Davis said.

ENGINEERING IN CONTEXT

In addition to the changing needs of industry, civil and environmental engineers are increasingly driven by an awareness that they have a role to play in solving major national—indeed, global—problems, whether environmental or socioeconomic. Consider, for example, UMD faculty members Alba Torrents and Natasha Andrade, who have collaborated with doctoral student Maria Rodriguez to study how illegal gold mining contributes to the destruction of the Amazon rainforest—and to suggest less destructive alternatives.

Or Gerald Galloway, who prior to retiring from the department this past summer spent years of tireless advocacy before the U.S. Congress and federal and state agencies on the need to beef up resilience in the face of more frequent extreme weather events, a byproduct of climate change.

Or Allison Reilly, who was tapped by the Day One Project to offer recommendations to the Biden administration on overhauling disaster policy in order to make it more effective—and more equitable. In her research, undertaken in collaboration with Clark School Distinguished Chair Deb Niemeier, Reilly has found that current policy often fails to discourage development in high-risk areas; in fact, a vicious cycle exists in which expensive developments get rewarded with greater amounts of disaster assistance, due to their perceived value. At the same time, poorer communities that are devastated by flooding or storms receive meager amounts of aid, sometimes because they lack the human resources needed to fill out the complex paperwork.

"I see engineers as having an advocacy role," Reilly said. "But even if we aren't embracing advocacy, we can pay more attention to the ways in which we influence decision-making—for instance, through the options we decide to present. A classic example is the response to Hurricane Katrina. For the lower ninth ward of New Orleans, which is economically disadvantaged and has a predominantly black population, engineers presented concrete seawalls. You look out your window and see a ten-foot-high concrete slab. But in more affluent neighborhoods, the options presented included parks and gradual, landscaped levees, all designed to increase the value of these homes."

"It's important that we teach engineers to be aware of how their work and their recommendations may affect particular communities and either exacerbate or help address structural inequality."

Reilly's colleague Andrade, the UMD department's associate chair for undergraduate studies and chair of the committee that drew up the curriculum overhaul, has worked to ensure this broader mindset is reflected in undergraduate courses. "You'll sometimes still hear people object that such concerns are out of their scope—that their job is simply to build things and make sure that they work. But that old viewpoint just doesn't stand up to scrutiny," she said.

"As engineers, we don't just build for the sake of building," Andrade said. "It's always for a purpose, and it has impacts, whether positive or negative. Whether we accept it or not, we're part of that larger context."

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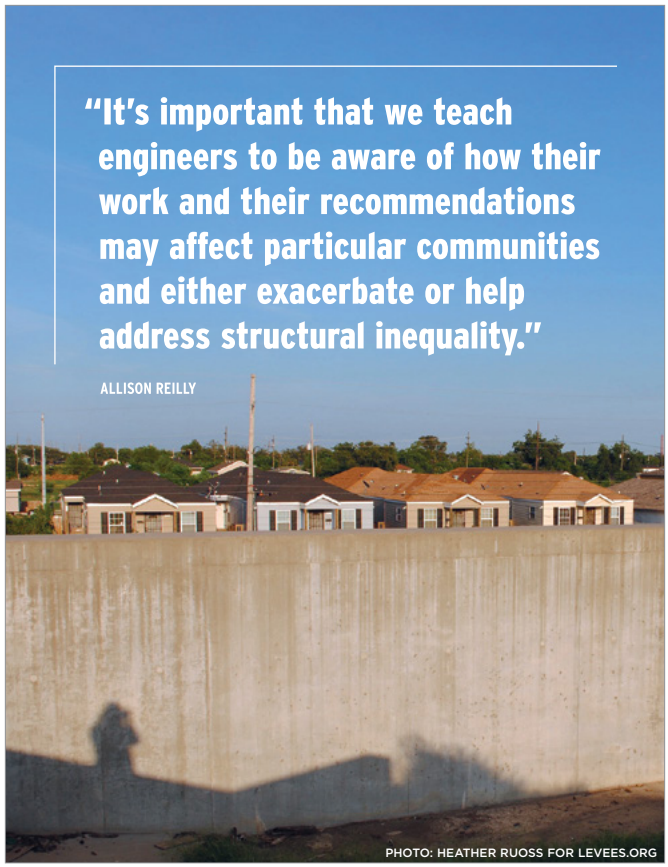

Seawall adjacent to a lower income New Orleans neighborhood.

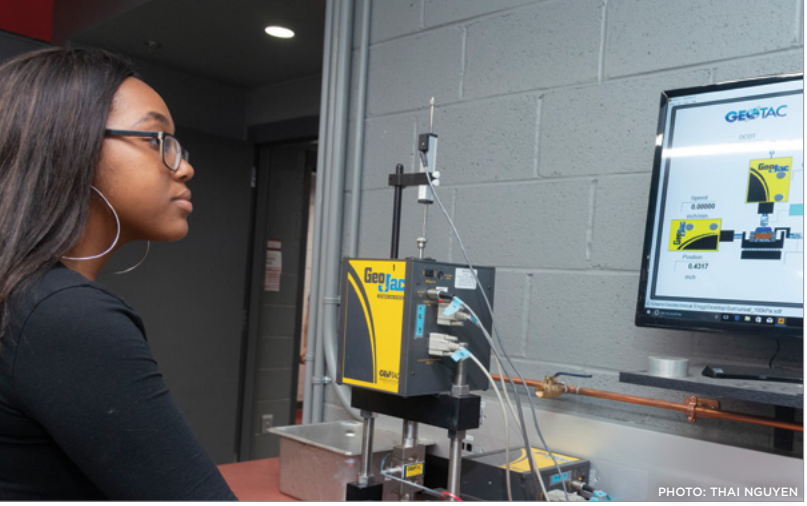

PHOTO: THAI NGUYEN

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DIVERSIFYING THE PROFESSION

The new curriculum at UMD is being offered to a student body that is itself undergoing significant transformation. Nearly a century after Evelyn Barstow ('32) became the first woman to study civil engineering at the University of Maryland, female students today comprise about a third of total enrollments.

That's still well short of true gender balance, though efforts continue to move the needle—and also to make engineering a more welcoming field for those who identify as non-binary. A similar story can be told with regard to race and ethnicity. Though the faces in an engineering classroom are no longer necessarily, or even predominantly, white and male, disparities remain: Black and Latinx students, especially from low-income communities, have struggled to gain a foothold.

Beyond the numbers, another formidable challenge exists: uprooting deep-seated attitudes within engineering culture. As Andrade explains: "You can recruit more female and minority students. You can create a classroom that looks more diverse on the surface. The problem is that many of these students will find, once here, that not all the doors are open to them—that preferential treatment is given to others, sometimes in ways that are subtle but very real."

In a group assignment, for example, a female student might find herself assigned the role of documenting the group's activities, whether she wanted that role or not. "I hear of cases like this all the time,' Andrade said. "The female student wants to design or program, but the male students automatically assume that she doesn't have the skills. So they assign her a role that she didn't want."

In a bid to tackle pervasive bias of this nature, the UMD civil and environmental engineering department last year set up a standing Diversity, Equity, and Inclusion Committee. Chaired by associate professor Birthe Kjellerup, its mission is to empower students from underrepresented backgrounds, encourage diversification within the department, raise awareness about bias, identify resources and solutions, and establish avenues of communication among different groups.

During its first year, the committee has developed the vision and mission statement for the committee, established a seminar series with an external sponsor, organized a logo contest for students, and met with student representatives to discuss specific ways of bringing about positive change. In addition, the committee has been collaborating with the department's student mentoring program to help pair students from underrepresented backgrounds with mentors who can share experiences and help them chart their path forward.

"Our goal is to help create an inclusive, welcoming community," Kjellerup said. "If you feel that you're in such a community, the chances are that you'll have a much better experience, and you'll be better equipped to succeed."

"And it's not something that begins when a student arrives at UMD and ends at graduation," she said. "Again, the goal isn't simply to make changes within a department, but more broadly to create change in the civil and environmental community that is rooted in our department at UMD."

A NEW SPACE FOR EXPERIENTIAL LEARNING

Students crave the opportunity to apply classroom learning to actual, hands-on engineering problems. For starters, it gives them an edge in a job market where practical experience is valued. UMD's planned Integrated Engineering Building—currently in the programming phase, with construction expected to begin in 2022—will include an abundance of new lab space in which students can experiment, design, build, and apply what they've learned. These new spaces will supplement existing, state-of-the-art lab facilities for structural and geotechnical engineering, providing an equivalent resource for transportation and environmental engineering students and faculty.

"More and more undergraduates are interested in research," said Marya Anderson, environmental engineering lab manager. "The challenge is finding space for them. With the IEB, we'll have space set aside for undergraduate researchers, both teams and individuals."

The IEB will also provide a new space for a larger teaching lab—more than double the size of the department's current teaching lab, Anderson said. In addition, it will include new labs dedicated to autonomous and connected vehicles, smart construction, and big data, as well as a new capstone project design space.

All this will help the department achieve its goal of adding more labs to undergraduate courses, and in turn giving students more of the hands-on experience they need.

CHARLES W. SCHWARTZ

RETIRES AFTER DISTINGUISHED CAREER AS PROFESSOR, CHAIR

Visitors to Charles W. Schwartz's office have often been surprised to see, along with bookshelves lined with scholarly works, an impressive collection of electric guitars.

Schwartz, who retired in October after nearly four decades as a UMD civil and environmental engineering professor—and seven years as department chair—is an avid amateur rock musician who continues to perform regularly with his band. In 2021, he played the national anthem, Hendrix-style, during commencement ceremonies at the A. James Clark School of Engineering.

But it is his achievements as an engineer, educator, and department head that have yielded the most enduring impact. An internationally renowned expert on pavement engineering, Schwartz has helped pioneer the use of environmentally friendlier alternatives to hot mix asphalt, among other innovations. With media outlets consulting him regularly on the state of roadways, Schwartz often joked that he'd set out for rock and roll glory, only to become known as "Professor Pothole."

While Schwartz inherited a robust department when he took the helm as chair in 2014, he also saw the need for transformation and growth. To meet an increased need for hands-on learning, he secured the funding to establish the Whiting-Turner Infrastructure Engineering Laboratories, a suite of state-of-the-art laboratories dedicated to understanding the behaviors of steel, asphalt, soil composites, and other infrastructure design materials. As Schwartz has said, "civil engineering is a tactile field. For students to be successful, they need direct interaction with the materials, testing techniques, and instrumentation." Schwartz also launched a new strategic plan for the department, as well as a bold curricular overhaul.

Under his leadership, the CEE department solidified its reputation as a national leader in the field of transportation engineering. In 2019, it established the Maryland Transportation Institute (MTI), a research hub dedicated to bringing together experts from across the University of Maryland to tackle challenging transportation issues, including congestion and road safety.

In addition, he encouraged the department-led Project Management Center of Excellence to explore new teaching modalities—particularly massive open online courses (MOOCs). His recommendations paid off: a series of EdX courses offered virtually by the center has attracted thousands of students, both nationally and internationally, since their inception.

"Chuck is a visionary," said UMD President Darryll J. Pines, a longtime colleague and fellow Massachusetts Institute of Technology (MIT) graduate, "but he's always been a visionary with a plan. As chair, he set ambitious, long-range goals for the civil and environmental engineering department, and he also took concrete steps to make those goals happen. The department will continue to reflect his legacy for a long time to come."

PHOTO: AL SANTOS

MEET INTERIM CHAIR ALBA TORRENTS

The UMD civil and environmental engineering department welcomes the appointment of Professor Alba Torrents as interim chair. An environmental engineer, Torrents has served as principal investigator on a wide range of projects, covering topics that include thermal hydrolysis treatment of wastewater and use of an electric nose to detect odors from biosolids. A native of Spain, she earned a bachelor's and master of science degree from the University of Barcelona before completing her doctorate at Johns Hopkins University in 1992.

Torrents, who was recently awarded the Ben Dyer Centennial Chair in Civil and Environmental Engineering, heads the CEE department's persistent organic pollutant laboratory, one of three environmental engineering labs at UMD. In her lab, Torrents and her students study contamination and processes in wastewater and agriculture, as well as legacy contamination in soils.

WORKING TOGETHER TO SHOW COVID-19'S IMPACT ON COMMUNITIES OF COLOR

The COVID-19 pandemic has had a broad, uneven impact on society, with communities of color being disproportionally affected. Bringing data engineering expertise to the table, UMD Civil and Environmental Engineering Assistant Professor Michelle (Shelby) Bensi and doctoral student Kaveh Faraji have been supporting Healthcare Ready as it develops a research study to understand what these communities need to cope and recover.

Healthcare Ready is a Washington, D.C.-based national nonprofit organization that focuses on strengthening the United States' healthcare supply chain preparedness and response before, during and after natural disasters and disease pandemics.

The UMD researchers have been leveraging multiple databases for the project, including the Center for Disease Control's (CDC) Social Vulnerability Index, and combining them to yield a more comprehensive picture.

"We started with the CDC's index, which covers variables relating to socioeconomic status, minority status, housing and transportation, and household composition and disability," Bensi said. "We added information about baseline overall health challenges in the community and about healthcare infrastructure, plus COVID case counts and death rates. In this way, we're able to expand our understanding of social vulnerability as it pertains to these communities."

Mobile Device Data Could Boost Road Safety for Bicyclists, Pedestrians

Vehicles and pedestrians can be a deadly combination: out of 530 fatal traffic accidents in the state of Maryland during 2019, nearly a quarter (23.3%) involved people being struck and killed. As transportation agencies and policymakers strive to rein in the fatalities, they face a hurdle: adequate data is not available for many intersections and road segments, particularly outside of major urban areas. Obtaining the needed information is a slow, cumbersome, and costly process, typically requiring personnel to visit the locations of interest and conduct a tally.

With the advent of mobile devices, better methods are now conceivable. With funding from the U.S. Department of Transportation (USDOT) and Maryland Department of Transportation State Highway Administration (MDOT SHA), University of Maryland (UMD) Associate

While each individual database provides critical information, combining them allows researchers to spot correlations that might otherwise remain hidden, Faraji said.

"By supplementing the CDC's database with COVID case data and natural hazard maps developed by agencies like the Federal Emergency Management Agency (FEMA) and the United States Geological Survey (USGS), we can identify the relationship among the vulnerability factors, the pandemic's impact, and location," he said. "We've been able to develop a new index that allows us to pinpoint communities that have been hit especially hard by the pandemic."

The findings obtained by Bensi and Faraji are now being integrated into the larger Healthcare Ready research study, which also involves surveying the nation to find out which effects of the pandemic—from increased unemployment to decreased access to medical care—are causing the most disruption, and for whom. The entire project is being supported by a grant from the Walmart Foundation.

"We want to find the communities where the impacts of COVID have been most drastic and where we need to focus our efforts for the next year," said Ryan Dadmun, a Healthcare Ready technical specialist who is involved in the project. "UMD's research really helped us narrow down where those places are located."

Data engineering of this kind will have value even after the pandemic subsides, as the insights about community resilience can be generalized to cover a wide range of challenges, including the impact of natural events such as earthquakes or hurricanes, Bensi and Faraji said. They noted that this project is a prime example of how the work of engineers in academia can be leveraged to assist with real-world issues.

"Too often, engineering researchers operate in a bubble, without the reality perspective that an organization like Healthcare Ready brings," Bensi said. "Ultimately, data engineering isn't just a game with numbers. As with civil engineering in general, we're studying the built environment—and that is something which involves people and societies in a very tangible way."

Research Professor Chenfeng Xiong is leading a project that uses location-based data from mobile devices to glean insights into the hazards at particular intersections or road segments.

The approach, harnessing the capabilities of UMD's Maryland Transportation Institute (MTI) could yield far greater accuracy and, compared to current methods, is much more efficient, Xiong said.

"Typically, in order to understand the volume of pedestrian and bicycle activities, we have to rely on very tedious manual or automatic counting stations," he explained. "Those gathering the data have to go to different critical intersections or segments and count how many people are crossing the street or walking."

"It's an old-fashioned, time-consuming, and costly process—and can also be dangerous for the data-gatherers," he said. "Furthermore, it only allows us to gather a limited amount of data on intersections or segments."

As an alternative, Xiong plans to collect massive volumes of mobility data from mobile device apps, then feed this information into algorithms developed at MTI. The results are expected to be far more precise—and less costly—than those achievable through the manual approach.

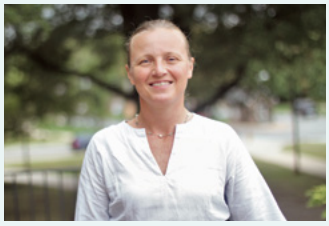
"With our algorithms and the data analytics strength we have accumulated at MTI, we can use the mobile device data to calculate pedestrian-bicycle volumes at a very fine grain of temporal definition. We'll also be able to cover all areas of Maryland, whereas right now there are gaps—for instance, in some rural or suburban areas."

With improved data availability, decision makers will have a sounder basis for developing policies aimed at making roadways safer for all who use them.

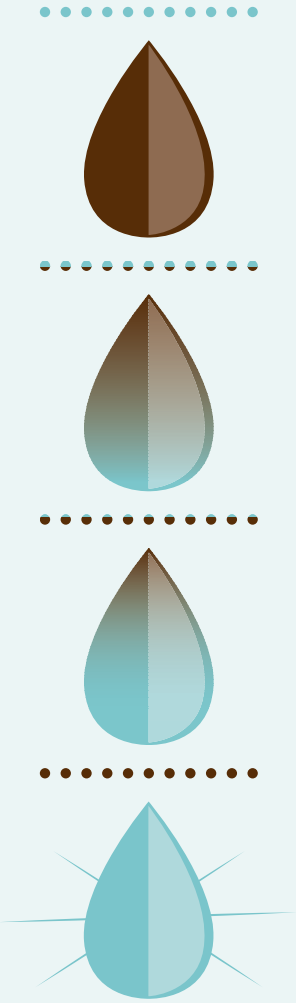
"On average, we're losing more than 100 people a year to crashes involving pedestrians and bicyclists," Xiong said. "That's a huge loss to society. We believe our tools and methods can help Maryland state agencies in determining where the problems are and better allocating resources to reduce fatalities and achieve the goal of zero deaths."

ENVIRONMENTAL CLEANUP:

KJELLERUP DEVELOPS "TREATMENT TRAIN"



"One of the main challenges is in determining how to decontaminate different kinds of pollutants."



Cleaning up dangerous pollutants at military sites is no easy task, and the challenge is made even more difficult by the need to prevent stormwater from ferrying the toxins into civilian areas.

To address this hazard, the Department of Defense (DoD) is marshalling the expertise of University of Maryland (UMD) civil and environmental engineering faculty—including Associate Professor Birthe Kjellerup, one of the nation's leading experts on biofilms.

Kjellerup, who recently wrapped up a DoD-funded study that investigated the use of microbial biofilms to break down polychlorinated biphenyl (PCB), is applying some of the findings to a second project, aimed at developing innovative ways to remove persistent organic pollutants (PoP) and metals from stormwater runoff, particularly from DoD sites.

Both studies received funding from the DoD through its Strategic Environmental Research and Development Program (SERDP), an environmental science and technology initiative run by the DoD in partnership with the Department of Energy (DOE) and the Environmental Protection Agency (EPA).

Kjellerup, together with Professor Allen P. Davis and collaborators at the University of Washington, is devising a "treatment train" that resembles, in principle, the systems that consumers use to filter tap water. The "train" envisaged by Kjellerup and colleagues involves several steps, each resulting in greater levels of decontamination.

"When the stormwater hits the first part of the system, the material there takes the brunt of the contamination and also concentrates it, allowing it to be removed and taken to a waste disposal site. Then the second and third steps clean the water further," Kjellerup explained.

One of the main challenges, she said, is in determining how to decontaminate different kinds of pollutants: metals such as copper, for example, won't biodegrade the way that persistent organic pollutants do. Contaminated sites may include both organic pollutants, metals, or a mixture of both.

Thus, her team is experimenting with a number of different materials that can be used for decontamination purposes, including biochar, the result of exposing a waste material to very high temperatures. "We're testing these different types of materials to see what combinations work best and do not introduce an additional form of waste. Recontamination is something we are very concerned about," Kjellerup said.

UMD's civil and environmental engineering department is uniquely poised to take on environmental cleanup challenges of this kind, Kjellerup said. The department is a hub for biofilms research, with Kjellerup editing the journal *Biofilm* and running a lab dedicated to this area of research. She also benefits from collaboration with experts on stormwater (Allen P. Davis), organic chemistry (Alba Torrents), wastewater treatment (Guangbin Li) and other aspects of environmental engineering.

Graduate students and post-docs in the UMD environmental engineering program have gone on to make significant contributions to decontamination research; among them is Staci Capozzi, who collaborated with Kjellerup on the SERDP project that finished in March.

"Staci made a crucial breakthrough in identifying the mechanism by which microbial biofilms are able to break down organic pollutants," Kjellerup said. "She disproved a number of hypotheses and was able to show that adsorption—the adhesion of molecules to a surface—is the mechanism."

Capozzi, now with Geosyntec Consultants, is building off that finding as part of a newly awarded SERDP project launching this year.

Cui Leads Groundbreaking Study on Project Delivery Methods, Equity

FIRST-OF-ITS-KIND STUDY PROVIDES EMPIRICAL DATA ON THE TRACK RECORD OF PUBLIC PRIVATE PARTNERSHIPS IN SETTING DISADVANTAGED BUSINESS ENTERPRISE GOALS.

Public Private Partnerships (P3) have been widely lauded but also criticized, with some charging that they favor large, well-established players and do little to foster a more equitable environment for female and minority-run businesses. Until now, however, empirical data to support or refute those claims has been lacking.

A newly-released study, conducted by Professor Qingbin Cui and doctoral student Kunqi Zhang, and published by *Transportation Research Record*, aims to fill in the data gap. It is the first ever to empirically test how different delivery methods correlate with the setting and attainment of Disadvantaged Business Enterprise (DBE) goals—typically expressed in terms of the percentage of contract dollars expected and actually awarded to minority and women-owned businesses that participate in federally-funded transportation projects.

And its findings are surprising. Not only do P3 projects have a better track record in setting equity goals than many assume, but they actually outpace Design-Bid-Build (DDB), a more traditional delivery method.

"The conventional wisdom turns out to be wrong," Cui said.

Drawing from the U.S. Major Highway Projects Database, Cui and Zhang sampled 134 federally assisted contracts. Linear regression models created by the team showed that two delivery methods—Design-Build (DB)/Construction Manager at Risk (CMAR) and P3—outpace DBB in setting equity-related goals.

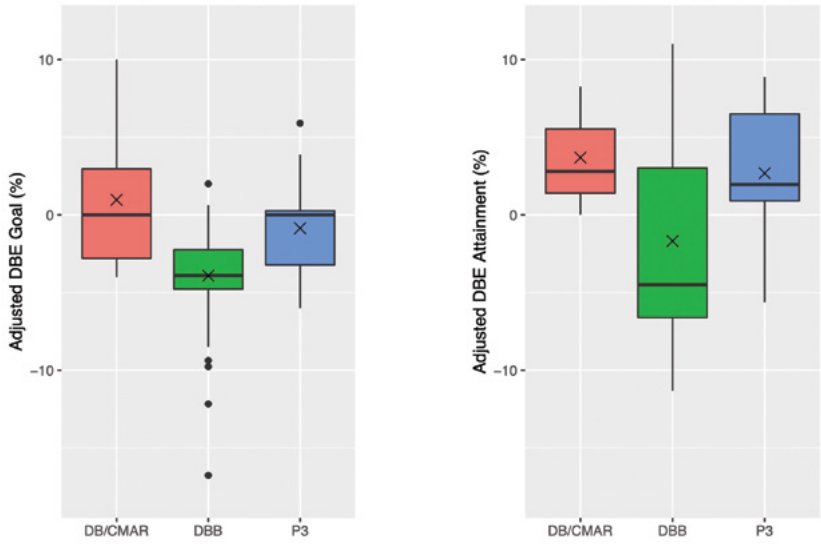
In Ohio, for instance, value-weighted DBE goals stood at 14.3% for P3, 10.7% for Design Build/Construction Manager at Risk, and 9.2% for DBB; in Texas, the numbers were 12.8%, 9.9%. And 8.0%. Similar trends were found nationwide, and DBE goals were also found to be the most robust predictor of actual DBE attainment.

Contract size is an important factor, Cui and Zhang found: the larger the contract, the more opportunities for subcontractors, in turn fostering a greater capacity to meet DBE goals. And both P3 and DB/CMAR dwarf DBB when it comes to contract size, with average amounts of $954.2 million, $466.6 million, and $89.1 million, respectively.

"Larger-scale contracts offer more opportunities for business that might otherwise not be able to get a foot in the door," Zhang said.

P3 projects may also have an incentive to promote diversity and equity because of the amount of public scrutiny these large, high profile projects often generate. "There's a public relations component," Cui said. "Companies involved in these projects are in the media spotlight and they want to be seen as doing the right thing."

The primary source for the study—the U.S. Major Highway Projects Database—was also developed at UMD, under Cui's direction. Unveiled in 2019, the tool covers nearly two decades of highway projects and allows researchers a ready means to make cross-project comparisons. Cui and Zhang conducted their research with support from the Maryland Transportation Institute, a research hub that brings together transportation experts from across the University of Maryland to devise interdisciplinary solutions to transportation challenges.



Distributions of Adjusted DBE Goal and Adjusted DBE Attainment by delivery method. DBE goal and DBE attainment have been adjusted to account for the different DBE availability in each state.

Graham Takes the Helm as New Clark School Dean

PHOTO: STEPHANIE S. CORDLE

The A. James Clark School community welcomes our new dean, Samuel Graham, Jr., who comes to UMD after a highly distinguished career at the Georgia Institute of Technology. An expert on electronics made from wide bandgap semiconductors, Graham formerly served as the Eugene C. Gwaltney, Jr. Chair of the George W. Woodruff School of Mechanical Engineering at Georgia Tech, in addition to multiple joint and courtesy appointments.

"I am honored to be appointed dean of Maryland's A. James Clark School of Engineering, a research powerhouse and home to world-class faculty, staff, and students," said Graham following his appointment. "I look forward to contributing to its legacy of excellence and leading the next generation of diverse Terrapin engineers poised to improve our world through innovations in technology."

As a researcher, Graham has focused much of his work on the development of a range of applications in communications, power electronics, and neuromorphic computing. His research is focused on engineering the electrothermal response of the devices in order to enhance heat dissipation and improve device reliability. In addition, he is creating physics-based models and unique experimental tools for verification that will enable the optimization and digital engineering of these electronics. Through his work with Department of Energy (DOE) National Laboratories, he is also developing thermal storage materials for use in building energy systems.

Prior to joining the faculty at Georgia Tech, Graham was a senior member of technical staff at Sandia National Laboratory in Livermore, California. Over the years, he has served as a member of the Defense Science Study Group and the Air Force Scientific Advisory Board and was the recipient of a National Science Foundation (NSF) Early Career Development (CAREER) Award. Presently, he serves on the advisory board of the Engineering Science Research Foundation of Sandia National Laboratories and the Emerging Technologies Technical Advisory Committee of the U.S. Department of Commerce. He is also a fellow of the American Society of Mechanical Engineers and a senior member of the Institute of Electrical and Electronics Engineers.

Graham earned his B.S. from Florida State University and his M.S. and Ph.D. in mechanical engineering from Georgia Tech.

BENSI WINS NSF CAREER AWARD

Natural hazards often come in bundles: an earthquake, for instance, may lead to flooding if dams or levees break. Indeed, such multi-hazard events are more the rule than the exception.

Yet experts who perform hazard assessments generally address each type of hazard in isolation, without investigating the ways in which multiple hazards could combine, says UMD faculty member Michelle (Shelby) Bensi, newly-announced recipient of a National Science Foundation (NSF) Early Career Development (CAREER) Award.

An assistant professor in the civil and environmental engineering department, Bensi has set out to close the gap in hazard assessment by developing tools and strategies that can guide our understanding of more complex types of risk.

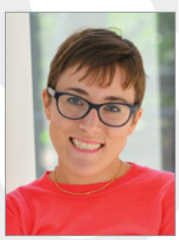
"Individual communities of practice have developed around specific kinds of hazards," Bensi said. "There are seismic researchers, coastal hazard researchers, inland flooding researchers, and precipitation researchers, just to name a few. And they often don't interact." Such compartmentalization even operates at institutional levels: one university may be known for its expertise in seismic events, while another may be a hub for flooding research.

In her NSF-funded research, Bensi will be seeking to develop a common lexicon as well as a mathematical framework that will enable specialists in different hazard areas to communicate and collaborate effectively. To do so, she will employ probabilistic graphical models known as Bayesian networks.

"Bayesian networks allow us to represent mathematics in a graphical form," Bensi said. "And that makes them ideal for communicating with subject matter experts across disciplines."

"They're also exceptionally useful for modeling complex dependencies—which are indeed what we find in multi-hazard events," she said.

The NSF CAREER Award, Bensi said, is the perfect springboard for such an endeavor. "It's designed to encourage big thinking, and to support research with the potential to transform a field or discipline," she said. "My interest in bridging the divide between researchers, practitioners, and educators working with different hazards was actually one of the things that spurred me to go into academia. I saw there were avenues available for the kind of work I wanted to do and this CAREER Award will help enable that."

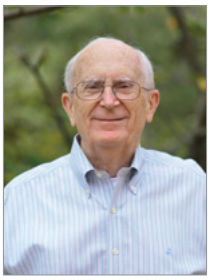


Amde, Galloway Retire

Two professors in the civil and environmental engineering department retired during the summer after highly accomplished careers as researchers and educators.

Amde M. Amde, who joined the UMD faculty in 1983, has published more than 200 refereed papers and holds two U.S. patents. His research has been supported by the National Science Foundation (12 grants), the U.S. Nuclear Regulatory Commission, the U.S. Department of Energy, the National Academies, the Federal Highway Administration, the Sloan Foundation, the Maryland Department of Natural Resources, the Maryland Department of Transportation (DOT), the Masonry Research Foundation, and others. His national and international awards include the 1991 Innovation in Civil Engineering Award of Merit from the American Society of Civil Engineers (ASCE) and the M.C. Bauchemie Best Paper Award in 2005. He served as editor of the American Masonry Society Journal and currently is editor-in-chief of the *Journal of Advanced Structures* and *Geotechnical Engineering*.

Gerald Galloway is among the world's leading experts on water resource management and flood plain planning. A civil engineer, public administrator, soldier, educator, and geographer, he joined the UMD faculty in 2004 as Research Professor and Glenn L. Martin Institute Professor of Engineering. Among many other projects undertaken during his UMD career, Galloway spearheaded the first-ever comprehensive report on urban flooding risks in the United States, and also served as a principal investigator (PI), together with co-PI Gregory Baecher, on a in-depth assessment of the 1% chance flood standard, a key component of the National Flood Insurance Program.



Galloway graduated from the U.S. Military Academy (USMA) at West Point and went on to a 38-year career in the U.S. Army, which included an appointment as Commander of the Virginia District of the Army Corps of Engineers. He served on the USMA faculty as professor of geography and computer science and professor and founding head of the Department of Geography and Environmental Engineering. In 1990 he was promoted to brigadier general and appointed the ninth Dean of the Academic Board (Provost) of the USMA. He retired from active duty in 1995. He has been awarded the Army Distinguished Service Medal, the Legion of Merit, the Bronze Star, the Air Medal, and the Meritorious Service Medal, among other honors. He is an Honorary Member of ASCE and a member of the National Academy of Engineering. Galloway continues to be consulted regularly by legislators, policymakers, and the media on issues related to water resource management, and has given testimony before Congress on multiple occasions, including in June 2021.

FACULTY & STAFF ACHIEVEMENTS

FACULTY

Professor **BILAL AYYUB**, director of the UMD Center for Technology and Systems Management, was selected as co-PI of the Ocean Energy Safety Institute 2.0, a consortium led by Texas A&M University with funding from the U.S. Department of Energy. In addition, **AYYUB** was selected as PI of a project funded by the Federal Railroad Administration on quantifying the resilience of freight railroad networks.

AYYUB is lead author and editor of the 2021 American Society of Civil Engineers (ASCE) publication *Hazard-Resilient Infrastructure: A Manual of Practice on Analysis and Design*. He is also lead author and editor of the 2020 book *Thoughts and Conversations of Buildings and Other Structures*.

Professor **GREGORY BAECHER** has been honored with inclusion by ASCE in its 2021 class of Distinguished Members for his development and implementation of probabilistic and risk-based approaches to geotechnical and water resources engineering.

Associate Professor **DIMITRIOS GOULIAS** was awarded the 2021 Poole and Kent Teaching Award for Senior Faculty. The annual award is given by the A. James Clark School of Engineering in recognition of teaching excellence.

Professor **DAVID LOVELL** was selected as a Big Ten Academic Leadership Program Fellow for the 2021-2022 Academic Year.

Clark Distinguished Chair and Professor **DEB NIEMEIER**, together with colleagues at the University of Texas and University of Vermont, was awarded a grant from the Democracy Fund to investigate the effects of accessibility to voting location on voting participation.

Professor **MIROSLAW SKIBNIEWSKI** was elected to the membership in the National Academy of Construction. The official induction ceremony will take place in October 2021 in Colorado Springs, CO.

Professor and Interim Chair **ALBA TORRENTS** was awarded the Ben Dyer Centennial Chair in Civil and Environmental Engineering by the A. James Clark School of Engineering at UMD.

STAFF

ISABELLA KOLAR, undergraduate advisor at the civil and environmental engineering department, received the A. James Clark School of Engineering's Student Advising Award for Professional Staff.

CALVIN BURNS

BY ISABELLA KOLAR

WHEN IT COMES TO BEING AN ACTIVE MEMBER OF THE UNIVERSITY COMMUNITY, CALVIN BURNS SETS THE BAR HIGH.

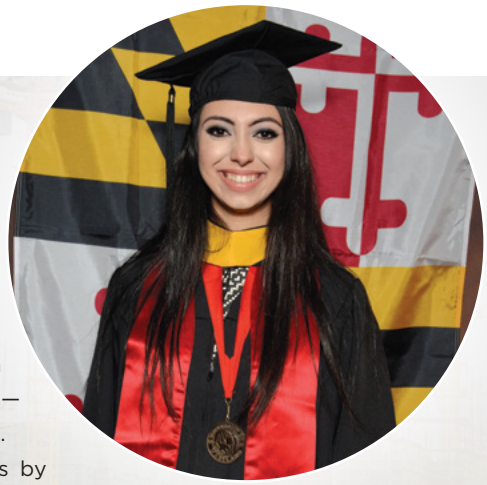
He's been a resident assistant and a member of the Resident Hall Association's Executive Board. He served on the University Senate, Engineering Senate, and Epsilon Eta, UMD's professional fraternity for environmental science. In addition, he served on the Sustainability Fund Review Board before moving to the Student Facilities Fund Review Board, where he now weighs in on proposed campus projects. His latest venture has been participating in the new alumni-student mentoring program spearheaded by Dr. Natasha Andrade and Pam Lloyd.

He's helped to focus campus efforts around environmental stewardship by organizing community stream cleanups and developing GreenEdu, an educational module akin to AlcoholEdu but designed to educate incoming students about sustainable practices.

And he's done all this while maintaining a rigorous academic workload. On track to graduate in 2022 with a civil engineering degree, specializing in the water & environmental resources track, he is also completing two minors (sustainability and project management) and a certificate from the Environment, Technology, and Economy (ETE) Scholars Program. While not in school, Calvin is busy with internships: in 2020, he doubled up on them, making the most of the virtual environment during COVID-19. He held a full-time role with EN Engineering, a dry utilities design firm, and a part-time role with Site Resources, a landscape development and storm-water management design firm.

Perhaps Calvin's most notable accomplishment, tying together his entire college experience, is the Hammock Haven: an ongoing project designed to protect UMD's botanical legacy while also providing the campus with more outdoor amenities.

HALA ALKHALOUF



WHEN THE UNITED STATES, ALONG WITH MUCH OF THE GLOBE, WENT INTO LOCKDOWN IN EARLY 2020, construction was one industry that didn't grind to a halt. Nevertheless, many construction firms took a serious hit, according to a UMD civil and environmental engineering graduate student who has produced one of the first systematic assessments of how the industry has fared.

Hala Marwan Alkhalouf's master's thesis, *Impacts of COVID-19 on Construction*, points to supply chain disruptions and worker shortages as two of the most serious factors affecting construction during 2020. Even where deemed essential, construction projects experienced delays because they depended on manufacturers and suppliers that—in many cases—were classified as non-essential. Projects also could not be completed on schedule if workers were absent. With many becoming sick as the virus spread—or choosing to stay at home in compliance with recommendations by health officials—manpower shortages were frequent.

Alkhalouf obtained her findings by conducting case studies involving projects in the Washington, D.C. metro area (DMV), examining project schedules, meeting minutes, specification charts, monthly reports, and other documentation, and using Primavera P6 and Schedule Analyzer software to parse the data.

"I studied two aspects of construction," said Alkhalouf, who completed her Masters of Science (M.Sc) degree while working full-time as a construction consultant for the Maryland-based firm O'Connell and Lawrence. "The first one is procurement; in every project, you need to procure material and transport it to the site. During lockdown, projects that did not already have all their material on site were impacted. You can't build if you don't have the materials."

Lower labor productivity, resulting from sick or absent workers, also fed delays and drove up costs. "If you don't have enough people to do the work, it's

Burns initially developed the idea of Hammock Haven during a freshman-year urban planning course. The result is s popular outdoor amenity on campus.

The seeds for this project were sown in his first semester at UMD. The urban planning course that inspired his passion for civil engineering centered on a cumulative white-paper-style blog post discussing a local public space that could be improved. Calvin did his project on the Cambridge Community, which is home to the Scholars Program. He felt the space lacked amenities to bring people together and researched a number of potential solutions.

After completing that course, Calvin continued to develop his idea with the help of fellow ETE students. After three more semesters of technical and empathy research, and with the backing of several campus organizations including the Department of Resident Facilities, he submitted a grant proposal at the end of his sophomore year.

Calvin can now see his hammock posts being used by groups of students whenever the weather permits, and says it is uniquely fulfilling to have had a tangible, positive impact on the campus community. Since his initial prototype proved successful, Calvin has been working with Epsilon Eta to expand the Hammock Haven to other locations on campus.

Calvin has already mapped out his life plans. First, he'd like to spend his early to mid-twenties as an Engineer in Training, securing a Professional Engineering (PE) License, and earning an M.E. degree at the Project Management Center for Excellence, based in UMD's civil engineering department. He hopes to start his own company designing and building net-zero homes and communities; he even hopes to build and move into his dream home in one of these sustainable communities.

If he can find the time, he hopes to eventually become involved in state and local governance to develop environmental legislation related to sustainable infrastructure. And finally, during retirement, Calvin hopes to own and operate a distillery where he'll put his sustainable agriculture experience to work making locally sourced tequila in the New England region.

Whether his life goes according to plan or not, this remarkably engaged, motivated young engineer has the work ethic to build his dreams into realities.

going to go at a slower pace," she said.

Between the procurement problems and worker absenteeism, the projects studied experienced delays of nearly a month—a costly bottleneck, since every additional day means additional money spent on overhead, salaries, and insurance. Serious as these delays were, though, the experience of U.S. firms during the pandemic has paled next to that of countries such as the United Arab Emirates, where construction relies heavily on migrant labor, housing the workers together in dorms. "One worker gets sick, they all get sick," Alkhalouf said.

What results of her research did she find most surprising? That the magnitude of the impact far exceeded the level of preparation. With the threat of an impending pandemic apparent since late 2019, and the effects on countries in Asia and Europe widely reported, contractors in the U.S. had the opportunity to make contingency plans—yet many were caught by surprise.

"People did not take this seriously at first—that's the bottom line," Alkhalouf said. "If they had, they could have procured the material much earlier and tried to expedite schedules, finding ways to account for the delays before they happened."

There's a longer-term lesson having to do with resilience, she said. Post-pandemic, there are still many other threats to consider, including those posed by extreme weather. Companies, she believes, should focus more efforts on contingency planning and have backup options in place in the event of supply chain breaks due to an unexpected hazard.

Alkhalouf's thesis was supervised by Miroslaw Skibniewski, professor of civil and environmental engineering and editor-in-chief of *Automation in Construction.* "Hala's research breaks new ground for better understanding how construction industry supply chains behave during extreme events such as the ongoing pandemic," he said. "Contingency planning for early materials delivery may sometimes contradict the established knowledge of just-in-time delivery principles to achieve lean production on project sites and to avoid materials storage costs."

"Construction schedule adjustments are needed to avoid costly delays caused by absenteeism among laborers, and these can be facilitated by the use of IT and automation-based solutions," Skibniewski said.

Alkhalouf also credits the Project Management Center for Excellence—based in the department—with supporting her work. She is now continuing her studies as a doctoral student.

GRADUATE AWARDS

Bechtel Award: **AZIN AL KAJBAF**

Clark Doctoral Fellowship: **CONSTANTINOS FRANTZIS**, **LINDA WATERS**

Harkins Group Fellowship: **HAMED GHAEDI**

Intelligent Transportation Society (ITS) of Maryland Scholarship: **QINGLIAN HE**, **ALIAKBAR KABIRI**

Rattan L. Khosa '71 Graduate Scholarship: **XINYA LU**

Master's Award: **LAVAN TEJA BURRA**

Lieutenant General John W. Morris II Graduate Fellowship: **PAUL MAGOULICK**

Outstanding Research Assistant Award: **YALDA SAADAT**

Ph.D. Award: **SANAZ ALIARI KARDEHDEH**

Summer Research Fellowship: **MARIA RODRIGUEZ**, **YUNPENG ZHAO**

UMD Global Stewards NSF NRT Fellowship: **ERICA FORGIONE**

Dr. Matthew W. Witczak Graduate Award: **NNEOMA UGWU**

Women's Transportation Seminar (WTS) Helene M. Overly Memorial Scholarship: **NNEOMA UGWU**

Women's Transportation Seminar DC Chapter Scholarship: **SARA ZAHEDIAN**

Anne G. Wylie Dissertation Fellowship: **SETARE SAREMI**

Stanley R. Zupnik Fellowship: **POOYA REZVAN**

UNDERGRADUATE AWARDS

ASCE Outstanding Senior: **JOHN NALLEY**

CEE Outstanding Senior: **ANDREW GRUPP**

CEE Outstanding Junior: **JOSEPH ANDERSON**

Chair's Award: **JASON WEBB**

Chi Epsilon: **EMMA TREBEL**

Bechtel Award for Outstanding Leadership: **LILIA YOUSEFIAN**

Robert L. Morris Award in Environmental Leadership: **ALEXANDRA MILLER**

Nneoma Ugwu Awarded Helene M. Overly Scholarship

Nneoma Ugwu, a doctoral student in civil and environmental engineering at the University of Maryland, has been named the 2020-2021 recipient of the Women's Transportation Seminar (WTS) Helene M. Overly Memorial Scholarship.

This international scholarship, awarded annually to one graduate student, aims to encourage women to pursue career paths in transportation.

"I am so honored and excited to be awarded the Helen M. Overly International Memorial Scholarship by WTS," Ugwu said. "This scholarship will go a long way in supporting my research on the impacts of Covid-19 on transportation as I explore the potential benefits of continued teleworking in order to assist policymakers in their decisions."

During the past year, Ugwu has been conducting a study designed to quantify how reductions in traffic due to teleworking impact congestion—a topic inspired by changes to traffic patterns arising from the COVID-19 pandemic. Research by the Maryland Transportation Institute has revealed that as little as a 15% reduction in traffic translates into nearly free-flow on otherwise very congested roadways.

Ugwu is researching the broader impacts of this finding, including how lower traffic volumes affect individual roadway segments, planned projects, and tolled facilities. In addition, she is examining equity issues around how reductions in roadway volumes impact low-income communities, and what longer-term trends might emerge if the reductions continue.

"She is able to work from the basic single project to the larger system in which the project operates. This is truly a valuable skill," said Clark Distinguished Chair Deb Niemeier, Ugwu's advisor.

Ugwu said her interests as a researcher have been shaped by experiences in her native country, Nigeria.

"My passion for transportation stems from experiencing firsthand the crippling effect of poor transportation systems and planning on a nation's economy and growth. I'm so happy that my dedication to providing equitable transportation systems and using transportation as a tool to alleviate poverty is being recognized," she said.

"I hope my work and successes encourage more diversity, especially for women in the world of transportation," she said.

First Virtual Operations Academy Senior Management Program a Success

BY KATHLEEN FRANKLE

The nationally recognized and highly acclaimed Operations Academy Senior Management Program held its first 100% virtual program in October 2020, adopting the online format in response to the COVID-19 pandemic.

Hosted by UMD's Center for Advanced Transportation Technology (CATT), Operations Academy is a two-week total immersion program focused on providing transportation system management and operations training (TSMO) specifically for state departments of transportation, toll authorities, metropolitan planning organizers, and law enforcement.

The change of format from in-person to virtual, necessitated a different approach to delivering content. Participants were assigned pre-study materials to review before the start of the program and virtual in-person sessions were used for discussions and breakout sessions to discuss and apply the content they had reviewed earlier.

Participants lauded the experience. "Having completed the first virtual Operations Academy, I would absolutely recommend this program to others," said Mike Davidson, project manager at Drive Engineering and a former project manager with the Pennsylvania Turnpike Commission. "The presentations, lessons learned, and meaningful conversations between attendees and presenters provided invaluable information that will help me in my career."

The program "taught me more in two weeks than I have learned in 11 years about TSMO," said Bethany Waltersdorf of the Iowa Department of Transportation.

The October/November 2021 Operations Academy Program is also being delivered virtually with a record number of students participating in the program. There will be 60 participants representing 34 states plus Puerto Rico.

PHOTO: SURAJU KEHINDE

DATA-DRIVEN RESEARCH, PANDEMIC HIGHLIGHTED AT TRB

As transportation experts from across the United States and the globe assembled—virtually—for the Transportation Research Board's (TRB) annual meeting in January, UMD researchers presented findings drawn from a widely utilized COVID-19 Impact Analysis Platform developed by the university's Maryland Transportation Institute (MTI) and Center for Advanced Transportation Technology Laboratory (CATT Lab). The platform leverages mobile device data to track travel data and an abundance of other metrics related to the pandemic.

MTI Assistant Director Chenfeng Xiong and members of his research group presented studies on the analysis and modeling of mobility trends during the pandemic, the phenomenon of "quarantine fatigue" and its effects on social distancing, compliance with stay-at-home orders, the pandemic's effect on use of different travel modes, and the impact of pandemic-related policies on outcomes in urban areas.

"While the pandemic has been a devastating event both here in the United States and globally, it is important not to pass up the opportunity to glean valuable data from it—data that can be used to help us better prepare for crises that may arise in the future," Xiong said. "The UMD COVID-19 Impact Analysis Platform is a wellspring of such essential data."

Also at this year's TRB meeting, CATT lab ran a virtual booth that showcased some of the capabilities being developed at the Lab. These include an intersection analytics module that uses probe vehicle data trip data to enable users to analyze the performance of potentially thousands of intersections; a suite of tools that tracks the impact of emergencies and major events across multiple transportation modes (land, sea, and air), and a tool for tracking energy consumption and emissions across the nation's highways.

Joe Makar: A CEE Changemaker for Diversity, Equity, and Inclusion

A longtime supporter of engineering at UMD, alum Joe Makar ('78, civil engineering) has provided generous funding to kickstart the department's Diversity, Equity, and Inclusion Seminar Series.

Makar has seen many changes at Maryland since his undergraduate days, including the growth and expansion of UMD engineering programs. Through his ongoing engagement with the A. James Clark School of Engineering, he has supported many of these changes.

A partner at Whitman, Requardt and Associates, LLP, Makar is a major donor to the Clark School and a member of its Visiting Committee. Among other contributions, Makar's financial support helped establish the department's Whiting-Turner Infrastructure Engineering Laboratories, providing state-of-the-art facilities and resources for UMD students.

Now, as UMD civil and environmental engineering ramps up initiatives aimed at fostering greater diversity and inclusion, Makar is helping to fund those efforts. A generous gift from his firm has made it possible to launch a Diversity Seminar Series that will bring speakers to campus to educate, inform, and inspire the UMD community.

It's a cause that is close to Makar's heart—and one that reflects his insights as a practicing engineer-turned-executive. Diverse teams are valued in industry, he says, both because of the synergy they create and the varied perspectives that they bring to the table.

"With a more inclusive team, you get a broader picture," he said. For example, a team member from a socioeconomically disadvantaged community might understand how a particular engineering project is likely to impact that community—and what should be done to ensure the results are beneficial. That's a dimension engineers have too often overlooked in the past, he said.

Engineering fields are changing in other ways, too, Makar explained. Sustainability has become a major focus, and one that engineers increasingly must factor in when designing infrastructure. Climate concerns are front burner in coastal states like Maryland, where Eastern Shore communities face an existential threat due to rising sea levels.

Meanwhile, autonomous vehicles are poised to revolutionize the transportation sector, which in turn has implications for infrastructure. "We have to design things differently, and that requires making sure our students are up to speed on all these developments," Makar added.

He credits the CEE department, and the leadership of Charles W. Schwartz, with devising a forward-looking strategic plan that reflects the field's ongoing evolution. As departmental chair, Schwartz moved decisively to map out a program for the future.

"CEE is changing both in terms of what industry needs and what students are interested in, and Chuck was quick to recognize that fact," Makar said. "He's done a phenomenal job of readjusting the civil and environmental engineering program to ensure that it remains the phenomenal program that it is," Makar said.

ELLEN TUSING

BY ISABELLA KOLAR

WORKING TOWARDS A MORE SUSTAINABLE ENERGY FUTURE REQUIRES A BROAD, GLOBAL PERSPECTIVE. It's a perspective that comes naturally to Ellen Tusing.

During her childhood, she and her family traveled to and lived in many different states and countries, including Bulgaria, as a result of her parents' missionary work. By the time she was looking at colleges, she was living in Pennsylvania, but was still thinking in big picture terms. She already knew that her foremost interests were environmental engineering and sustainability. These interests would be the foundation of her studies in UMD's CEE department and of her current work as a young professional in the field of solar energy.

Tusing started her freshman year as a CEE student in fall 2013, choosing the environmental/water resources track. UMD appealed to her because of its campus and the diversity of its students. "I love College Park," she says, speaking of its convenient location near Washington, D.C. (great for networking), the revitalization of the neighborhood around campus, and how the city has "the perfect amount of things" to do off-campus.

During her time at UMD, Tusing's primary focus was her schoolwork, but she was also part of campus organizations, including Cru, and volunteered as a language partner for a Chinese student. She also worked as a staff supervisor at the Eppley Recreation Center. Between her junior and senior years, she interned with the Federal Energy Regulatory Commission (FERC) in the hydropower division.

After she graduated in May 2017, ECS in Northern Virginia hired her to do environmental consulting. Two years ago, she transitioned to a new role at Kimley-Horn in Richmond, Virginia. There, she works in solar energy, designing utility-scale solar projects generally ranging from 40-150 megawatts. She is also involved in public interactions related to the work. She is currently the project manager for a 20-megawatt site in Gloucester, Virginia that her team is designing.

Tusing worked remotely for about six months during the pandemic, then returned to the office where safety protocols had been implemented. "Civil Engineering without your team is hard," she said. The virtual environment meant not only learning new technology but finding new ways to maintain relationships. However, the workload at her company did not slow down. "I think it made us better overall," she said of the experience.

Tusing is also continuing to play a role in the CEE department. She explained that as an undergraduate she found having other women in her classes hugely beneficial, so she wants to help increase female representation in the field. "I want to be a voice for women in engineering," she said. One way she is accomplishing this is as a mentor for the department's new Mentorship Program, launched by Dr. Natasha Andrade and Assistant to the Chair Pam Lloyd. This program connects current undergraduates with recently graduated alumni who provide advice and insight based on their own knowledge and experiences. This past year, Tusing mentored two undergraduates.

Tusing also recently gave a guest lecture on solar energy via Zoom in Dr. Andrade's ENCE215 (Engineering for Sustainability) class. As an undergraduate, she found the course "awesome," so she was happy to have another chance to give back. Meanwhile, sustainability continues to be a core focus for her. Tusing loves being outdoors in nature, and carries her efforts to live sustainably into every aspect of her day-to-day life, not just her job.

Her biggest piece of advice to civil engineering students? Keep going! School, she said, was far from easy for her, but she persisted and achieved her goals. She urges others who find it challenging to do likewise, and to know "there's a place for you in engineering."

Want to get involved or share your story?

Contact Leslie Borak **lborak@umd.edu**
or Anna Lee **annalee@umd.edu**

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College Park, MD 20742

PHOTO: ALAN P. SANTOS

SAVE THESE DATES

OCTOBER 20: Inaugural CEE DEI Seminar, featuring Dr. Nnenia Campbell

OCTOBER 22: Chi Epsilon Career Fair

DECEMBER 21: Main Commencement

DECEMBER 22: College Commencement

JANUARY 9-13: Transportation Research Board Annual Meeting

FEBRUARY 15: Suit Up and Be Civil (Chi Epsilon networking event)

FEBRUARY 25: 11th Alumni Cup Competition

MAY 5-6: UMD Project Management Symposium

MAY 20: Main Commencement

MAY 21: College Commencement

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For the most complete and current information on department events, visit cee.umd.edu/events.